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### **Title**

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# **Ethnography of Cool Roof Retrofits: The Role of Rebates in the Materials Selection Process**

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## **Introduction**

In the summer of 2010, ethnographic research was conducted with nine households in the Bay Area and Sacramento region. The purpose of this task was to collect methodologically grounded insights into how and why consumers chose the cool roofing material they selected. These nine households comprised fifteen respondents, and their dependents. They were selected from among a pool of respondents to a mail solicitation of all Sacramento Municipal Utility District and Pacific Gas and Electric customers who had received a rebate for their cool roof retrofit. Consumers are uniformly happy with their cool roof retrofits. Consumers typically stayed very close to the aesthetic of the original roof style. Price was not a primary concern, while longevity was paramount. Consumers did not use roofing price, nor energy savings (with one exception), in tracking return on investment through energy savings. The utility rebate had little role to play in terms of incentivizing customers to choose cool materials. Contractors were critical partners in the decision-making process.

## **Background**

The genesis for the idea of adding an ethnographic component arose in January of 2010, after discussions concerning the intersecting interests of the research ongoing at Lawrence Berkeley National Laboratory and proposed research housed at the Lyle Center for Regenerative Studies, part of the California Polytechnic University at Pomona. The Pomona research, CHILR, or California Heat Island Long-term Remediation, is concerned with the role of social networks and cultural capital in the selection of roofing materials, including but not limited to cool (reflective) materials and pigments.

## **Research question**

The specific task of this research was concerned with examining the process of selection undertaken by each household with respect to their cool roof retrofit, as well as any potential influence they may be exerting upon cool roofing material selection in their neighborhood and immediate social network. This qualitative data can then be interpolated with the quantitative usage data provided by the public utility companies (including the data of the customers who were interviewed) to give engineers greater insight into everyday usage practices of residential consumers of cool roof materials.

## **Ethnography and engineering**

Engineers design materials and implement systems, but it is people who use and adapt systems through everyday practices. Some research has suggested that the effectiveness of certain types of energy conserving design, such as those falling under the Leadership in Energy and Environment Design (LEED) rubric, can be much lower than anticipated due to tenant non-compliance. Ethnography, which is often referred to as a 'grounded methodology'<sup>1</sup>, can help illuminate the human factors of the system, eliciting qualitative data and providing analysis and interpretation that can enhance quantitative findings.

Ethnographic research generates a lot of data, and that data tends to be rich in meaningful detail where human activity is concerned. If quantitative data is being collected, as it was in the larger research

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<sup>1</sup> Because it is accessing perceptions and judgments directly from participants in their own words, rather than inferring their perspective based upon a set of circumscribed answers to a defined set of standardized questions.

program, we can then set ethnographic data alongside the information derived from larger numerical data sets to explicate patterns using the voices of the actors themselves. Because ethnographic research is often organized around case studies, the focus is less on replication but rather on generation: a set of several case studies should not provide identical data sets, but rather they should reveal various facets of a phenomenon or set of phenomena for inclusion in the final analysis.

## METHODOLOGY

The purpose of this task was to collect insights into how and why consumers chose the cool roofing material they selected, using the classical ethnographic methods of fieldwork, recording field notes and observations<sup>2</sup>, and various forms of informal and semi-structured ethnographic interviewing:

[A] primary reason for fieldwork in ethnography is to achieve the emic validity that ethnography promises. I define emic validity simply as understanding the study host(s) from their own system of meanings. (Whitehead, 2005)

The insights achieved through ethnography are often described as 'grounded' because they are rooted in the perceptions of the respondents, rather than the expectations of the researchers. The concept of emic validity is an established one in anthropology, dating at least as far back at Bronislaw Malinowski's research in the Trobriand Islands during World War I, where the goal of ethnography becomes, "to grasp the native's point of view...to realize his vision of the world" (Malinowski, 1922). The term *emic* comes originally from Kenneth Pike in linguistics, and was brought into the discipline by Marvin Harris in the early 1960s, and it refers to a system of meanings, internal to a particular cultural system. These meanings may differ from community to community, and certainly often do between the researcher and their subjects:

Moreover, as suggested by Guba and Lincoln (1997:198), the various hypotheses, theories, and interpretive frameworks brought by outside investigators "may have little or no meaning within the emic view of studied individuals, groups, societies, or cultures." (Whitehead, 2005)

Research that allows subjects to speak for themselves often produces data that would not have been elicited using a more restrictive methodological framework. During this research, it produced the unexpected result that people who installed foam roofing materials are highly satisfied with their choice due to its insulative properties against cold, rather than its ability to deflect sunlight.

Ethnography presents the world of its host population in human contexts of thickly described case studies. (Loc.cit)

The context in this case, is one surrounding the decision-making process concerning an expensive infrastructural upgrade to the home, which in late modern capitalism not only serves as shelter, but often also an investment vehicle, and a nest-egg for retirement. Several of our households had spent decades in their home, which means one could argue that the context for the decision stretches back at least as far as their initial choice and occupancy of the home, if not farther, into patterns of taste rooted deep in childhood and familial experiences. As one example, the Thurgoods are an elderly African-American couple who have lived in their Marin County original Eichler home for 47 years. They chose

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<sup>2</sup> Approximately twenty hours of audio were recorded digitally from ethnographic interviews, accompanied by digital notes taken with a LiveScribe pen.

the Eichler home, and bought it from an Eichler development company, specifically because they appreciated the explicit expression of inclusiveness in the architect's philosophy. The architect, in this case, had a specific social vision that he used architectural design to advance. Those design choices, half a century later, constrain the choices of the homeowners, thus affecting the decision-making process surrounding cool roof retrofits.

