

The Role of Energy Efficiency in Homebuying Decisions: Results of Initial Focus Group Discussions¹

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ABSTRACT

Various government agencies, advocacy groups, researchers, and homebuilders have struggled to understand what role, if any, energy efficiency plays in home-purchase decisions, and how to make energy-efficient homes more attractive to consumers. There are many reasons why homeowners buy the homes that they do; location, quality, price, amenities, and other factors play into those decisions. In the past, energy efficiency is believed only to have played a small role in particular home-purchase decisions. This report summarizes results of a “natural experiment” that describes views of homeowners who live in a 193-home residential tract outside of Sacramento, California. Homes in this tract are comparable in most respects except that they have substantially different levels of energy efficiency. In a series of four focus group discussions, views of these homeowners regarding their purchase decisions were collected and analyzed. Results suggest areas of further research, including mixed-method approaches to better understand the role of energy efficiency in homebuyer decisionmaking; investigating strategies for marketing energy efficiency; and investigating homeowner energy awareness that may be related to neighborhood design.

Introduction

Outside of Sacramento, California, side-by-side housing developments were built in 2004–05 by Premier Homes and Cresleigh Homes on a shared tract of land. “Premier Gardens” and “Cresleigh Rosewood” developments include 95 and 98 homes, respectively, in each. Homes in this tract share the same streets and are served by the same amenities in the surrounding community. While sizes and prices varied among the several floor plans offered by both builders, collectively the Premier Homes differed most from the Cresleigh Homes in their levels of energy efficiency.

The Cresleigh Homes products were certified by the local utility, the Sacramento Municipal Utility District (SMUD), as “Advantage Homes” at the “Gold” level.² This rating

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² The Advantage Home program provides financial incentives to production homebuilders for constructing homes that significantly exceed California’s Title 24 Building Energy Standard cooling requirements. Meeting these

translates to an estimated 30% improvement in performance over conventional homes built to California's "Title 24" cooling energy standard. The Premier Homes products include some additional features over the Cresleigh Homes products: (1) a tankless water heater which heats and delivers water on-demand, (2) all-fluorescent lighting, (3) denser ceiling insulation and more efficient air-conditioning³, and (4) rooftop solar panels that produce electricity that is returned to the utility grid, thus generating a credit against the household's utility bill. The Premier Homes products were certified as "Solar Advantage Homes," and are also described as "Zero Energy Homes" by the U.S. Department of Energy's Building America program. This rating translates to a 60% improvement in cooling performance over homes built to California's energy standard.

Recognizing this unusual "natural experiment,"⁴ we hoped to tease-out subtle explanations for the homeowners' preferences for energy efficiency in these two groups of homes at the time of their purchases, and what may account for these differences. In a series of focus group discussions, we gathered information on how these two groups of homeowners considered energy efficiency in their purchase decisions, the influence of builders and others on their decisions, and the role energy efficiency has played in their homeownership experiences more broadly. This study builds upon the work begun in a previous study (Hanson, Bernstein & Kulick 2004) which explored homebuyer preferences, the relationship among comfort, quality and energy efficiency in homebuying decisions, and drew from interviews with executives of several leading production homebuilding companies in California.

What Homebuyers Want

In a 2000 survey of 40,000 households across the United States, the National Association of Homebuilders (NAHB) reported that homebuyers want larger homes with ample interior space and amenities. Only 24% of homebuyers were willing to compromise on size in order to reduce price (NAHB 2002). This, of course, is consistent with a well-known trend in new home construction: The median new home size (measured as floor area) has increased by more than 50% since 1971 while household size has decreased by 17% in that same period (U.S. Census Bureau, cited in NAHB 2002).

Moezzi and Diamond (2005) suggest that higher turnover in single-family houses and perceptions of resale value are important drivers of demand for homes that are larger than actual household needs. NAHB (2002) also reports that where homeowners might consider smaller homes, it would be in a trade for "higher quality products and amenities," not to hold down purchase price or to save on energy bills. In fact, while NAHB researchers reported in 1999 that

requirements requires several modifications, including higher insulation levels, tighter heating and cooling duct systems, upgraded appliances, and others. Homes that have met Advantage Home requirements also qualify for the "ENERGY STAR® Home" rating according to the ENERGY STAR® Home Energy Rating System (HERS) designed by DOE and the U.S. Environmental Protection Agency.

³ In the Premier Homes, ceiling insulation is rated at R-38 and air-conditioning systems are rated at 14 SEER (Hammon 2006) By contrast, ceiling insulation in the Cresleigh Homes is rated at R-30 and air conditioning system are rated at 10 SEER. SEER is a unit of energy efficiency performance called "Seasonal Energy Efficiency Rating." R-values indicate resistance a material has to heat flow. Higher R-values indicate greater insulating capabilities.

