Statewide Hard to Reach Market Update Study

Study ID: SCE0202.01

Final Report

Prepared for
Southern California Edison

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July 15, 2005

Funded with California Public Goods Charge Energy Efficiency Funds

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Executive Summary

The California Public Utilities Commission (CPUC) has continually emphasized the importance of targeting Hard-to-Reach (HTR) customers in energy efficiency programs. Hence, the CPUC directed the four California investor owned utilities (IOUs): Pacific Gas and Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas and Electric (SDG&E) to make a concerted effort to target energy efficiency programs to HTR customers. For the residential segment, HTR are those groups of customers who are not low income, and who traditionally have not participated in the utility energy efficiency programs. The CPUC established the following criteria for categorizing residential customers as HTR:

- **Language**. Primary language spoken is other than English, and/or
- **Income**. Customers who fall into the moderate income level (income levels less than 400% but greater than 175% of federal poverty guidelines), and/or
- **Housing Type**. Multifamily and mobile home tenants, and/or
- **Geographic**. Residents of areas (sometimes referred to as "rural") other than San Francisco Bay, San Diego, Los Angeles Basin, or Sacramento, and/or
- **Homeownership**. Renters

The next challenge for the utilities was to take the five HTR household characteristics and identify areas where energy-efficiency program managers could concentrate their marketing efforts to increase the participation of households with the HTR characteristics. During 2001-02, the CPUC-sponsored Statewide Residential Needs Assessment (RNA) Study[1] produced 5-digit zip code-level identifiers of areas where high density of HTR segments is expected. The RNA Study relied on available market segment and US Census data at the zip code level. The zip code level identifiers were used because of their availability through utility customer databases. To implement the CPUC directives for the HTR goals for each energy efficiency program, both IOUs and non-utility agencies have made use of the RNA Study HTR-designated zip codes to address as well as track the HTR goals. In general, the residential programs have used the RNA study to designate HTR zip codes using three of the five characteristics: rural, moderate income, and renter. Where customer-specific information could be collected by programs, such as language and housing type, such information was used in combination with zip code level information for the HTR marketing and tracking of the HTR goal accomplishment.

E.1 Focus of This Study

This study was commissioned to provide data that is up-to-date and useful for targeting HTR populations that are defined from consistent sources across SCE, PG&E, and SEMPRA utility territories. This study was also commissioned to provide an overall assessment of the

[1] TecMrkt Works, CALMAC # 353

HTR activity within the residential programs. In addition, the CPUC expressed its research needs in the form of three questions:

1. How well are the Hard-to-Reach (HTR) communities, as they are currently defined by the CPUC, being served?
2. Are the HTR, as they are currently defined, still hard to reach?
3. Are there other categories of residential customers that should be included in the definition of HTR?

This Study has its limitations in being able to address the above questions in their entirety, particularly because of data limitations, but also because certain restrictions were set for the study's scope. This Study was not directed to find alternative definitions of hard-to-reach, nor to comment on the effect that previous and current HTR policy has had on program participation. The Study also does not attempt to define what adequate service levels to the HTR households ought to be.

Hence, by tracking the energy efficiency program participation levels, the Study aims to identify the geographical areas where distribution of energy efficiency funds are low relative to other areas and associate small area geographic demographic characteristics, which include the as-defined HTR, to those identified areas. The programs can use this information as an indication of where programs can focus their attention for HTR targeting and possible missed energy-efficiency opportunities.

E.2 Methodology

The methodology developed in this Study uses a GIS system to identify the Census block-group in which each IOU program participant lives. The methodology then uses the distribution of Census characteristics of the block-group to represent the likely characteristics of each participant. We then aggregate the rebates received by the participants of each block group and analyze each block-group's totals with respect to the HTR characteristics of that block-group. With this methodology, we can examine the distribution of program activity with respect to each of the five criteria by which the CPUC has defined HTR customers.

Before we can present an organized assessment of the HTR participation levels, we must establish some definitions to clarify various ways of describing HTR terms.

- **HTR households** refer to households that possess one or more of the five characteristics set out by the CPUC as being HTR. These are renters, multi-family and mobile home occupants, non-English speaking households, moderate-income households, and those living in rural areas.

- **HTR designated zip codes** refer to the assignment of specific zip codes to be designated as HTR areas. The RNA Study identified zip codes that had the highest concentration of HTR households. Each utility then used its own approach for designating which zip codes would be included. Only one utility, SCE, created a separate targeted area for each program based on the characteristics of the specific

program. At SCE, the targeted zip codes for their multi-family program differed from the targeted zip codes for their single-family program. The multi-family program list concentrated on areas with larger numbers of renters as well as areas that were rural. The SCE single-family list differed in that it also included moderate-income areas.

The other three utilities created a single set of zip codes for all programs within that utility that specified which areas were HTR-designated. PG&E designated rural as their entire service territory outside the San Francisco Bay and Sacramento areas and then used that list to designate which zip codes were HTR. SDG&E and SCG included zip codes with large concentrations of moderate-income or rural households for their definitions of HTR segments. Since the RNA study did not provide zip codes for the non-English speaking HTR segment, this criterion was not used for zip code level targeting by any of the four IOUs.

E.3 Data Issues

There are essentially two main types of data that drive this Study's methodology: Census information and IOU program participation data for PY2002 and PY2003. Five of the IOU programs have address data that can identify where the participant resides. These programs are:

1. Statewide Single Family Energy Efficiency Rebate Program (SFEER)
2. Statewide Multi-Family Rebate Program (MFRP)
3. Statewide Energy Star New Homes Program (ESNHP)
4. Statewide Residential Appliance Recycling Program (RARP)
5. Statewide Home Energy Efficiency Survey (HEES)

Data from other IOU programs and from third-party programs were not included in this assessment. SDG&E also provided data from their Low Income Energy Efficiency (LIEE) Program. Not all of the utilities were able to get all of the data for the five selected programs. There was a major problem in obtaining rebate amounts for the new construction programs of each utility. Although new units being built are included in utility records at the time each application is received, the actual rebate amounts are not determined until the home is finished. Only PG&E could produce any records for ESNHP, and the data for the 2003 ESNHP was incomplete. SDG&E was unable to supply data for the ESNHP, the RARP, and the HEES programs. SCG only has data for the SFEER and MFRP programs. While SCG does not participate in the RARP, it does have an ESNHP and a small HEES program. As a result, there is not a consistent set of programs across all four utilities, and the Study is unable to generalize the performance of some programs across IOUs. The data sets we used are specified in the headings for Tables E-1 through E-5.