In another example of how the 'world of the host population' and its context impinges upon the selection process can be seen with our other North Bay resident, Frank Lopez. At the time of his home purchase, he was recently divorced, with nearly grown children; a public works employee in one of the most affluent areas in the country. The placement of his house within a specific, urban, space, as well as the particular vintage of his home and the prevalent design mode of the time, helped make his house an affordable one. His economic circumstances and household composition in the 1980s dictated his house selection, which in turn plays a role in what kinds of roofs he can install thirty years later.

Ethnographic research at this level is more akin to digging test pits in archaeology, seeing what is down there, than in producing a broad swath of representative individuals and querying them with calibrated questions. A large subset of ethnographic literature on methods is concerned with negotiating relationships, including gaining entrée to the respondent's physical space, establishing rapport, conducting an open-ended interview that may veer in unexpected directions, and then navigating a graceful exit from the field.

Summaries of interview field notes were prepared and distributed, as well as a spreadsheet comparing responses across households. The field notes form the basis for the analysis that follows. Despite the individual and specific nature of the experience of selecting a roof for one's home, dependent as it is upon income, socio-economic status, lifestyle choices, social and cultural capital available for deployment, as well as architectural, geographic, and climate considerations; there are patterns in the responses. Organizing respondent statements by topic, broad recurring themes in the process of cool roof retrofits were identified.

### **How were contributors selected?**

It was agreed upon that a sample set consisting of between eight and ten case studies would be conducted with households who had installed a cool roof. The initial timeframe was the summer months of 2010, with a deadline of late July. These case studies were to include as wide a variety of roofing material types as possible, as their first goal. Aiming for demographic and geographic variety in representation was a subsidiary, though desirable goal. The primary research question was to investigate the consumer perspective on their cool roof retrofit and the rebate process.

A letter went out, in May of 2010 to the Sacramento Municipal Utility District customer list, totaling 207 households. From those, 15 households responded (7% response rate), from which five households were interviewed, comprising a total of nine individuals. Once a pool of respondents had been assembled, short telephone conversations took place with each of them, running down their roof type and making sure they were the owner-occupier of the property where the roof had been installed. Once their suitability was established for interviews, schedules were queried. Timeslots were available from 8:00 am to 6:00 pm, weekdays and Saturdays, during the first week of June. Anyone who could not make those times was eliminated, leaving the pool of final respondents.

A letter with identical verbiage was prepared at the same time for Pacific Gas and Electric customers, but due to issues internal to PG&E including the need for a separate business response card (BRC) and the collection of actual signatures of customers for release of data; however, it did not drop until midway through August of 2010. Approximately 375 customers were sent the letter and, re-sent it when the first letter did not contain the required BRC due to communication issues between PG&E and their mailhouse. There were 79 households responding to the PG&E letter, a 21% response rate.

The high response rate was likely due to the accidental second drop of the PG&E letter, containing the BRC. Many of the respondents to the second letter were contacting the task group members into October, well past the original deadlines for the project. Since five households had already been conducted, using the smaller universe of SMUD customers (an decision made in light of the time-limitations and the lack of movement on the PG&E letter) that left five slots maximum, who needed to be interviewed within an ever shortening timeframe. As with the SMUD customers, short telephone conversations took place with everyone replying during the week immediately after the first mail drop, establishing roof types and making sure they were the owner-occupier of the property where the roof had been installed. Once their suitability was established for interviews, schedules were queried. Timeslots were available from 8:00 am to 6:00 pm, September 14, 15, and 16 of 2010.

From the PG&E respondents who contacted the task group within the latter half of August, four households were selected to take part in interviews based on their including roofing material not encountered with the SMUD sub-set (foam) and geographic/climate diversity (North Bay and East Bay). One of the four subsequently dropped out due to a scheduling conflict, leaving three households. Although there were more homeowners in the PG&E universe, as well as a higher rate of response (due to the BRC accident) those who did contact us were largely replicating the roofing types, demographics, and even geographic distribution of the SMUD group. This is because PG&E service territory surrounds and encompasses the SMUD service region, such that PG&E customers and SMUD customers live in the same climate zones. The PG& E households were thus selected to fill left open by the chronologically earlier SMUD interviews, rather than, what would have been optimal, the other way around.

A total of 94 households from a universe of 582 potential households is equal to a response rate of 16.51%. This is an excellent rate of response in comparison to classic direct mail campaigns, which typically average, according to the Direct Marketing Association, across all types of industries, a return of 2.61%, but which, depending upon the nature of the product and solicitation, as well as the target audience, can be easily as low as .02%. From their June 15<sup>th</sup>, 2010 press release:

Response rates for Direct Mail have held steady over the past four years. Letter-sized envelopes, for instance, had a response rate this year of 3.42 percent for a house list and 1.38 percent for a prospect list.

With the letter going out from Lawrence Berkeley National Laboratories to the customers of the utilities, the best comparison would be to a prospect list (such as a purchased list of names) with whom there is no previous relationship, rather than as a customer list. This means that the high response rate is even more indicative of the deep level of satisfaction people were experiencing with their cool roof retrofits.