⁴ A "natural experiment" is an instance of observable phenomena arranged in a manner that approximates a "scientific experiment." In a scientific experiment, variables can be described as "control" or "treatment," and when properly manipulated can explain cause and effect within the system. In a natural experiment, researchers do not manipulate treatment conditions, but instead attempt to collect data in such a way that the effects of variation in certain variables can be held approximately constant, and so that the effects of other variables can be discerned.

88% of consumers indicated that builders and developers should build more energy-efficient homes, fewer than half said that they would pay less than \$1,000 up-front to save \$1,000 in annual utility costs (NAHB 2000). Cahners (2001) reports that homebuyers expect to recoup any investment in energy efficiency in three to four years; indeed NAHB (2001) reports that homebuyers are not at all interested in paying more than \$5,000 up-front to save \$1,000 every year thereafter. Together, this research suggests that consumers do not perceive energy efficiency as a worthwhile investment (by comparison to investing in a larger home with more amenities) if this investment will not pay returns in less than five years of living in their homes. Previously, we reported that builders assume that first-time buyers will stay in their current home for five to seven years, and “move-up” buyers will stay even longer (Hanson, Bernstein & Kulick 2004). If this is the case, the decision not to invest in energy-efficiency improvements is somewhat puzzling. According to Salant (2001), homebuyers often say that they want an energy-efficient home in one breath, and a host of energy-consuming comfort features in the next.

One might expect California homebuyers to behave differently than elsewhere in the United States in an effort to protect themselves against high utility bills, especially with the recent energy crisis fresh in their minds. But Californians are coping with another crisis: housing affordability. The California Department of Housing and Community Development reports that to meet 2020 projected housing needs, 220,000 units per year would need to be constructed from 1997 to 2020, a level that has rarely been achieved since 1970 in California and never sustained for more than two consecutive years. Through the 1990s, residential construction in California occurred at a rate of approximately 100,000 units per year; in 2005, residential construction was about 150,000 units. The result: the median-priced home is now out of reach for 85% of the state’s population.⁵ With housing prices especially high in the state’s largest urban areas,⁶ demand has created strong pressure to build new homes on less expensive land further from city centers, and increasingly in California’s inland valleys,⁷ where energy use especially for summertime cooling is greater. Despite the relatively greater importance of energy efficiency in these areas, its value appears not to weigh heavily in many home purchase decisions. This study seeks to understand a possible exception to this trend.

Quality, Comfort, and Energy Efficiency

The complexity of homebuyer preferences owes, in part, to the fact that real estate is both an investment and a place in which to live. We previously characterized this complex of preferences in terms of dimensions of “quality,” “comfort,” and “energy efficiency” (Hanson,

⁵ According to the California Association of Realtors, only 15% of California households statewide were able to afford a home in October 2005, down from 19% in 2004, and 23% in 2003. The minimum household income needed to purchase a median-priced home at \$538,770 in California in October 2005 was \$128,480, based on a typical 30-year, fixed-rate mortgage at 6.03% and assuming a 20% downpayment. By comparison, 48% of households across the United States were able to afford a new home in October 2005; the minimum household income needed to purchase a median-priced home at \$218,000 in the United States was \$51,990.

⁶ Historically, California’s largest urban areas have been limited to Los Angeles and San Francisco Bay areas, followed by San Diego and Sacramento. Residential space in “The Towers,” a 53-story condominium project being built in downtown Sacramento, is currently being sold for \$500 per square foot. \$500,000 for a 1,000 square foot studio apartment, until now, was unheard of in areas other than Los Angeles and San Francisco (Ortiz 2006).

⁷ According to the California Association of Realtors, the most affordable regions in the state in 2005 were the High Desert, Sacramento, Central Valley, and Riverside/San Bernardino.

Bernstein & Kulick 2004). Thus energy efficiency occupies an important, though blurred, area of consumer considerations in homebuying. Moezzi and Diamond (2005) suggest that mortgage and tax considerations, zoning, and other factors are also difficult to separate from what consumers want. We anticipate that the unique setting of our study allows us to assume that many potentially confounding factors are held constant, allowing us to focus on variation in what remains.

Consumer decisions likely vary across preferences, together and in combination, according individual perceptions, lifestyle needs, and investment strategies. Previously we reported that homebuyers are often attracted to those homebuilding companies that offer energy-efficient products, but given a choice, “wow” features such as kitchen countertop and flooring upgrades often trump energy-efficient features in the ultimate purchase decisions. We also reported that consumer interest in low-emissivity⁸ windows in some cases was not for their greater energy efficiency and promise of energy savings, but instead for their ability to better protect homeowners’ curtains and furniture from sun damage.

There are inherent difficulties in measuring comfort and quality especially, despite their seeming familiarity, but consumers do make decisions with them in mind. In this study, we qualitatively probed preferences of homebuyers in our two groups of homeowners for insights into how comfort and quality considerations were considered alongside energy efficiency, and why homes of one level of energy efficiency were chosen over the other.