It was determined that the analysis would be performed at the Census block-group level. There are generally about 600 to 3000 people in a block-group with 1500 persons being the optimal size. There are a little more than 22,000 block-groups in California.

Census data were obtained from a variety of sources. Most of the 2000 Census data that were needed was prepared by Applied Geographic Solutions. In addition, they provided year 2004 estimates of housing counts and composition to reflect changes in California since the census in 2000. Finally, Athens Research annually prepares for the utilities estimates of the number of low and moderate-income households by block-group. The Athens data also includes a designation for each block-group based on the percent of households that are designated as being in rural areas.

E.4 Results

E.4.1 Methodology Issues and Limitations

This report is the first attempt to assemble and analyze all of the California Energy Efficiency residential programs as a portfolio. It suffers from some missing data issues, and some weaknesses in the study approach. While the analysis does produce some important findings, the limitations temper our ability to state definitive findings. Before presenting any results, the authors want to alert the readers to the study's issues and limitations.

The biggest limitation of this study results from missing data. Ideally, the study wanted to track every dollar of PGC funded rebate obtained by residential customers. The study did not achieve this objective. Data were only obtained for five residential programs (of which one, HEES, was a non-rebate, education and information program) and one low-income program where address data are collected. None of the other statewide programs and none of the local programs run by third parties contributed data to this study. Either these programs do not have participant data available or the data does not contain an address to which to assign the participant. For example, the Lighting Upstream rebate is an in-store coupon for which only the redeemer's zip code is collected. Many other programs do not provide direct benefits to only one household.

This study is limited to the five statewide programs for which participant data are routinely collected; and even then, the study is missing most of the residential new construction program results and a few other data sets from the Residential Appliance Recycling and Home Energy Efficiency Survey[2] programs. In addition, only one utility provided data from the Low-Income Energy Efficiency (LIEE) program. While this is technically separate from the Energy Efficiency initiatives, the funds do flow to residential households. We cannot easily separate out the low-income households from the Census information, so the results are more informative when we also include the distribution of LIEE funds.

There is a second limitation to this study that we want all readers to appreciate in interpreting the results. Even though we have moved from an analysis based on the large zip code to the smaller block-group, we still are subject to the ecological fallacy problem. The Census Bureau selects Census block-groups to represent as homogeneous of population as possible. In this respect, the Census block-groups are far more homogeneous than the zip

[2] The Home Energy Efficiency Survey does not provide a financial rebate, but the service directly benefits a single household. The dollar figure used in this project reflects the cost of providing that service.

codes previously used to define HTR-designated areas. Even so, the values are the composite values of each Census-block, and not the actual characteristics of the participants.

We recognize this by expressing results as probabilities and not absolutes. For example, if there are five participants in a block-group with 500 households and 80% of these households are non-English speaking, the straight odds are that four of these participants are non-English speaking. Of course, this approach fails if there are true program barriers that make it more unlikely that non-English speakers are able and/or willing to participate. Only calls to individual participants can reveal that information within the block-group. However, based on probability, the study can confirm broad trends across all the block-groups, if those trends are pronounced.

The study is also limited in that the Census does not provide full cross-tabulations of all characteristics at the block-group level. The Census data can tell us what percentage of a block-group is non-English speaking and what percentage is renters. The Census data cannot tell us what percentage are simultaneously both non-English speaking and a renter. Because the five HTR characteristics are highly correlated, it is inaccurate to assume that multiple characteristics are proportionally distributed, yet there is no alternative when addressing multiple characteristics simultaneously. Accordingly, we are accurate when considering one variable at a time, but much less so when combining characteristics.

From the evidence provided above, and the caveats just expressed, we present the following results.

E-4.2 How Well Are the Households with Hard-to-Reach Characteristics Being Served?

The primary question addressed by this study is whether the programs are serving households with one or more of the five HTR household characteristics: multi-family, rural, non-English speaking, moderate income, and renters. We demonstrate this by calculating the average rebate funds paid per household in 2002-03 for each program for each block-group. We then categorize the block-groups into six percentile classes for each of the five household characteristics: The use of percentile classes allows us to examine broad trends in the distribution of PGC funded rebates. The six percentile groups vary by the percentage of households in the block-group having the specified HTR characteristic. For example for the non-English speaking analysis, Percentile Group 1 contains the 10% of block-groups with the lowest percentages of non-English speaking households. In this study, Percentile Group 1 includes all block-groups where less than 14% of the households are non-English speaking. Percentage Group 6 contains the 10% of block-groups with the highest percentage of non-English speaking households. In this study, Percentile Group 6 includes all block-groups where more than 77% of the households in the block-group are non-English speaking. The four other percentile groups are constructed at 10^{th} to 25^{th} percentile, the 25^{th} to 50^{th} percentile, the 50^{th} to 75^{th} percentile, the 75^{th} to 90^{th} percentile.

The results in Table E-1 show the distribution of funds across the four utilities for the non-English speaking household characteristics. As one moves down the chart from Percentile

Group 1 to Percentile Group 6, the concentration of HTR households with non-English speakers increases. If we follow one program the Multi-family Rebate Program (MFRP) from top to bottom, the results show that households in the block-groups with the fewest number of non-English speaking households received on average $0.25 in rebate funds, while block-groups with the highest concentration of non-English speaking households received $0.98. In other words, **on average, households in areas where more families are non-English speaking receive more MFRP funds than do households in areas where fewer households are non-English speaking**.

The results reverse when one examines the next column showing the Single Family Energy Efficiency Rebate Program (SFEER). The block-groups with the lowest percentages of non-English speakers received $1.52, while the block-groups with the highest percentage of non-English speaking households received just $0.23. The Energy Star New Home Program (ESNHP) funds, surprisingly, go to the block-groups with the very least and very most non-English speaking households, while the Refrigerator Appliance Recycling Program (RARP) and the Home Energy Efficiency Survey (HEES) are both small and reasonably balanced in their distribution.