Other avenues were explored for gathering names for contacting, including official (and unofficial) avenues at both Southern California Edison and Sempra Energy; as well as the social networks of research team members, Los Angeles Times environmental columnist Emily Green, environmental/homesteading blogger Erik Knutzen of Homegrown Evolution, and 'green' celebrity Ed Begley. Unfortunately, no further names were elicited. Of the non-participating utility companies in

California, it appears that only Southern California Edison had offered a residential cool roof rebate. Anecdotal evidence suggests that it was short-lived and possibly not well publicized. Despite repeated overtures, the internal culture of Southern California Edison was apparently the major obstacle to our receiving a copy of their cool roof rebate recipient list.

**Who were our informants?<sup>34</sup>**

Ron and Darlene Reeve



Frank Lopez

Tom and Rita Rivers



Brigit Van de Kamp



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<sup>3</sup> Last names have been changed to protect privacy  
<sup>4</sup> Not pictured: Geri and Prentiss Thurgood; Melanie and Melvin Chen; Peggy and Bob Halbmond; Walter Albermarle



Round One: Sacramento, June 2010

	<i>the Reeves</i>	<i>Walter Albemarle</i>	<i>the Chens</i>	<i>the Halbmonds</i>	<i>the Riverses</i>
<i>Residence</i>	Folsom	Sacramento	Sacramento	Carmichael	Carmichael
<i>Gender</i>	male & female	Male	Both	Both	Both
<i>Age</i>	55-70	Above 70	55-70	55-70	55-70
<i>Marital status</i>	married	Widowed	Married	Married	Married
<i>Education</i>	some college	BA	BA	some college/MA	MA/BA
<i>Employment</i>	Retired	retired	retired	Retired	Retired
<i>Home ownership</i>	own w/ mortgage	own (no mortgage)	owned free /clear	owned free /clear	own w mortgage
<i>Income (\$K)</i>	60-79	decline	decline	Decline	80-99K
<i>Race</i>	White	decline	Asian	White	White
<i>Religion</i>	Christian	decline	decline	Decline	None
<i>Politics</i>	Republican	decline	Independent	Democrat	Democrat

Round Two: North and East Bay, September 2010

	<i>Frank Lopez</i>	<i>the Thurgoods</i>	<i>Brigit Van de Kamp</i>
<i>Residence</i>	San Anselmo	San Rafael	Pleasanton
<i>Gender</i>	Male	Both	Female
<i>Age</i>	55-70	above 70	40-54
<i>Marital status</i>	Divorced	Married	Divorced
<i>Education</i>	some college	some college	BA
<i>Employment</i>	Retired	Retired	self employed
<i>Home Ownership</i>	owned free /clear	own w mortgage	own w mortgage
<i>Income (\$K)</i>	60-79K	20-39K	decline to state
<i>Race</i>	Hispanic/White	Black/African	white
<i>Religion</i>	Atheist	Christian	Atheist
<i>Politics</i>	Independent	Decline to state	Decline to state

**Grand Tour questions**

The ethnographic interview process encompassed asking Grand Tour questions and being conducted on a home tour, as well as the elicitation of an oral history concerning occupancy and decision-making process. Grand Tour questions are a classic method used by anthropologists negotiating entry into a field situation. They presume little to no knowledge of the situation, and ask the subjects to elaborate without many prompts.

A typical Grand Tour set up might be, “tell me about your day” or “what do you do when you first get to work?” This procedure provides a framework for the anthropologist to use in eliciting richly detailed data about specific cultural concepts and processes that can otherwise go underanalyzed, like, “doing housework” or “answering emails” that in truth, are multi-part, complex, and encode various meanings for the person doing them.

In this instance, Grand Tour questions included “show me your house” and “tell me about your experience with your roof.” This type of question allowed informants to provide information that specific questions may have failed to anticipate. One example would be that North Bay informants chose their roof type as much for its thermal and insulative qualities, as for its cooling and reflective properties.

### **Oral Histories**

Mini-biographies were solicited, with particular attention given to the selection, purchase and inhabitation of the house in question. Despite a shared national conception of Americans as ‘restless’ people, prone to novelty and lifecycle upheavals like divorce, with subsequent household reorganization, the informants in our study had been in their homes 20, 30, 40 even 50 years! Of the thirteen participants, two were divorced (and not remarried), one was widowed (and not remarried) and the remaining ten were married to their original spouses. Only one household still had children resident.

Most were retired, with two self-employed. Income ranged from struggling to affluent and every rung in between. All claimed ‘some college’ with a few obtaining graduate degrees and professional certifications. All exhibited high levels of social and cultural capital through their choice of neighborhoods, car makes (mostly late models), and leisure activities – many were steady members of voluntary associations while others were regular travelers.

At the most basic level, if economic capital is ‘what you have’ then social capital is “who you know’ and cultural capital is ‘what you know’<sup>5</sup>. Economic capital can include things such as income, real estate, equity in a business, or investment properties. Social capital is a way of thinking about the productive aspects of one’s social network, things like networking with business associates, or civic engagement, managing one’s reputation, or having membership in specific clubs. Finally, cultural capital includes such aspects as one’s educational attainments, acquired skills, and experiences. All of these capitals are fungible, in that they can be exchanged one for another.