The Homebuilding Process, the Builder-Homebuyer Relationship, and the Homeownership Experience

Consumer preferences are intimately tied to the homebuilding process, and the role of the builder in a particular home purchase decision cannot be ignored. Larger homebuilding companies, including Premier Homes and Cresleigh Homes, often coordinate information, decisions, and actions at almost all stages of the homebuilding process. According to Hassell et al. (2003), this process is defined by the following stages, with each comprising several steps:

- *Land Development:* Acquisition, use planning and subdivision, rough grading, and infrastructure construction.
- *Design:* Floor plan, lot layout, basic specifications and options, and basic cost analysis.
- *Pre-construction:* Selection of homebuilder, selection of trade contractors, sequencing and scheduling, selecting and ordering materials.
- *Construction:* Excavation; foundation; structure; heating, ventilation, and air-conditioning (HVAC) systems; plumbing; electrical, etc.; finishing (interior and exterior); certificate of use and occupancy.
- *Post-construction:* Purchase by owner, financing and insurance, purchasing durables and consumables, operation and maintenance, warranty claims, and customer service.

The builder typically enters the process around the design and pre-construction stages. Although the homebuyer typically enters the process at the post-construction stage, consumer

⁸ Low-emissivity windows reduce the loss of radiant heat from a home while still allowing visible light to pass through them, thus keeping warmer air inside during the winter and warmer air outside during the summer. These windows also filter ultraviolet light from the sun, which can otherwise harm indoor furnishings.

preferences identified through market research influence builder decisions and actions at earlier stages of the process, including design and pre-construction.

The builder-homebuyer relationship develops at the post-construction stage in three ways: (1) builders' sales staff present information and custom options that the potential homebuyer selects from; (2) the builders' customer service departments remain in contact with the homebuyer over at least the first year of homeownership; and (3) the builders' strategy seeks to maintain strong relationships with homebuyers in order to promote word-of-mouth advertising and often to sell current customers their next homes.

How the builder presents a home at time of sale likely influences the purchase decision. But perhaps more importantly, the owner's ongoing experience in the home likely affects preferences that will be revealed in subsequent purchase decisions, and potentially builders' future designs. Our study seeks additional insight into the role energy efficiency plays in the builder-homeowner relationship, and how consumer preferences for energy efficiency evolve.

Method

Our study area comprises a 193-home tract outside Sacramento, California that was developed in 2004-05 by two homebuilding companies, Premier Homes and Cresleigh Homes. The tract had a common entrance from adjacent streets and residents had access to the same goods and services of the surrounding community, including schools. Within the tract, homes built by each builder were often across the street from one another, in some cases next to one another on the same side of the street, and in other cases shared a backyard fence. Construction by each company proceeded simultaneously, and homebuyers often were able to choose from among the homes offered by each company. The two companies' products differed most in their levels of energy efficiency, and to lesser degree in their floor plans, sizes (floor areas) and prices. Both companies offered custom options (e.g., flooring and countertop upgrades). Recognizing this "natural experiment" yet the complexity of consumer preferences, we decided to apply qualitative methods to better understand why homeowners in this tract purchased their homes.

A Natural Experiment in Residential Energy Efficiency

The internal validity of natural experimental (or quasi-experimental) designs is threatened by variance of factors other than the factor of interest (in this case the role of energy efficiency in homebuying decisions.) The following discusses variation in energy efficiency, floor plans, floor areas, and prices among the homes. In our analysis, we identify Premier Homes products as Zero Energy Homes (ZEH), their owners in our sample as ZEH homeowners, Cresleigh Homes products as non-ZEH homes and their owners as non-ZEH homeowners:

- *Energy efficiency:* Both the ZEH and non-ZEH homes in the study area include several features that afford relatively greater energy efficiency than most homes in California, including denser insulation, foam-wrapped exteriors, low-emissivity windows, advanced heating and cooling systems, and programmable thermostats. As described above, the ZEH homes included tankless water heaters and rooftop solar panels, fluorescent lighting and other energy efficient advantages over the non-ZEH homes. According to marketing

materials available from the local utility,⁹ this difference translated to performance gains over conventional homes built to California's energy code for cooling by approximately 30% in the case of the non-ZEH homes, and 60% in the case of the ZEH homes.