Table E-1: The Distribution of 2003 Incentives across Percent Non-English Speaking Percentiles: ($/household)

Percentiles by Percent of Households that Are Non-English Speaking (range of values)	MFRP 2003 (all)	SFEER 2003 (all)	ESNHP 2003 (PG&E Only)	RARP 2003 (PG&E, SCE)	HEES 2003 (PG&E, SCE)	LIEE 2003 (SDGE only Normalized for all 4 IOUs)*
Average all Block-groups	$0.41	$1.07	$0.34	$0.18	$0.09	$3.60
Percentile Group 1: 10% of Block-groups with Lowest Percentage of Non-English Speaking (<14% Non-English Speaking)	$0.25	$1.52	$0.68	$0.12	$0.07	$1.49
Percentile Group 2: 10 to 25% (14% to 21% Non-English Speaking)	$0.16	$1.67	$0.00	$0.15	$0.08	$1.54
Percentile Group 3: 25 to 50% (21% to 34% Non-English Speaking)	$0.40	$1.39	$0.17	$0.19	$0.09	$1.57
Percentile Group 4: 50 to 75% (34% to 56% Non-English Speaking)	$0.48	$0.88	$0.44	$0.19	$0.09	$3.68
Percentile Group 5: 75 to 90% (56% to 77% Non-English Speaking)	$0.31	$0.52	$0.16	$0.22	$0.09	$7.02
Percentile Group 6: 10% of Block-groups with Highest Percentage of Non-English Speaking (>77% Non-English Speaking)	$0.98	$0.23	$0.00	$0.26	$0.11	$9.47

* SDG&E funds its MFRP and SFEER 2.95 times more than the combined average of the four IOUs. We have adjusted SDG&E LIEE by 2.95 to reflect what would be a likely combined LIEE amount for the four IOUs.

As we noted in our limitations above, the broad trends shown in Table E-1 cannot confirm that non-English speaking households are receiving funds in the SFEER. It is entirely possible, that funds received within a block-group are going to the English-speaking households in the block-group, and the drop-off seen from the Percentile Group 1 to the Percentile Group 6 averages is a result of the drop-off in the number of English speaking

households in each Percentile Group. Conversely, it is probable, though not confirmable, that non-English speaking households do receive large amounts of the MFRP rebates. Overall, the five energy-efficiency programs show a small favoritism to the block-groups that have the lowest percentage of households with non-English speaking occupants. However, this is misleading in that the Low Income Energy Efficiency (LIEE) program provides PGC funds to many residential customers. We have included the data for the LIEE program in the SDG&E service territory to Table E-1 to show the fund distribution trend. We normalized the SDG&E LIEE amounts to be in line with the statewide averages for the MFRP and SFEER statewide averages. While we cannot comment on the other three utilities because we do not have their LIEE data, for SDG&E, a higher proportion of PGC funds are likely given to non-English speaking households, than to households with no non-English speakers.

Tables E-2 to E-4 show that the other HTR household characteristics for renters, multi-family and mobile homes, and moderate income all have very similar trends. The only criterion that produced different results is the rural household characteristics. Table E-5 shows this distribution, which does not use percentiles, because 88% of all block-group have no rural households. **In this case, the MFRP and the ESNHP have relatively small activity in the rural areas, while the SFEER, RARP, and HEES have rural activity levels similar to the urban area activity levels.** For SDG&E, The LIEE also does not appear to be as effective in reaching the rural areas as it is in reaching the urban areas.

Table E-2: The Distribution of 2003 Incentives across Percent Renter Percentiles

Percentiles by Percent of Households that Are Renters (range of values)	MFRP 2003 (all)	SFEER 2003 (all)	ESNHP 2003 (PGE Only)	RARP 2003 (PGE, SCE)	HEES 2003 (PGE, SCE)	LIEE 2003 (SDGE only Normalized for all 4 IOUs))
Average all Block-groups	$0.41	$1.07	$0.34	$0.18	$0.09	$3.60
Percentile Group 1: 10% of Block-groups with the lowest Percentage of Renters (<9% Renters)	$0.03	$2.56	$1.24	$0.27	$0.20	$0.85
Percentile Group 2: 10 to 25% (9% to 17% Renters)	$0.08	$1.78	$0.10	$0.22	$0.11	$2.02
Percentile Group 3: 25 to 50% (17% to 35% Renters)	$0.14	$1.21	$0.10	$0.18	$0.09	$2.06
Percentile Group 4: 50 to 75% (35% to 61% Renters)	$0.48	$0.76	$0.34	$0.17	$0.07	$3.04
Percentile Group 5: 75 to 90% (61% to 80% Renters)	$0.57	$0.35	$0.19	$0.18	$0.07	$4.58
Percentile Group 6: 10% of Block-groups with Highest Percentage of Renters (>80% Renters)	$1.62	$0.14	$1.08	$0.16	$0.05	$5.20

Table E-3: The Distribution of 2003 Incentives across Percent Multi-Family and Mobile Homes Percentiles

Percentiles by Percent of Households that Are Multi-Family and Mobile Homes (range of values)	MFRP 2003 (all)	SFEER 2003 (all)	ESNHP 2003 (PGE Only)	RARP 2003 (PGE, SCE)	HEES 2003 (PGE, SCE)	LIEE 2003 (SDGE only Normalized for all 4 IOUs)
Average all Block-groups	$0.41	$1.07	$0.34	$0.18	$0.09	$3.60
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Multi-Family and Mobile Homes (0 Multi-Family and Mobile Homes)	$0.00	$1.82	$0.00	$0.24	$0.14	$1.53
Percentile Group 2: 10 to 25% (0 to 2% Multi-Family and Mobile Homes)	$0.07	$1.62	$0.27	$0.21	$0.11	$1.26
Percentile Group 3: 25 to 50% (2% to 13% Multi-Family and Mobile Homes)	$0.13	$1.16	$0.11	$0.18	$0.08	$3.20
Percentile Group 4: 50 to 75% (13% to 36% Multi-Family and Mobile Homes)	$0.29	$0.86	$0.36	$0.18	$0.07	$3.01
Percentile Group 5: 75 to 90% (36% to 61% Multi-Family and Mobile Homes)	$0.74	$0.53	$0.49	$0.14	$0.07	$4.24
Percentile Group 6: 10% of Block-groups with Highest Percentage of Multi-Family and Mobile Homes (>61% Multi-Family and Mobile Homes)	$0.99	$0.24	$2.10	$0.18	$0.06	$4.21

Table E-4: The Distribution of 2003 Incentives across Percent Moderate Income Percentiles