### **Formal interviews**

There was also a formal interview with structured questions concerning quantitative data and structural/technical factors identified as areas of interest to the California Energy Commission, the

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<sup>5</sup> The most widely used version of this within the social sciences comes from Pierre Bourdieu’s *Outline of a Theory of Practice*, 1972. He also included a concept called symbolic capital, which may be thought of as the artistry with which one deploys the other capitals aesthetically.

California Air Resources Board, and the Heat Island Group at Lawrence Berkeley National Laboratory). The questions we asked are listed in Appendix 1. The answers to many of these questions form the basis for this report, and will be presented verbatim. Most were successful in eliciting some type of intelligible response; however, the questions about social media and participation in potential events were found to be confusing and even distressing, and so were dropped from the second round of interviews. They will not form any part of the analysis.

### **Miscellaneous Data Capture**

Freelists were asked of the first few informants, but they did not elicit much in the way of useful information, so they were eliminated. A Freelist activity is one based on free association, a cultural domain, or category will be offered like, 'crime' or 'weather' and answers are collected. Generally there would be a set of related domains within a larger set, all eliciting answers. So 'crime' would be composed of questions around the sub-domains 'murder' or 'burglary.' Multiple informants' answers are collated and their responses organized along axes based upon linguistic similarity and/or cognitive content. The one couple that did understand how to proceed with the exercise, the Riverses, gave the following answers:

Question: What comes to mind when I say 'cool roof'?

"Light color. Long Lasting. Coolness. Energy savings."

Question: What comes to mind when I say 'energy conservation'?

"Not that hard. Conscious. What a big source of expenditure a house is. You think of a car, but a house is, whew! Can be attractive. Works. Grandchildren. Future. Independence. Foreign Oil. Energy independence. Friends off the grid. Responsibility for the planet."

In addition, photographs were taken of the informants, their house exterior and neighborhood. Photographs of attics were requested, but only one household had access to the attic, while at least four households (out of eight) had no attic at all due to the nature of their flat roof and/or clerestory ceiling.

## **Results**

### **Sample sizes and self selection bias**

The small sample sizes used in ethnography are often difficult for quantitatively predisposed researchers to accept. The key is in understanding the above-stated concept that the unit of measure is the individual, and the value of the data sought lies in its specificity to the situation. For example, one could devise a survey instrument concerning an issue, and distribute it to a huge sample of people, but if the situation one is looking for is unlikely or rare, all that will do is return large sets of "not-applicable" answers. That would be a reliable answer, one that could be established with mathematical precision, but it would not necessarily reach participants who are statistical outliers, and if it did, that would pose yet another sampling issue. It would not provide any new or valid data. Since we are seeking specificity and not attempting to form general rules about the nature of a phenomenon, it becomes more important to reduce *researcher bias* than sample bias.

In the case of cool roof research, the number of people who applied for and received cool roof rebates through their local utility is very small in comparison to the roofing market as a whole. The entirety of the data set received an invitation to participate, from which approximately 10% responded. Was there self-selection bias inherent in the data set? Absolutely. Can we determine what that bias was? Not necessarily<sup>6</sup>. Does that bias affect the nature of the information collected in terms of its validity? No, it does not. Given a small field of potential respondents, and the people that responded, within that field an effort was made to include a set of informants across a spectrum of circumstances.

One question that was raised at the end of the data gathering phase was, why does there appear to be a bias towards older homeowners among the respondent pool? I have outlined our selection process above, so it seems appropriate to speculate briefly as to why, with a large percentage of the available universe responding, they all tended to be retirees. As mentioned in the section on methodology, context matters. The context for the rebate respondents was the year 2008, which is when all of the retrofits took place. The peak for housing was in August of 2006, and so by 2008 the global housing meltdown and credit crunch were well underway. It is likely that, given the wave of foreclosures and the elimination of many home equity lines of credit that were the hallmarks of the economic difficulties, that the only people who could afford to make a large infrastructural investment in their home were people with long tenures and thus large amounts of equity and/or cash. This would bias the pool in favor of older people, particularly in the Northern California housing market(s) which have traditionally outpaced the national average in terms of price, and so meant a later entry into homeownership.

Economics and demographics can have intersecting effects as well, if there is a larger pool of non-responding younger homeowners who have the money for large home improvement projects, their relative affluence vis-à-vis their peers could also indicate greater professional responsibilities, in addition to the pressures of a lifestyle that could include minor children in the household. These variables and their potential effect, would make excellent research questions concerning what drives rebate responsiveness.

## **Themes**

### *Aesthetics/Values*

Consumers typically stayed very close to the aesthetic of the original roof style. Wood shake roofs generally became asphalt composite shingles mimicking shake ('Weathered Wood'); concrete tile was replaced with concrete tile in cooler pigments. Only with flat roofs was there a significant departure from more traditionally architectural materials – tar and gravel was replaced by membrane and foam, but these were roofs where the material type cannot be seen. Brigit Van de Kamp confirms this when she discusses how her original roof was shake and she replaced it with a composite cool roof in "Weathered Wood." She had read about cool roofs a few years earlier, in a LEED certified green building professional course, and so she was eager to try it out. Some neighbors and colleagues of hers found it 'too light' in color, and she agrees somewhat ruefully, adding that, "It needs more architectural detail. Their house is really spectacular, more of a mansion, really, and so I can see why they wouldn't want to go with shingles that have such a low profile." In other words, for her 1305 square foot ranch, it wasn't ideal, but she can live with it; however purely from a design perspective, she sees the "low profile" of the product as a flaw.