- *Floor plans:* Five standard ZEH homes were available, while seven non-ZEH homes were available. Each builder offered homes with two to four bedrooms, two to three baths, and one to two stories. ZEH homes had two- to four-car garages, while non-ZEH homes had two- to three-car garages. Standard floor plans for both home groups could be customized to some extent (e.g., adding an interior wall to create a shop in the garage or to create another bedroom or den).
- *Floor area:* ZEH homes ranged in floor area from 1,285 to 2,248 square feet (sf), while non-ZEH homes were somewhat larger, *on average*, ranging from 1,610 to 2,442 sf. Differences in size were greatest in the case of owners of the smallest ZEH homes (1,285 sf) and the largest non-ZEH homes (2,442 sf), which together represent less than 10% of homes in the study area. In the remaining 90% of homes, homebuyers were free to choose among homes from either builder that varied in size from about 1,500 to 2,200 sf.
- *Prices and costs:* Prices varied by product, custom options, and over the 2004–05 sales period, ranging from the mid-\$200,000s to the mid-\$400,000s. Except in the case of the smallest ZEH home and the largest non-ZEH home, there was substantial overlap of sales data from the two companies, in purchase date, purchase price, and size. Most homes were priced in the \$300,000s. Differences in prices likely reflected differences in size, custom options, and date. Cost of the home also depended on mortgage lending options available to the homebuyers at the time of their purchase.

With the exception of the smallest ZEH home and largest non-ZEH home, homebuyers were free to choose among homes that were generally comparable with respect to floor area, size, price, and custom options. Both groups of homes were served by the same community amenities. How various decision factors varied among owners of homes with substantially different levels of energy efficiency were the themes of our discussions with homeowners.

Focus Group Discussions with Homeowners

Quantitative research methods are less suited to analysis of phenomena where scales of measure are several and difficult to specify, such as those inherent in homebuying decisions. Quantitative approaches are also predisposed to particular hypotheses, data, and measures that may not always be relevant to the construct of interest. By comparison, qualitative methods are often suited to revealing information that is often difficult to measure, inseparable from its context, and is often highly subjective. Qualitative methods, such as focus groups, are well-suited to our interest in exploring a problem that has eluded the energy efficiency research community for long. Focus groups were first employed by Lazarsfeld and Merton in 1941 to gather military intelligence

...in exploring ways to generate new questions that could be used to develop new quantitative strategies or simply complement or annotate the more quantitative findings of their research (Kamberelis & Dimitriadis 2005).

⁹ In this study area, the local utility was the Sacramento Municipal Utility District (SMUD).

There are several problems with focus group research. Among them, focus group research often suffers from the inherent subjectivity of the responses and interpretation of the results, along with the small sample sizes these methods typically employ.

Another potential concern with our approach is that we have interviewed homeowners after they made their purchase decisions. While the discussions were not held long after the decision,¹⁰ thus conditions were still fresh in our participants' minds, responses were likely subject to the influence of "cognitive dissonance." That is, participants are psychologically inclined to verbalize support of their decision (and less likely to verbalize disappointment with it) to avoid the emotional distress of having made the wrong decision. Market researchers typically interview prospective buyers in order to avoid this well-known effect.

These drawbacks call into question the reliability and validity of results reported in our study, on its own, and the extent to which conclusions can be generalized. On the other hand, there is evidence that stated preferences, particularly for energy efficiency, do not reveal themselves in actual decisions, thus interviewing prospective buyers has its own problems. Our study intends, as an initial step, to explore issues and identify hypotheses that can be more rigorously tested using other methods, just as Lazarsfeld and Merton did during World War II.

Focus group discussions with homeowners in our study area were held in October 2005. All homeowners in the tract were contacted by mail one month prior and two weeks prior to the scheduled discussions. The mailing consisted of a cover letter and flyer that generally indicated RAND's interest in better understanding why homeowners bought their current homes. The letter described an hour-long, catered meeting at a nearby hotel along with a \$100 cash incentive for participating in a group discussion. The U.S. Department of Energy was identified as the source of funding for this study. Recipients were asked to respond by phone to an assignment coordinator in RAND's Survey Research Group if they were interested in participating in a discussion.

Callers were screened to ensure that they were homeowners in the study area and that no two callers were from the same household. Participants were assigned to one of four groups according to the builder of their home (ZEH or non-ZEH) and according to their preference for attending either a weekday evening or weekend morning discussion.

At the scheduled times, participants were met at the hotel and invited into a meeting room where they were asked by a facilitator to fill out a pre-discussion questionnaire. The questionnaire asked about household size, household income; ethnicity, race, gender, age and education level of the discussion participant; appliance use; purchase date and price of the current home, and how many homes previously owned. After completing the questionnaires, participants were engaged in an hour-long discussion that followed a semi-structured discussion protocol.

The discussion focused on factors that influenced the purchase decision, more specifically on the influence of energy performance of the home and information provided by the builder, and on participants' ongoing homeownership experiences. Discussions were moderated and recorded by the facilitator, and recordings were transcribed. Transcripts were independently reviewed by the facilitator for accuracy and then by two researchers. General impressions and specific examples from the transcripts were discussed, interpreted, and reported by the

¹⁰ Some participants had purchased their homes within a few months of our discussions. The longest purchase-interview period was about one year.

researchers. Statements were not attributed to individuals or companies in the report, and this intent was made clear to participants in an effort to elicit candid responses.