Percentiles by Percent of Households that Are Moderate Income (range of values)	MFRP 2003 (all)	SFEER 2003 (all)	ESNHP 2003 (PGE Only)	RARP 2003 (PGE, SCE)	HEES 2003 (PGE, SCE)	LIEE 2003 (SDGE only Normalized for all 4 IOUs)
Average all Block-groups	$0.41	$1.07	$0.34	$0.18	$0.09	$3.60
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Moderate Income (<24.8% Moderate Income)	$0.16	$1.90	$0.07	$0.19	$0.08	$0.04
Percentile Group 2: 10 to 25% (24.8% to 29.4% Moderate Income)	$0.16	$1.90	$0.65	$0.19	$0.08	$0.98
Percentile Group 3: 25 to 50% (29.4% to 33.9% Moderate Income)	$0.19	$1.62	$0.19	$0.21	$0.10	$2.90
Percentile Group 4: 50 to 75% (33.9% to 37.2% Moderate Income)	$0.29	$1.30	$0.41	$0.19	$0.09	$3.37
Percentile Group 5: 75 to 90% (37.2% to 39.9% Moderate Income)	$0.31	$1.14	$0.08	$0.17	$0.10	$3.97
Percentile Group 6: 10% of Block-groups with Highest Percentage of Moderate Income (>39.9% Moderate Income)	$0.73	$0.83	$0.37	$0.16	$0.10	$3.69

Table E-5: The Distribution of 2003 Incentives across Rural Percentages ($/household)

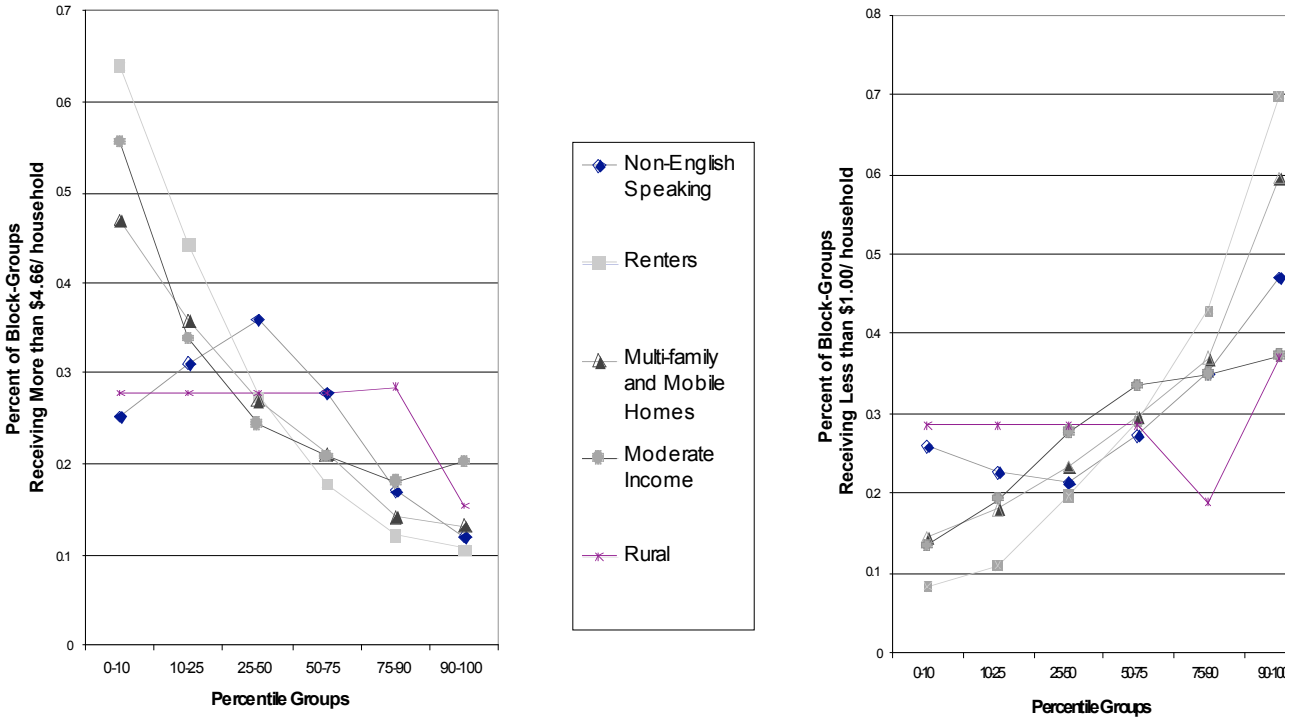
	MFRP 2003 (all)	SFEER 2003 (all)	ESNHP 2003 (PG&E Only)	RARP 2003 (PG&E, SCE)	HEES 2003 (PG&E, SCE)	LIEE 2003 (SDGE only Normalized for all 4 IOUs)0*
Average all Block-groups	$0.41	$1.07	$0.34	$0.18	$0.09	$3.60
Block-Groups Less Than 0.01% Rural (88% of Block-groups)	$0.47	$1.05	$0.44	$0.20	$0.08	$4.02
Block-groups Between 0.01% And 100% Rural (12% of Block-groups)	$0.17	$1.36	$0.04	$0.13	$0.18	$2.39

We examined the characteristics of those block-groups that received the most amount of money and the least amount of money to see if we could detect any biases. We present the values for PG&E in this Executive Summary as an illustration. Figures for the other utilities are similar and are shown in the respective chapters of the report. The left side of Figure E-1 shows the percentages of block-groups receiving more than $4.66 per household for PG&E,

this figure represents the mean amount received but only 27% of the block-groups achieved this high of average funding. This chart shows that as the percentage of an HTR household characteristic in a block-group increases, the average PGC funded rebate per household activity decreases. Remember, however, that this does not include LIEE funding.

At the other end of the distribution 28% of block-groups received average benefits of less than $1.00 per household. As the right side of Figure E-1 shows, these tend to be those block-groups with the higher percentages of households with one or more HTR household characteristics. The problem with Figure E-1 is that it again excludes households served by the LIEE program. Looking at these figures and ignoring the contribution that the LIEE makes is likely to lead to a conclusion that the block-groups with large concentrations of households with HTR household characteristics are not getting an equitable share of rebates.

Figure E-1: The Distribution of Block-groups Receiving More Than $4.66 or Less than $1.00/household from 2002-03 at PG&E.



E.4.3 Are Households with the Five Original HTR Characteristics Still Hard to Reach and How Should We Redefined Who Is HTR?

In truth, this study cannot answer this research question. The specification of the five original HTR characteristics was not based on empirical evidence. Therefore, we have no basis on which to judge past or current status.

It is clear that some areas of the state with large concentrations of households with HTR household characteristics are receiving significant PGC funded rebates. This is particularly the case in SDG&E when the analysis includes LIEE funds. Yet, just because HTR households receive rebate funds, does not mean that the households within these areas are not still hard to reach. It may be that current policy has helped attract these types of households. Because there is no baseline data documenting the level of HTR household participation before the CPUC directed the current emphasis on marketing to HTR households, there is no way of knowing if the current conditions are an improvement or slippage from earlier conditions.