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<sup>6</sup> It could be that those happiest with their roof responded, but it could also be a X factor, like leisure time, or a personality trait such as extroversion. Determining the self-selection bias of the respondents would be a research project in and of itself.

The Chens also took the aesthetic component seriously in selecting their roof. They are the original owners of their home, and got to pick a few of the finishing materials, and room set-ups; they have a fireplace in the master bedroom, for example. Most of their neighbors have already replaced their roofs, so the Chens were among the last to replace their roof, which was 30 years old. They replaced their original roof with the same material (concrete tile) but when they investigated roofing they were pleased at the new color choices available. They picked 'Malibu' in Arrowhead Grey. They considered composite, steel, concrete tile, and "a lightweight tile." Composite was rejected due to looks. "I liked what we had with the concrete tile, I like the way it looked," says Melvin.

Contractors were critical partners in the decision-making process. The consumers, with one exception, had multiple bids demonstrating a variety of products. The purported expertise of the contractor was a strong influence in the adoption (or lack thereof) of new cool roofing materials. One couple was warned off of metal roofing with what, in hindsight, they considered to be a dubious explanation about paint wear, and even though they doubted the story, it still swayed the outcome. Ron Reeve tells how he was also warned off metal, by the concrete tile company. "They told me the paint flakes off and you have to re-do it every couple of years." But Darlene chimes in, skepticism clear in her tone, "I've never heard of anyone repainting their roof." The Chens were also advised against getting a metal roof; it was pitched as being more appropriate for a colder country like Tahoe.

### *Concerns*

Since customers are neither installing the material, nor handling permits, ease of installation is a non-issue. 'Longevity' was, however, a major concern. The majority of the households consisted of retirees who had been through the process multiple times, so there was a strong sense that they never wanted to have to deal with this issue again.

Fitting in with the neighborhood was another primary concern, potentially overlapping with personal aesthetic sensibilities to produce a micro-regional outcome. This matches information drawn from a telephone interview with Tony Chiovare of Custom-Bilt Metals, who mentioned the role of contractors as dispensers and managers of local knowledge. Tony pointed out that contractors often take heed of the palette and style of the neighborhood and urge customers against outré choices.

### *Selection/Satisfaction*

Consumers are uniformly happy with their cool roof retrofits. They are enthusiastic about their results, even when they do not track savings in terms of cost or energy, or changes in temperature. Consumers have opinions about their cost and energy savings; however those opinions, (with the exception of Brigit Van de Kamp), are not based on empirical data gathering, either from information provided by the utility, or from measuring or recording data on their own. In the case of the Reeveses, Darlene mentioned that she had kept track of such information, "A long time ago," meaning earlier in the marriage, "but no one was interested." The Reeveses, like others interviewed, knew that the Sacramento Municipal Utility District provided rate and usage and cost information on their website, and had even printed out a few pages for the interview, but it was not something that they looked at regularly, or which had factored into any calculations.

This sense of satisfaction was not limited to those we interviewed; short phone conversations with potential informants also revealed a deep level of satisfaction with their decision. Frank Lopez told me, "It stays warmer, there is more insulation, and it is easy to maintain." He was also happy to find that summers, "it stays a lot cooler and in winter a lot warmer. A LOT!" He estimates maybe a 5-10 degree

difference in terms of how much cooler or warmer the interior of the house stays than before the roof was installed. Interesting to note is that none of the retrofitters installed additional insulation at the time of the roofing work, nor were there any structural changes involved. Due to the scope of the research, follow-up questions concerning insulation were not asked; however, independently of questioning, the North Bay respondents praised their white roofs for their insulative qualities. Both of these houses have flat roofs, and both households claimed to have had zero insulation between ceiling and roof prior to the retrofit. The foam material is seen as providing a perhaps unexpected benefit to consumers in terms of heat retention, physical comfort, and monetary savings.

The role of contractors as partners is also important in that consumers are confronted by a wide field of products, materials, colors, features, benefits, drawbacks, and price points—too wide, in fact, for the layperson to be able to comfortably compare and make a rational decision without assistance. The Chens did research online, called friends and family for referrals (talking to two composite type roofers family members had used) and attended several home shows looking at what they wanted. Ultimately they had eight estimates before settling on what they had originally, which was concrete tile. They were also the only household to seriously consider installing a solar roof, but they did some calculations and found it probably would not pay for itself in the long run.

### *Tracking>Returns*

Price is not an obstacle. There were wildly differing prices per square foot, even for similar materials. Consumers did not use roofing price in tracking return on investment through energy savings. As long as it was in their budget, and they liked the 'look' they were happy. They did use price to reject some vendors, for instance tar and gravel was seen as 'double the price' of foam. The utility rebate had very little role to play in terms of incentivizing customers to choose cool materials. In all cases, the rebate was discovered 'after the fact' and was seen as a 'nice bonus.' No one claimed to have learned about cool roofs through communiqués from their utility, though a few reported reading their utility company's inserts with a fair degree of regularity.

Only one household actually tracked their energy and money savings, and they were thrilled to be able to tell friends and neighbors that they were saving "\$1000 a year!" No one else moved beyond the merely anecdotal in describing the changes brought about by the cool roof retrofit. Even when provided with the data by the utility company, eight of the nine households gave it little more than cursory attention.