Results

Overview of the Sample

The overall participation rate for all households in the subdivision was 16%, with participants heavily favoring ZEH homeowners: 24 ZEH homeowners and eight non-ZEH homeowners responded and signed up to participate in the study; two non-ZEH homeowners did not show-up for the discussions. Focus group attendance during weeknight sessions was 11 and two for ZEH and non-ZEH homeowners, respectively. Nearly all ZEH homeowners were also joined by their spouses during the weeknight focus group session.¹¹ Focus group attendance at the weekend sessions was 13 and six for ZEH and non-ZEH homeowners, respectively.

Selection differences are the primary threat to our research design. Cook and Campbell (1979) recommend collecting and reporting demographic information in an effort to explore selection issues empirically. The following reports information collected from our pre-discussion questionnaires and also 2000 Census data describing the surrounding areas (i.e., Sacramento city, Sacramento County, Rancho Cordova, and the 95827 zip code area):

- The number of persons living in non-ZEH homes exceeded that of ZEH homes (3.50 persons per household compared with 2.88; in California, 2.87 persons on average occupied a household in 2000). This difference appears to be accounted for by a greater number of children, on average in our sample, in the non-ZEH homes.
- Household incomes for all households in our sample were about twice the median household incomes reported for surrounding areas in 2000. Non-ZEH households tended to have a greater proportion of income-earners, some with two or three householders working full-time. Generally, household income of non-ZEH homeowner participants exceeded that of ZEH homeowner participants by about \$10,000–40,000.
- Nearly all homeowners in our sample had previously owned homes—usually more than one, and more on average for ZEH homeowners.
- Most homeowners in our sample were between 25 and 44 years old, with a greater share of younger homeowners in the ZEH group.
- The share of male participants in the ZEH groups was about twice that of the non-ZEH group.
- About three-quarters of homeowners in our sample were white—slightly less than that (71%) in the ZEH homeowner group but slightly more (83%) in the non-ZEH homeowner group. These shares exceeded those observed for Sacramento County (64% white) and California (60% white) in 2000.

¹¹ It is unclear why this happened. Spouses were not invited to the discussions nor offered additional incentives when they appeared. They were not counted in our sample, nor were additional questionnaires collected from them, but they were not turned-away from the meeting. While discussion mostly involved a single voice from each household, it is possible that some instances of agreement reflected within-household views rather than between-household views in the ZEH homeowner group discussions. The result is that our interpretation of the strength of statements made by ZEH homeowners may have been overstated in our findings.

- Almost all participants had attended at least some college; more than half had undergraduate degrees. By comparison, in Sacramento County and California more generally, about 25% of people had bachelor's degrees or higher in 2000. ZEH homeowners in our sample were twice as likely to have advanced degrees (master's or higher) as non-ZEH homeowners.
- Appliance use by homeowners in our sample was similar, with the exception that some ZEH homeowners had pools (8% of all ZEH homeowners in the sample), and non-ZEH homeowners were more likely to have a second refrigerator in their garages (75% of non-ZEH homeowners versus 50% of ZEH homeowners).
- There was substantial overlap in price and purchase dates reported between ZEH and non-ZEH homeowner groups. Most homes were purchased between summer 2004 and fall 2005. Purchase prices of non-ZEH were slightly higher, on average, than ZEH homes in our sample. Two participants lived in the smallest ZEH home product, and two participants lived in the largest non-ZEH home product.
- Homes of our participants were about \$100,000 below the median home price in California, but were generally about \$25,000–75,000 above the median prices in surrounding areas.
- ZEH homeowners, collectively, had researched 16 other residential areas before purchasing their homes. Non-ZEH homeowners, collectively had researched less than half as many other areas.

In all, homes in our study area were priced lower than the median home price in California, but higher than the median home price in surrounding areas, thus appear to be targeted at experienced homebuyers (i.e., not first-time homebuyers). Based on information they provided, homeowners in our sample had higher education attainment and higher incomes than the median incomes for surrounding areas. By comparison to non-ZEH homeowners in our sample, ZEH homeowners reported being more experienced in homeownership and portrayed themselves as better educated and more thorough and discerning in their search for a home, despite their younger age. Non-ZEH homeowners in our sample reported earning higher incomes and having larger households to support.

Analysis of Transcripts

A more complete accounting of the results can be found in the Working Paper associated with this report. In that paper, results are presented in a manner that highlights the *strongest* statements and *clearest* differences regarding relevant issues. Strongest statements were those that were corroborated *within* homeowner groups, especially when participants from different discussion sessions made similar statements. Clearest differences were those positions that differed most *between* homeowner groups on a particular issue.