To address issues of hard to reach customers' participation will require continued monitoring of distribution of rebate funds and/or program participation over time. Such studies will define household types and spatial locations where low activity is an issue. Programs can then develop strategies or the IOUs can design new programs to address these problem areas.

The preponderance of areas in the state that have no program activity is a place that the CPUC and the IOUs should begin to address. While some areas with high concentrations of HTR household characteristics have large participation rates, there are other areas of the state with similar concentrations of households with HTR characteristics that have received little or no PGC funded rebates. One reason for this result is the lumpiness of some programs, particularly new construction and multi-family where one project can receive a large amount of funding. Under these circumstances, there is an unavoidable appearance of feast or famine with respect to participation level.

This study has found that some low activity is structural in nature. A multi-family program will not be successful in recruiting rural households, nor will a single-family rebate program geared to homeowners attract renters. No amount of marketing and recruitment support can produce participants in areas where there are few eligible households. This finding suggests that a diversity of programs geared to specific markets is required. As data such as produced here become available, new targets requiring modified strategies will emerge. For example, the MFRP is responsible for bringing a significant amount of resources and energy-efficiency benefits to the multi-family segment. Yet the MFRP program has not been successful in reaching its secondary target: the mobile home sector. This might suggest that additional marketing techniques, modified incentive structures, and even a wholly separate program is required to recruit interest among the mobile home segment.

Other low activity may be due to spatial factors. Word of mouth contact, the driving force for many of these programs, is likely to spread in areas already involved in the program, rather than jump to new areas. Some programs, such as MFRP rely on builders or contractors to supply services. The supply of participant contractors is a factor in why some areas participate and others do not. (see Wirtshafter et. al, 2000). Contractors when left to there own devices will choose locations near them. **The IOUs may want to alter incentive levels to encourage program participation in underserved areas**.

CPUC policy has to date ignored location itself as a factor in deciding hard to reach criteria, reasoning that as long as the program is serving HTR households, the non-activity in some areas is not an issue as over time funding will catch up to the areas missed in this round. There are at two good reasons for not ignoring the fact that some areas are receiving little funding. First, the idea that areas will receive their equitable share over time assumes that, in a reasonable period, the program will cover all of those needing its support. This is truly not the case for the MFRP, which services a few percent of the State's multi-family households each year. More importantly, one of the tenets of California's Energy Efficiency efforts has been to promote market transformation by building a delivery infrastructure. If the intent is to build infrastructure, programs need to establish a priority for encouraging adoption in areas where the program has not yet caught on, rather than continuing to support projects in areas that have a demonstrated capability.

E.4.4 What Is a Better Mechanism to Identify and Track HTR?

The study also addressed whether reliance on the zip code level HTR targeting used by the utilities is valid and worth continuing in operation. What seems most clear from our analysis is using the zip code level designation to identify and track the number of HTR participants is bound to be imperfect. This is particularly true because counting every participant household in HTR zip codes as being an HTR household is a likely over-estimate of the number of HTR households that have participated. Let us say for example that ten households participated in zip code X, which is deemed HTR because 60% of the households are in the moderate-income range. We might ignore ecologically fallacy issues and assume that 60% of these ten participant households are HTR, but it is not justified to assume 100% of the households are HTR. This over-counting amplifies when the HTR characteristic is the rural designate. Zip codes can be designated HTR rural even if less than 10% of the households fit the Census or Goldsmith criteria. Yet the current counting treats every household treated in that zip code as an HTR household. The PGE approach treats all areas outside of San Francisco and Sacramento as rural even though large areas inside this area are not rural. At the same time, the same method never counts any participant household in San Francisco as HTR even if a non-English speaking, moderate-income, renter occupies it.

The use of HTR zip codes for program marketing may be acceptable if the IOUs match the program to the characteristics to which they are marketing. Programs geared to rural households can use the RNA study results to identify rural zip codes; those marketing to multi-family can identify areas with large numbers of multi-family households. However, using a single metric that combines all five HTR characteristics is unlikely to point the individual programs to the best set of potential households.

The continued use of the HTR zip codes even for marketing is further brought into question given the low degree of accuracy this study has found between areas designated as HTR by the four IOUs and the new Census characteristics measured at the block-group level. As demonstrated in the tables below, the HTR designation both includes many areas that do not appear to have large numbers of households with HTR characteristics, and excludes many areas that do have large numbers of households with HTR characteristics.

We test the accuracy of the HTR zip code designation by comparing areas with Census specified high concentrations of HTR characteristics against the zip code HTR-designation. If the HTR designation is valid, we will see the majority of the block-groups with the highest concentrations of the characteristic as being among those block-groups HTR-designated. Table E-6 shows this cross-tabulation using the 75% and 90% percentile cut-offs as the definition for areas with high concentrations of households with an HTR characteristic.

For example, at the 90% cut-off, only those block-groups with more than 40% of households in the moderate-income category are included. This represents the 10% with the highest percentages of households in the moderate-income category. As the figures show, more block-groups with this high concentration of moderate income are not classified as HTR-designated, than there are block-groups in this concentration that are classified as HTR-designated.

In fact, for every criterion except rural, the HTR designation excludes more block-groups with high concentrations of the HTR household characteristics than it includes. Even in the rural case at the 90% cut-off, the HTR-designation process fails to classify 44% of the block-groups that have more than 6.8% of the households living in rural areas.

Table E-6: Cross-tabulation of HTR-Designation with Block-groups with Highest Concentration of HTR Household characteristics

	75 Percentile Cut-off	Is Block Group HTR Designated			90 Percentile Cut-off	Is Block Group HTR Designated	
		No	Yes			No	Yes
Percent Moderate Income	>37%	4669	4262		>40%	1873	1702
Percent Renters	>69%	5136	3556		>80%	2032	1429
Percent Multi-Family and Mobile Homes	>36%	5318	3448		>61%	2207	1311
Percent Non-English Speaking	>56%	4518	4105		>77%	1717	1763
Percent Rural BG	>1%	1875	2206		>6.8%	1566	1992

* These tables indicate there are more than 35,000 block-groups in the analysis even though California has only 22,000 block-groups. Some block-groups are serviced by more than one of the four IOUs, particularly in the SCE/SCG areas, and are included more than once.