No one had measured/recorded actual changes in room temperature. However, the estimates are probably fairly accurate. When pressed for specifics, the tenor of the conversation evolved from stories of 'huge' changes to reports of **average** temperatures two to five degrees Fahrenheit cooler or warmer (the foam was seen as a much-needed form of insulation) depending upon the season.

### *Lifestyle adaptations for conservation*

The Reeves are forthright Republicans, with Republican views on things like immigration, which they feel is a more pressing issue than energy conservation. They nonetheless think energy conservation is important, "I think there is media pressure on conservation," says Ron, "I think it has an influence on everybody in general."

They recently bought a Toyota Camry, a month after doing the roof. They traded in a Buick with a V6 and are getting six more miles to the gallon, which is noticeable when they fill up. Along with the roof,

they installed a solar tube for their upstairs laundry room. Darlene is thrilled with it, since you never need to turn on the light, "unless it is dark, and I don't want to do laundry when it's dark anyway." They take me to see it, and I take some pictures. It is very bright, as bright as artificial lighting. Darlene turns on the light, and it is much dimmer than the light from the solar tube. They have fluorescent lights around the house, "but it isn't good for reading."

Darlene says that folks in the neighborhood are "doing their part" with "green bins and blue bins and trash bins. People do what we can do with busy lives." They have a daughter with a degree in environmental science, "so recycling has always been a part of our lifestyle," says Ron. "Or we get a talking to!" chimes in Darlene.

Frank Lopez does consider himself to be energy conscious, and among other things he combines trips in his cars (Tundra pickup and Plymouth minivan) to save gas; he puts on a sweater before turning on the heat, and he has been planting trees around his house to shade it.

Walter Albermarle tells me, "Look, it's nice to save energy, but that would be a secondary consideration." Walter uses minimal energy, mostly using one large room upstairs as a combination office and living room, using appliances minimally, and practicing traditional conservation techniques, such as putting on a sweater when he feels cold, and turning the lights off when he leaves a room. Frank Lopez also cites such practices, telling me it is a form of cost savings.

Some changes the Chens have made include installing fluorescent lights, and buying an Energy Star rated washer and dryer: "Driving less, we're gonna have to change our equipment for our pool. We'll get something more energy efficient." *Solar?* "There is a possibility we might go that way. We didn't go that way before because of all of the greenery, but with that redwood gone..."

The Thurgoods have made some changes: they drive a 2010 Honda Civic, and they have swapped out some incandescent light bulbs for fluorescents, "but they buzz." They let fresh air in, keep lights off, and have increased the home's weather-stripping.

The Riverses and Halbmonds have made a lifelong commitment to reducing their energy consumption, dating back to the early 1970s. The genesis for the couples' participation in the project to build the passive solar townhome complex that they reside in came out of a group called Creative Initiative; a program that, in their own words, took the place of a more traditional church-based community in the lives of its members. The Rivers and builder Dave Smith were members of Creative Initiative together, and Dave along with another man had decided to form a development company. As it turned out, despite high expectations, their townhome complex would be the "first and last" project the development company would do, "they went bankrupt," explains Tom, "No one was doing solar back then, outside of Davis."

Their passion for conservation emerged in the 1970s as a response to the energy crisis of 1973, "when we had the gas lines," Tom recalls, "and so we had the idea of an, 'energy fast' reducing our [automotive] gas usage to just twenty gallons a month." There is a little bit of confusion as to whether he means automotive or overall, but that gets sorted out. Even though they meant automotive, the group in the townhome complex used very little 'gas' for heating, as well, because the homes were outfitted with woodstoves. Some of the 'back' units still use them, to the surprise of some of the group, "We stopped using them and switched to gas when it became clear that burning wood was worse [for air pollution, in terms of particulate load.]" The split is tallied as, all three 'front' units, occupied by original owners, now use gas. All four 'back' units, occupied by later arrivals, use the woodstoves.

One of them uses pellets, "They are supposed to burn cleaner," Tom tells me.

Peggy and Bob Halbmond joined the townhome project in its conception phase, not as much out of conviction, but because they had a realtor who was a friend of Rita and Tom's, and they "were looking for a home to buy and retire in [later]." Peggy was a nurse and Bob was a transit operator with mid-level incomes. They also liked the smaller size for the lower maintenance, along with shared responsibility for managing the common areas.

#### *Other people's behavior and lifestyle changes*

Walter Albermarle: "People are spoiled. They want their home at 78 in summer and 72 in winter...It's their problem if they want to run up a thousand dollar a month SMUD bill. Not my problem. If I had to guess at the average bill around here I'd have to say \$300-500. Mine, except when Shelly is here watching my dog, is maybe \$70-\$125."

Melanie Chen says, while her husband looks on nodding his agreement, "Everyone can do more, but I think, in our neighborhood, [and across] California, I think we are a little bit more open." Their neighborhood recycles, although there was a learning curve for many locals - Sacramentians were used to just tossing their green waste into the street (!) and there was internal, cultural, resistance to change; "I thought to myself, this is my God-given right!" says Melanie, laughing, "Your dad still does it, " she says pointing to Melvin. She continues, "Yes, they are phasing it [recycling] in still, neighborhood by neighborhood, but the budget, it's just so much cheaper, they may have a choice now, but they won't have a choice soon." Apt words for many aspects of environmental and energy related issues.