Results of the various focus group discussions are summarized here in terms of three broad themes: (1) the various factors that influenced the current homebuying decision, (2) the influence of builders and others on the current homebuying decision, and (3) the influence of the previous homeownership experience on the current homebuying decision, and potentially the influence of current experiences on the next homebuying decision.

Considerations in Home Purchase Decisions

Homebuyers in our sample engaged in a complicated decision process involving lifestyle considerations, real estate market pressures, and financing and timing constraints, as well as different preferences for energy cost savings and comfort amenities. Where these values appeared to separate most clearly among ZEH and non-ZEH homeowners was in an apparent trade-off between potential energy cost savings and floor area of available homes, especially floor area of the bedrooms.

The Builder's Role in Home Purchase Decisions

According to the participants in our discussions, energy-efficiency information was relatively incoherent in its presentation by builders' sales staff to homeowners before the sale. While materials that described the energy-efficiency merits of these homes (e.g., potential for energy cost savings) were available from the utility, this information was seldom presented in a manner that may have influenced the purchase decisions. The potential for energy-efficiency considerations to influence the decisions appeared to depend largely on homeowners' prior knowledge regarding energy efficiency, which in the case of the non-ZEH homeowners in our sample appeared to be less than that of ZEH homeowners. There appeared also to be differences between early-release ZEH homeowners and later-release ZEH homeowners in terms of the amount of energy performance information received from the ZEH homebuilders' sales staff and their consultants.

Homeownership Experience and Energy Efficiency

The experiences in their current and past homes varied among the ZEH and non-ZEH homeowners in our sample. For all homeowners in our sample, home size mattered and more was generally preferred, just as national surveys report. But to ZEH homeowners, energy efficiency appears to have mattered more at the time of their recent purchases. The preference for energy efficiency among ZEH homeowners appears to be associated with relatively greater awareness of its value, despite an apparent lack of effort by the builder to promote this feature.

While the decision to purchase a larger non-ZEH home may be associated with higher income and larger households, awareness of the value of energy efficiency in non-ZEH homeowners appeared to have grown over the past year of homeownership, having been associated with paying energy bills and communications with ZEH homeowner neighbors whose bills are substantially lower.

Conclusions and Options for Further Research

We draw several tentative conclusions from our focus group discussions with homeowners, some that corroborate findings from our previous interviews with homebuilder executives and some that inspire new paths of inquiry and opportunities for energy policy research.

It is important to remind the reader of the small sample size, self-selection of our participants, and the post-decision focus group approach¹² this study has employed, which calls into question issues of reliability, validity, and the extent to which we can generalize our findings. However, the intent of this study is to provide a relevant basis for follow-on research that more rigorously tests our findings and further explores various insights. To this end, our findings suggest at least three promising lines of inquiry: (1) mixed-method approaches to understanding the valuation of energy efficiency in homebuyer decisionmaking, (2) exploring “comfort” and “quality” associations with energy efficiency for their marketing potential, and (3) investigating the impact of neighborhood design on homeowner’s attitudes toward energy efficiency of their homes and future home purchases.

Homebuyer Decisionmaking

Home purchase decisions reflect a range of considerations including affordability, resale investment value, mortgage availability, timing, and lifestyles, together that are as varied as the individuals making the decisions and their particular situations. Nonetheless, if our “natural experiment” is valid, we have been able to reveal subtle variations in homeowners and their preferences for different levels of energy efficiency among a reduced set of other considerations.

Overall, we report that ZEH and non-ZEH homeowners sorted themselves mostly according to preferences for home size or energy efficiency. Both groups of homeowners described disappointment with the smaller size of the ZEH product (particularly the bedrooms), which is consistent with a preference for larger homes reported in national surveys. Non-ZEH homeowners in our sample, in a trade for 12–15% greater floor area, on average, reported paying energy bills that were about twice as high as those paid by ZEH homeowners. In addition, given that information about energy performance characteristics and cost savings were not often shared by the builders until after the purchase decision was made, one might question whether the decision was well informed. This comparative valuation of floor area for energy cost savings as well as value of additional energy performance information to homebuyers may be established using econometric methods (described further below).

Previously, we reported that there are scant, largely anecdotal publicly available data on the value that consumers place on energy efficiency in new homes, and likewise for quality and comfort (Hanson, Bernstein & Kulick 2004). Existing consumer surveys, we suggested, simply do not represent energy efficiency in sufficient detail and recognition of its context in purchase decisions. We also constructed an analytical framework that will allow for more suitably targeted data gathering and much needed empirical analytic work that consistently compares consumer values within and across the categories of interests. We suggested that further efforts should bear in mind several important classes of questions:

- How do homebuyers interpret “energy efficiency” in new home construction? Likewise, how do they interpret “comfort” and “quality?”
- What associations do buyers make among quality, comfort, and energy-efficiency attributes and features?
- What relative preferences do buyers have for attributes from among these three classes?