The problem with the zip code level HTR-designation process is not only that it misses areas that have strong HTR household characteristics, but also that it classifies areas with no strong HTR household characteristics as being HTR-designated. In Table E-7, we create a new variable, "Strong Presence of any HTR Household Characteristic," which determines if a block-group has one or more of the HTR household characteristics. This variable is set to "Yes" if the percentage level of any one of the five HTR household characteristics is above the 75% percentile mark. Block-groups in the "No" Category do not have a single HTR criterion that reaches into the top quarter of all values for that criterion. Yet as Table E-7 shows, the HTR designation includes 4800 block-groups with no strong presence of a single HTR household characteristic. These 4800 block-groups represent more than 30% of the total block-groups designated as HTR. The HTR designation process also excludes more

than half of all of the block-groups that do have a strong presence of at least one HTR characteristic.

Table E-7: Cross-tabulation of HTR-designation Versus Strong Presence of Any HTR Household Characteristics

		Is Block Group HTR Designated		
		No	Yes	Total
Is there a strong presence of any HTR household characteristic	No	7692	4800	12492
	Yes	12744	10460	23204
	Total	20436	15260	35696

The real strength of the GIS system created for this study is its ability to produce targeted marketing lists for the programs. When coupled with the utility customer data, the GIS can create targeted lists with specific customer addresses. A challenge for this study and GIS technology is to make applications of this type of targeted marketing query as simple as the selection of the customer zip code. The authors suspect that improvements in the GIS software and broader utility billing and marketing applications will drive the development of this type of capability in the very near term.

E.5 Conclusions

This paper reports on the first multi-year, multi-program, statewide assessment of the distribution of PGC funded rebates across the residential population. The study collected participation data from each of the four California IOUs for their 2002 and 2003 residential programs. The intent of this study was to determine the extent to which current programs were reaching segments of the residential population thought to be hard to reach. Data availability among other issues limits the specificity with which we can present results; however, we are able to describe broad trends and make some clear policy recommendations. In addition, this type of study uses probabilities to estimate if programs are reaching household types. The only way to confirm the trends found here is to contact samples of customers.

Programs are delivering rebates to some of the state's households that have one or more of the five HTR characteristics: renters, rural, non-English speaking, moderate income, and multi-family/mobile homes. Some programs are more effective in reaching these households. **The single-family program does tend to serve non-HTR households but this is somewhat mollified by the multi-family program which reaches many HTR households**. In SDG&E at least, the Low Income Energy Efficiency program is particularly successful in reaching these households.

The study did find that some areas in the state received no PGC funded rebates from any major residential program in 2002 and 2003. We recommend that IOUs begin to market in these areas and develop special incentives to encourage participation. We also recommend that tracking this type of analysis over time will help determine if there are other groups of un-reached customers. Ultimately, the existence of a diverse portfolio of

programs is the most effective means of ensuring that programs are available and reachable by all residential customers.

This study cannot determine if recent initiatives designed to reach the HTR have contributed to the current distribution. Accordingly, we cannot recommend any changes in the programs now underway. **However, this study's results do not support the continued use of the zip code level HTR-designation process**. The designation is too imperfect to be useful; including areas that do not have HTR household characteristics, while excluding areas that do have strong HTR household characteristics.

1 Introduction

This study was conducted at the request of the California Public Utility Commission. The study was managed by Southern California Edison. It was funded through the public goods charge (PGC) for energy efficiency and is available for download at www.calmac.org.

1.1 Designation of Hard to Reach by the California Public Utilities Commission

The California Public Utilities Commission (CPUC) has continually emphasized the importance of targeting Hard-to-Reach (HTR) customers in energy-efficiency programs. The premise of this emphasis is the belief that these customer segments have been served inequitably. While these customer segments have contributed equally to the Public Goods Charge (PGC) funds, they have not explicitly benefited from the energy efficiency programs funded by the PGC.

Hence, the CPUC directed the four California investor owned utilities: Pacific Gas and Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas and Electric (SDG&E) to make a concerted effort to target energy efficiency programs to HTR customers. For the residential segment, the HTR are those groups of customers who are not low income, and who traditionally have not participated in the utility energy efficiency programs. The emphasis on customers who are not low income is due to the fact a separate set of Low-Income energy efficiency programs are available to low-income customers. The CPUC established the following categories of residential customers as being HTR:

- **Language**. Primary language spoken is other than English, and/or
- **Income**. Customers who fall into the moderate income level (income levels less than 400% but greater than 175% of federal poverty guidelines), and/or
- **Housing Type**. Multifamily and mobile home tenants, and/or
- **Geographic**. Residents of areas other than San Francisco Bay, San Diego, Los Angeles Basin, or Sacramento, and/or
- **Homeownership**. Renters

It should be emphasized that the designation of these five criteria as HTR is not based on any specific empirical analysis. Performing that analysis is in fact one of the objectives of this study. This study was also commissioned to provide data that are up-to-date and useful for targeting the CPUC designated HTR populations that are defined from consistent sources across SCE, PG&E, and SEMPRA utility territories as well as to provide an overall assessment of the HTR activity within the residential population.

1.2 Implementation of the CPUC HTR Directive by the Utilities

The four IOUs in California were faced with the challenge of directing their energy efficiency programs to reach out to residential customers who fit one or more of these five HTR household characteristics. To meet the CPUC's directive, the utilities needed a means to identify easily who among their residential customers had the HTR characteristics. None of the utility customer information systems possesses the demographic information on customers to make this identification directly possible.[3]

The Statewide Residential Needs Assessment Study. During 2001-02 the CPUC sponsored the Statewide Residential Needs Assessment (RNA) Study (TecMrkt Works 2002) designed to provide insight into the characteristics of the HTR segments. The RNA study also produced 5-digit zip code level identifiers of areas of expected high density of HTR segments. The RNA used US Census data to establish thresholds for areas where percentages above the threshold signaled that an area had a large concentration of households possessing those HTR household characteristics. For example, the percentage of moderate-income households was established by identifying the percentage of households without seniors in the zip code whose household income fell between 150% and 400% of the Federal poverty guideline (for households with seniors the measure was between 200% and 400%). Top percentage thresholds were then selected for utilities to target HTR segments. In the case of moderate-income segment, zip codes that had more than 43% of households with the moderate-income level were determined to be HTR zip codes. Similar thresholds were established for renters. Each utility created a list that identified which zip codes within their service territories were to be HTR zip codes.

Each utility used a different method for determining which zip codes were included in the HTR designated zip codes. Only one utility, SCE, created a separate targeted area based on the characteristics of the specific program. At SCE, the targeted zip codes for their multi-family program differed from the targeted zip codes for their single-family program. The multi-family program list concentrated on areas with larger numbers of renters as well as areas that were rural. The SCE single-family list differed in it also included moderate-income areas.