The Rivers and Halbmonds live in a planned passive solar housing development where all of the original owners sat down and worked out the 'culture' of the place collectively: Rita Rivers tells me, "Some of them were really, far out, commune, let's cook together, kinds of people." In the beginning it was a very cohesive social unit, as she goes on to explain, "everyone had kids," they had work parties, getting together for activities like "picking up river rock" to landscape with, while still later the teenaged boys were supposed to cut the lawn, "but that didn't work out too well" she sighs.

#### *Carbon Footprint*

Most people did not completely comprehend this concept, either referring to carbon credit trading schemes, or, as Frank Lopez put it, "I don't use much carbon except when I turn my car on."

#### *Conserving energy in general*

Frank Lopez tells me, "But, eventually the oil [unintelligible] we are going to go to solar. And get rid of the oil. We're always going to need oil for *something*. But not as much as we are using right now." He believes in saving energy for fiscal purposes: "Saving energy is like saving money. I try and save as much as I can. Because I'm retired. I would say I am pretty frugal, I have always been frugal. "

The Chens believe saving energy is important, "Yes! It is a finite resource and we are fast depleting it!"

The Thurgoods believe firmly in energy savings, for financial reasons, but also because of the environment, "and it is the humane thing to do. Global warming, pollutants, we have to be caretaking..."



Energy conservation is important to Brigit Van de Kamp, and she says that this has always been a part of her worldview, she grew up in a family that was into 'backpacking, gardening' with a grandfather whose motto was 'take MORE out than you took in.' It is about "nurturing the earth."

### *Energy Independence*

Walter Albermarle feels that energy independence would be good. "I would like it better if we weren't" but that we have enough oil here to get ourselves out of it, "Right now BP is causing us to lose independence...I think our noble president has made a big mistake not turning the Feds loose on them [BP] for the stunt. Letting BP go their own way – they are going to end up killing half of Florida before they are done! I'd be drilling in the Gulf, rigs on the coast, I'd be drilling in Alaska, I'd be drilling in Montana. The restrictions we put on energy in this country, the greenies have gone overboard!"

This is a sentiment echoed by Frank Lopez, who says, "As a matter of fact, we have more oil than Saudi Arabia, more oil than in the world. We have the most oil! But it's all underground and the environmentalists won't let us drill! Whether it is the ocean or whatever it is [this is said in the midst of the BP Gulf oil spill drama], I don't know if it is politics or what – 'We are going to use everybody's oil but we will keep ours for us as a reserve just in case we ever need it.'"

The Chens say that energy independence is needed, "more so now, we use it, if we don't replace it..."

### *California's Future Energy Needs*

Hardly anyone had a cogent answer on this topic, and it was simply not on their radar. Every informant had some awareness of all of these issues, but the concept of a unified 'California' energy situation was not something they could easily conceptualize:

The Thurgoods see California's energy future as one where we need more "conserving."

Walter Albermarle said, "I don't care whose gasoline you buy in Sacramento, it all comes out of the same refinery in Richmond."

The Chens think that, as a "large state it is good that we are at the forefront of [thinking about] it."

Frank Lopez says, "The state is in deep (expurgated) ". The Public Utilities whatever-they-call-it, they have a problem. They can never seem to get their heads together. It's politics, they can never make a decision, get together on ONE decision. Just like the budget...". This comment came in September 2010 as California was already two months into a deadlocked failure to come to a budgetary agreement for the now-instantiated fiscal year.

### *Global Climate Change*

The Reeves do not believe in global warming. "No, I think the Geneva Convention (sic) proved scientists can't agree." They laugh a little bit in mentioning Al Gore, and think carbon credits are not a good solution, Ron asks me rhetorically, "So, you can waste all you want as long as you pay for it?"

Walter Albermarle does not give an opinion global climate change or carbon emissions (he suggests just burning all the oil in the BP spill) "I'm too old to worry about that; that's your problem!" He laughs a little bit as he says this, rubbing his hands.

Frank Lopez has more to say about pollution than climate change, "I'm not really up to it. I think we have no control how the earth is, you know. And eventually we may come into...an ice age, eventually, you know, as the world turns."

Brigit Van de Kamp says she believes in global climate change. "During the Gulf War, you see these pictures of oil fires...[we are] still burning coal...things are going to be 3 degrees hotter." We need to reduce greenhouse gases, change the things we do."

The Chens believe in climate change. "I don't care what anyone says...I'm convinced, whether or not it is human or natural, probably both. It's happening, the glaciers are melting."

The Thurgoods see Global Climate Change as BOTH media hyped AND real. They definitely have noticed what they consider to be long-term, large-scale changes to the weather in San Rafael, "It is totally different." They see the climate as more extreme, and unstable. Summers used to be about 90 and "just stay there" but now they can hit 100 degrees. It can also be unexpectedly cooler, perceived as occurring without an established pattern and outside of previously experienced parameters.

Rita Rivers, after the freelist elicitation, goes on to say, "I'm not one of those people who believes the earth can take care of itself no matter what we do. I think we could kill it. I think we are in the process."

## **CONCLUSIONS**

The language people used, and the attitude they displayed toward their roof retrofit suggests an interesting interpretation: roofs are currently seen as consumer goods (selected for aesthetic and social properties like neighborhood relationships) rather than as investments in infrastructure (selected upon the basis of performance and cost). This may represent a departure from the past with potentially significant implications for utilities and incentive programs, as well as for manufacturers and their marketing practices. The role of the contractor and the micro-regional quality of the California roofing market cannot be overstated in terms of their importance for market penetration. The contractor's local knowledge is an important juncture along the path taken by the dissemination of information pertaining to cool roof material selection and deployment.