¹² Recall that the particular concern with interviewing homeowners after they have made their decision is regarding “cognitive dissonance” — i.e., their psychological inclination to voice support of their previous decision.

- How do preferences for the home associate within the greater context (neighborhood, community, commute to work, and homeownership experience)?

The focus group approach we have taken in this study appears to be well suited to the task of elaborating the rich details of these associations and preferences, but applying particular insights more generally in policy development requires validation through more rigorous approaches. A host of survey methodologies and analytical methods exist for analyzing stated preference methods (conjoint analysis and discrete-choice modeling) and contingent valuation (widely used for valuation of nonmarket environmental goods). Applying these methods in pre-purchase surveys has the advantage of avoiding the problem of cognitive dissonance among respondents that has likely affected our post-decision focus group discussions.

Econometric methods are appropriate for analyzing actual purchases (revealed preferences), thus overcoming the reliability issues of stated preference approaches. The hedonic pricing method, furthermore, allows for the implicit valuation of components of an aggregated purchase, when only the aggregate expenditure is observable. Insights from our focus group discussions make possible a meaningful hedonic price analysis of the purchase decisions of residents in our study area, in particular to quantify the implicit value of energy efficiency, floor area of bedrooms and living rooms, and information provided by the builders (which varied in content across ZEH and non-ZEH groups, and also over time for the ZEH group).

We recommend further research efforts that employ interviews with builders, focus group discussions with homeowners, and survey and econometric methods, together to triangulate information on homebuyer decisionmaking. Open questions remain:

- How do homebuyers value energy efficiency among myriad other considerations when purchasing a home?
- Under what conditions (including providing information) does the value of energy efficiency increase in relation to others and reveal itself in the purchase decision?

Furthermore, if research into homebuyer decisionmaking has the underlying intentionality of encouraging demand for residential energy efficiency, one might also consider various “story-based” planning theories. Throgmorton (1992), for example, describes “persuasive stories” as means to convince “interpretive communities.” Many such communities are less impressed by numerical demonstrations of energy cost savings¹³ but instead by stories that “incorporate the literary techniques of plot, point of view, character, and use of tropes, and that weave conflict and crisis together in a compelling manner. Most importantly, the story must drive toward a convincing resolution of inherent conflicts” (Myers & Kitsuse 1999). With this in mind, further research might ask:

- What are the elements of the stories that compel homeowners to purchase their homes?
- Can a more persuasive “story” motivate consumer demand for energy efficiency?
- What would be the “literary technique” required?

¹³ Consider the non-ZEH homeowner who listed first and foremost granite countertops as the determinant in the purchase decision. Consider also the two ZEH homeowners who bought “on faith” and “blind.”

Decision support system researchers now recognize the value of combining “cold” and “story-based” analysis into systems of knowledge, and social science researchers increasingly turn to qualitative research approaches and mixed qualitative-quantitative approaches to better understand and model real-world phenomena within social contexts.¹⁴ Doing so may not only lead to better understanding of the role of energy efficiency in homebuying decisions, but how to encourage more homebuying decisions that have energy efficiency in mind.

Marketing Energy Efficiency

We reported previously that builders recognize the broad marketing appeal of offering energy-efficient homes (Hanson, Bernstein & Kulick 2004). Both ZEH and non-ZEH products in this study have been marketed, to some degree, for their energy efficiency.

We also reported that some builders are hesitant to promote energy-efficient features that exceed perceived consumer demand, for fear of compromising the sale. This hesitance appears to be supported by homeowners’ statements in this study; i.e., often builders did not provide information on energy performance of their homes until after the purchase decision was made. However, in this study, we also report at least one ZEH homeowner that was persuaded in part by the builder’s description of energy features of the home. The following lists several observations regarding issues that may be relevant to how builders present sales information:

- Energy-efficiency considerations were clouded by many other factors in the context of the decision. And, in some cases, it was not discussed at all with the builders before the sale.
- Choosing custom options appeared to be a frustrating experience for homebuyers. One participant particularly appreciated that energy efficiency was “integrated together” and offered as a standard feature of the home.
- As reported previously, energy efficient features are often attractive for “comfort” and “quality” reasons (e.g., low-emissivity windows were often favored for their ability to reduce sun damage to indoor furnishings). In this study, one homeowner expressed interest in gazebos that could support additional solar panels.
- Awareness of the value of energy efficiency appeared to grow with homeownership experience. This growing energy awareness appears to be associated with communications among neighbors regarding energy bills.