The other three utilities created a single set of zip codes for all programs within that utility that specified which areas were HTR-designated. PG&E designated rural as every city not located in the San Francisco Bay Area or Sacramento and then used that list to designate which zip codes were HTR. SDG&E and SCG included zip codes with large concentrations of moderate-income or rural households for their definitions of HTR segments. Since RNA study did not provide zip codes for the non-English speaking HTR segment, this criterion was not used for zip code level targeting.

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[3] Utilities often do have detailed information on their low-income customers in order to process low-income energy assistance and other household services offered to qualified low-income customers. However, this income and housing data can only be collected when customers apply for one of these low-income programs. There is no equivalent income requirement for participating in any other energy efficiency programs, so it is neither possible nor necessary for utilities to collect or store this type of information for customers above the low-income thresholds. The same is true for other demographic characteristics, such as primary language, home ownership, and to some extent dwelling type.

Implementing the HTR Directive at the Program Level. Each program was also responsible for counting what percentage of program participants were HTR. With two exceptions, the approach used by the IOUs was to count every participant who lived in a designated zip code as an HTR household.[4] -

Each evaluation study of the program was also then responsible for verifying that the HTR program participation rates claimed by each utility program were accurate. For the most part, the evaluations also used the HTR zip codes to verify HTR accomplishments.

1.3 Focus of This Study

This study was commissioned to provide data useful for targeting HTR populations that are defined and derived from consistent sources across SCE, PG&E, and SEMPRA utility territories as well as to provide an overall assessment of the HTR activity within the residential programs. Census data were used to identify HTR segments and to determine who has participated and what HTR submarkets were responding to energy efficiency programs.

Additionally, the CPUC expressed its needs in the form of three questions:

1. How well are the Hard-to-Reach (HTR) communities, as they are currently defined by the CPUC, being served?
2. Are the HTR, as they are currently defined, still hard to reach?
3. Are there other categories of residential customers that should be included in the definition of HTR?

It was determined that the CPUC questions and the project's overall objective dovetail into the following research questions:

1. How well has each utility's portfolio of programs done in reaching HTR customers? How evenly are the funds distributed across various groups of customers?
2. How are PGC funds distributed across tracts within each utility?
3. What are the differences between those areas getting large amounts of funds and those receiving lower amounts? What are the factors (e.g. density, housing type, customer demographics, and proximity to corporate headquarters or training facilities) which may explain these differences?
4. How has each program done in addressing its HTR goals?
5. What specific areas and demographic types may have additional program opportunities?
6. How can this study help programs identify and target those specific areas and demographic types?

[4] For its count of HTR activity in the multi-family program, SDG&E used the percentage of funds spent on tenant space. For the Home Energy Efficiency Survey, all IOUs used the information provided by respondents to classify participants as HTR.

1.4 Report Organization

The remainder of this report is divided into the following sections:

- Chapter 2: Data and Methodology
- Chapter 3: Assessment of How Well Are the Hard-To-Reach (HTR) Communities Being Served?
- Chapter 4: Assessment of the Characteristics of Block-groups in PG&E Territory
- Chapter 5: Assessment of the Characteristics of Block-groups in SCE Territory
- Chapter 6: Assessment of the Characteristics of Block-groups in SCG Territory
- Chapter 7: Assessment of the Characteristics of Block-groups in SDG&E Territory
- Chapter 8: How Accurate Are the Currently-used HTR Designated Zip Codes
- Chapter 9. Summary and Recommendations on What Areas and Demographics Need Additional Targeting And How to Identify Them?
- References

2 Study Methodology and Data Needs

2.1 Overview of Methodology

The methodology developed for this paper uses a GIS system to identify within which Census block-group each participant lives. The methodology then uses the Census characteristics of the block-group to represent the likely characteristics of each participant. The results for each block group are then aggregated. With this methodology, we create a distribution of program activity with respect to each of the five household characteristics by which the CPUC has defined HTR customers.

Geo-locating the Participant Addresses and Block-Group Designation

The first step in the methodology is to locate the exact latitude and longitude of each participant based on the home address. We used several different approaches for locating addresses. Many of the addresses pulled from customer records already contain the latitude and longitude. A second option was to use the zip +4 codes to locate households. We obtained a list[5] of zip +4 centroids representing small street segments all of which are contained within the same Census Block. This level of accuracy is more than is needed as our analysis is performed at the higher order Census Block-group level. Approximately one-third of the addresses received had neither the latitude and longitude, nor the zip +4. For these addresses, we used the geo-location routine contained in ESRI's ArcView software and the 2004 California Street Atlas provided by ESRI. This geo-location routine tries to locate automatically the exact street segment and the correct side of the street by finding the provided street address among the Street Atlas database. When located, the routine enters the latitude and longitude into the database. After an automatic pass through the address list, the routine allows a manual examination of the address. The entire geo-coding process was able to locate more than 99 percent of the participants except for the case of new construction where un-established addresses and new street names create location issues.

The US Census has established the block group as a set of homogenous blocks all of which are contained within the same census tract. There are generally about 600 to 3000 people in a block-group with 1500 persons being the optimal size. The use of block-groups adds more precision to our analysis and more homogeneity when characterizing persons from the block-group average conditions. There are a little more than 22,000 block-groups in California.

2.2. Definition of Key Terms

Before we can present an organized assessment of the HTR issues, we must establish some definitions to clarify the various HTR terms as used in the Study:

- **HTR households** possess one or more of the five characteristics set out by the CPUC as being HTR. These are renters, multi-family and mobile home occupants,

[5] The list was obtained from Sammanish Data System, Inc. of Bellevue, WA of California

non-English speaking households, moderate-income households, and those living in rural areas.

Energy Efficiency programs generally do not have access to the characteristics of participating households , such as income, primary spoken language, own/renter status, dwelling type. Hence, programs cannot exactly identify whether the participants fall into any of the five HTR household characteristics. The exceptions to this statement are rural households which we can geo-locate, and participants in the multi-family program that we can reasonably assume are either multi-family or mobile home households.

We can use the Census information to assign each participant the characteristics of the block-group in which the household is found. We can then use the assigned characteristics data to identify differences in participation across the block-groups. It is an "ecological fallacy" to assume that the characteristics of individual household have the average characteristics of the block-group. This means that we cannot be certain that the characteristics of the participants match the average characteristics of the block-groups in which they are located. Nevertheless, the Study assumes that block group characteristic assignment is an improvement in the direction of locating households that are likely to fit the HTR household characteristics.