The good news is, consumers are already primed to hear an appealing narrative about energy savings; the bad news is that narrative will have little role to play in their decision-making process, which will be based primarily on accepted neighborhood practices and color samples. Energy savings will be seen as a potential bonus, albeit one that is not quantitatively measured, nor used as a talking point among their social network.

More good news is that these consumers at least were willing to pay a premium to get a cool roof, depending upon how representative they are, one conclusion might be that there is almost no upside to the contractor in carrying non-cool materials. Complicating matters is the diversity of California's housing stock (in terms of age and style), demographics, geography and micro-climate ( for example, the coastal consumers interviewed all lacked air conditioning, one of them, Frank Lopez, sees neighbors putting in solar roofs in a tree shaded neighborhood, and wonders out loud if it is all just a fad).

## Future Directions

One of the most productive aspects of ethnographic research is its ability to uncover potential new lines of research. With small population sizes and very specific case studies, the conclusions drawn from ethnography should not be seen as a definitive last step before direct application to policy questions. Instead, it can often uncover surprising activities that may be 'smoothed out' in the averaging provided within large data set. Conversely, ethnographic data often acts as a null hypothesis generator, contradicting the often universalizing assumptions about human behavior that arise in the absence of actual observation. During this research project, several interesting directions for future research questions arose, including:

Age and rebate incentives. While we know that there was a strong tilt toward the upper end of the scale in terms of age of respondents, we do not know why. Potential explanations could involve varying factors from availability, civic engagement, equity in the home, and even political leanings. Was it simply an artifact of self selection for the interviews? Or do older and younger people respond differently to rebate offers?

Tax incentives vs. rebates. It was only in the second round of interviews that we began actively discussing the role that tax incentives might have on roof retrofits. Typically, they are larger than rebates, though not as 'visible' since they come off one's tax bill as opposed to receiving a check. How educated are consumers about these, and how do the overlapping jurisdictions (e.g. municipal, state, and federal) in which consumers live their lives, use energy, and respond to market and state imposed incentives and disincentives affect behavior?

Contractors and metal roofs. There were several instances where contractors actively dissuaded homeowners from metal roofs. Why? Are there cross currents within the home contracting industry that promote an anti-metal attitude? Are there geographic differences?

Insulation. We did not delve into the reasons why, when people are spending several thousand dollars, they did not also upgrade their insulation. Do they think they have enough? Is there perhaps a belief that cool roofs and insulation will cancel each other out?

The themes explored in this research concerning consumer behavior, would also be an excellent starting place for follow-up research using larger data sets with more variation among customers, particularly with respect to the age profile. It was also unfortunate that we were unable to acquire Southern California Edison's customer contact information or usage data, as the potential geographic differences in climate and lifestyle might also be pertinent.

## Appendix 1: Question List

How did you come up with the idea for a cool roof?  
What kind of research did you do?  
What were some of the pros and cons?  
What was your initial impulse or inspiration?  
What problem were you trying to solve?  
Were you trying to save money? Energy? Time? Effort?  
How did you get the idea for a cool roof?  
Where did you first encounter it?  
What kinds of roofing did you investigate?  
What materials did you consider?  
Which ones did you like best? Why?  
What did the final decision come down to: cost? Durability? Ease of installation? Looks?  
How long did it take, from first concept to installation, all told?  
Were there any obstacles to implementing your idea?  
What were they?  
Was someone in your household 'in charge' of the project, or was it a group/mutual effort?  
What was the total cost of the project?  
Do you have a method for calculating return on investment for your home projects in general?  
Is that important to you?  
Is getting the exact right thing important to you, or is cost more of a deciding factor?  
How did you track costs?  
Do you have any paper backup? Anything I could take a look at?  
Has the investment paid off for you?  
How have you tracked/measured savings?  
Have you measured temperature changes before and after the cool roof retrofit?  
Do you have an anecdotal sense of the change?'  
How hot did it used to get in your house before?

Did you run the A/C more?  
What are your average bills today?  
Do you recall what they were in the past?  
Would you pick the same material over again?  
What would you say are the pros and cons of the roof you installed?  
How did the neighbors react? What about friends, family, coworkers - is this something you talk about in other spheres?  
Do you use social media, Facebook? Twitter? Do you have 'followers'? Do you talk about your cool roof?  
Would you be open to participating in an event, or a media presentation; something sponsored by your utility, such as putting a sign or a plaque in your yard or on your house?  
How was it working with the city on permits?  
Was the utility helpful?  
Did you qualify for a rebate?  
Was that a deciding factor?  
Have others been inspired by your example?  
Were there any problems, or complaints?  
Has anyone been inspired to follow your lead? Who?  
Is it important to save energy? Why?  
How do you see California's energy future?  
Is energy independence important to you?  
What is your opinion on global climate change?  
Is reducing your carbon footprint of importance to you?  
How can one best achieve this?  
Is this something you wish more people would do?  
Have you heard of the 'urban heat island effect'?  
What does that mean to you?  
Are there other energy-saving/carbon-reducing changes you have made?  
Around the house?  
In your lifestyle (like driving less)?

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