Home features that promise “comfort” or “quality” often have greater appeal to homebuyers than features that promise “energy efficiency” despite its associated energy cost savings. However, builders and homeowners name several amenities that serve multiple purposes, including energy efficiency (e.g., multi-zone HVAC systems that better moderate indoor temperatures, trellises and gazebos that can support solar panels, and low-emissivity windows that protect furnishings from sun damage). The potential for cross-selling energy efficient options according to their promise of comfort and quality remains. How to present information to consumers that discloses the various merits of homes and their features in convincing fashion can be explored further. One model to investigate is the Energy Star program,

¹⁴ See Davis, Kulick & Egner (2005) for a useful review of decision science.

which labels energy efficient appliances with the familiar yellow tags that summarize energy performance characteristics and potential energy cost savings. To this end, further research can address the following questions:

- What are the comfort and quality dimensions of various energy-efficient home features?
- What are proven strategies for marketing these energy-efficient features, according to their comfort and quality dimensions?
- What have we learned from the Energy Star labeling program experience for appliances that is relevant to new home construction and sales?

Furthermore, builders are required to initiate homeowner associations in new subdivisions. Yet the potential for builders and utilities to incorporate rewards for energy-efficient behaviors into more formal agreements (i.e., through covenants, codes, and restrictions) appears to be untapped. Local utilities might be involved, for example, in rewarding neighborhood communities that committed to certain energy-efficiency innovations. Potential homebuyers might find such neighborhoods attractive. Open questions remain:

- How might builders and utilities coordinate interests through the development of homeowner associations?
- How might homebuyers respond to such programs?

Developing a catalog of energy efficient features, along with strategies for marketing these items, potentially creates win-win opportunities for encouraging residential energy efficiency while also generating additional builder profit. Formalized agreements between utilities and neighborhood associations that promise rewards to homeowners for energy conservation efforts may attract homebuyers to consider these new home developments and generate homeowner energy savings.

Energy Awareness in Neighborhoods

Several ZEH homeowners expressed their intent to consider energy performance in their next home purchase. One ZEH homeowner, citing satisfaction with the current home, intended only to move to another Zero Energy Home. ZEH homeowners were pleased with their energy bills, describing them as the lowest they had ever paid. By contrast, several non-ZEH homeowners in our sample expressed concern for the energy bills they paid, along with disappointment with the energy performance of their non-ZEH home. Recalling that the non-ZEH homes in our study area were certified by SMUD as “Advantage Homes” at the “Gold” level, and estimated to perform approximately 30% more efficiently than conventional homes, this is somewhat surprising. We interpret the statements of the non-ZEH homeowners in our sample as evidence of growing energy awareness in these homeowners, and potentially a greater preference for energy efficiency in the next home purchase. This growing awareness appears to have been facilitated in part by informal communications among neighbors living in adjacent

ZEH and non-ZEH homes. We report that at least one non-ZEH homeowner's disappointment¹⁵ was stated in the context of awareness of neighboring ZEH homes. Elsewhere in the focus group discussions, communications among ZEH and non-ZEH homeowners regarding energy bills were also reported. We suggest that these observations have implications for neighborhood design.

In partnership with the Congress for the New Urbanism and the Natural Resources Defense Council, the U.S. Green Building Council has recently expanded its Leadership in Energy and Environmental Design (LEED) program to include a focus on neighborhood design (i.e., LEED Neighborhood Development program, or LEED-ND). The LEED-ND program is currently being piloted in several locations across the United States. The LEED-ND rating system incorporates principles of "green building," "new urbanism," and "smart growth."¹⁶ What it does not incorporate is a credit for developing greater energy awareness in its residents, which as homeowners move from home to home, neighborhood to neighborhood, over a lifetime of home purchase decisions, may be at least as important as the energy-efficient homes and neighborhoods they leave behind.

Our findings suggest that interactions among neighbors may have special relevance for encouraging energy-efficiency purchase decisions. If increased energy awareness correlates with greater demand for energy efficiency in homes, and if this awareness is influenced by neighborhood design, this line of inquiry may have important implications for the recently piloted LEED-ND rating system. Open research questions remain:

- Does energy awareness increase through informal, socially mediated neighborhood processes?
- Does heightened energy awareness translate into energy efficient home purchases?
- How might neighborhood design influence energy awareness?

Our results suggest that the mix of ZEH and non-ZEH homes may be related to increased awareness in the non-ZEH homeowners. If this is the case, neighborhood design that incorporates this may achieve greater energy awareness in the long term, accelerate demand for energy efficiency in future markets for new homes of all sizes, and have important implications for builders' strategy as well.

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¹⁵ Note that if the phenomenon of "cognitive dissonance" explains why people are less likely to express disappointment with their previous decisions, this homeowner may have further understated the value placed on energy cost savings.

¹⁶ For more information on these concepts and organizations, see the websites for the Green Building Council (<http://www.usgbc.org/>), the Congress for the New Urbanism (<http://www.cnu.org/>), and Smart Growth America (<http://www.smartgrowthamerica.com/>).

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