- **HTR zip code designation** refers to the process used in the RNA Study to identify zip codes that had the highest concentration of households with HTR household characteristics. In formulating this process, the designers were only able to use three of the five HTR household characteristics to designate zip codes as HTR: high concentration of renters, moderate-income households or zip codes which have are determined to be rural using the Goldsmith criteria. This designation process was not directly able to consider areas with large non-English speaking households and large percentages of multi-family or mobile homes.

  Because the HTR zip code designation is done at the larger zip code level, there is even greater diversity of households within its boundaries. This makes the concerns of ecological fallacy a larger issue when one tries to assign average zip code characteristics to all participants within that zip code. Unfortunately, this is exactly what the HTR zip code designation process does: It assumes that all participants within an HTR-designated zip code are households with one or more HTR-criteria. In fact, there may be large settlements within the zip code that do not have many households with one or more HTR household characteristics. Concomitantly, there may be other zip codes with settlements of high concentrations of households with a HTR characteristic, however, when the characteristic from this small area is averaged with that of the rest of the zip code the average concentration may fall below the established threshold, and the zip code is not designated HTR.

- **Portfolio Participation** refers to a measure of the number of households and the total rebate dollars actually distributed by a combined set of residential programs into each census block group. We then take these totals and divide them by the

number of households in the block group to develop a common scaled parameter of participation per block group: $/per household.

- **Program Penetration** refers to the measure of the number of households and total rebate dollars divided by the number of households actually eligible for the program. This measure makes sense when addressing individual programs. When used, it helps identify areas that have low rebate levels, and program penetration can be helpful to target areas for marketing of a specific program. A penetration study, which this author did for the MFRP, see Wirtshafter et. al. (2005), showed that increasing program activity into rural areas by the MRFP was not possible as these areas have few eligible multi-family units. This Study's main focus is not on the operation of the individual programs, but the overall distribution of funds across programs. This requires us to include all residential customers. For this reason, this study concentrates on a measure of portfolio participation and not program penetration.

2.3 Data Needs

There are essentially two main types of data that drive this Study's methodology: Census information and utility program participation data. A data request was made to SCE, PG&E, and SEMPRA that required data for each program in 2002-2003 to include the following participant customer information.

- Program name
- Program year
- Street address
- City
- Zip code +4
- PGC funded incentive amount
- Account number
- Longitude/latitude

In the following sections, we discuss the issues surrounding each of the data types. We discuss the data available and how that availability affects the methodology used to assess the data and process the desired results.

2.3 Utility Program Participation Data

2.3.1 Assessing the Utility Program Participation Data

Ideally, all PGC funds that flowed to residential customers would be included for measuring the portfolio participation. This would include the Statewide programs, local third-party initiatives, and funds distributed via the Low-Income Energy Efficiency Program (LIEE). The data needed would consist of the names, addresses, and PGC funds received by every participant in every utility and third party program in both PY2002 and PY 2003. Note that the Study only considered the rebate/incentive received by the participants as a proxy for

measuring the extent of PGC expenditure per household. One program included in the study, the Home Energy Efficiency Survey (HEES) is not a rebate program, but is instead a free audit program. The data for HEES represents the approximate cost of providing the audits, and not a rebate amount provided to participants.

It was determined that neither the utilities nor the CPUC's Master Evaluation Contractor has the desired data elements on the program participation for the third-party programs. As for LIEE data, it was determined after some discussions with the Project Advisory Team that LIEE related issues and program participation data did not fall within the Study's defined jurisdiction. SDG&E did provide LIEE data for comparative purposes. Other programs, such as the Upstream and Downstream Lighting Programs did not collect individual customer participant information and thus did not have an address for each of the participants. Therefore, these programs could not be included in the analysis. As a result, it was determined that the analysis would include the following five programs.

1. Statewide Single Family Energy Efficiency Rebate Program (SFEER)
2. Statewide Multi-Family Rebate Program (MFRP)
3. Statewide Energy Star New Homes Program (ESNHP)
4. Residential Appliance Recycling Program (RARP)
5. Home Energy Efficiency Survey (HEES)

Table 2-1 shows the data that were provided.

Table 2-1: Data Records Provided by Utilities

	Number of Records in 2002	Total $ Rebates in 2002	Number of Records in 2003	Total $ Rebates in 2003
PG&E				
Statewide Single Family Residential Rebate Program (SFEER)	59,729	$5,408,323	114,958	$10,615,521
Statewide Multi-Family Rebate Program (MFRP)	224	$1,062,566	500	$3,428,754
Statewide Energy Star New Homes Program (ESNHP)	396	$5,426,671	560	$1,667,250
Residential Appliance Recycling Program (RARP)	14,984	$599,360	11,362	$493,280
Home Energy Efficiency Survey (HEES)	27,378	$368,555	43,245	$582,348
SCE				
Statewide Single Family Residential Rebate Program (SFEER)	27,980	$3,278,928	27,845	$5,108,086
Statewide Multi-Family Rebate Program (MFRP)	307	$1,125,364	243	$1,659,893
Statewide Energy Star New Homes Program (ESNHP)	NA	-	NA	-
Residential Appliance Recycling Program (RARP)	25,539	$972,930	30,360	$1,194,305
Home Energy Efficiency Survey (HEES)	37,694	$898,560	35,229	$842,734
SCG				
Statewide Single Family Residential Rebate Program (SFEER)	34,851	$2,769,360	41,282	$3,272,030
Statewide Multi-Family Rebate Program (MFRP)	341	$530,682	496	$1,209,243
Statewide Energy Star New Homes Program (ESNHP)	NA	-	NA	-
Home Energy Efficiency Survey (HEES)	NA	-	NA	-
SDG&E				
Statewide Single Family Residential Rebate Program (SFEER)	32,023	$3,000,531	31,038	$3,033,170
Statewide Multi-Family Rebate Program (MFRP)	280	$1,455,236	253	$2,179,119
Statewide Energy Star New Homes Program (ESNHP)	NA	-	NA	-
Residential Appliance Recycling Program (RARP)	NA	0-	NA	-
Home Energy Efficiency Survey (HEES)	NA	-	NA	-
Low Income Energy Efficiency	18,107	$11,306,199	18,512	$11,808,953

As Table 2-1 indicates, not all of the utilities were able to get all of the data for the five selected programs. There was a major problem in obtaining rebate amounts for the new construction programs of each utility. Although new units under construction are included in utility records at the time when the application is received, the actual rebate amounts are not determined until the home is finished. Only PG&E could produce any records for ESNHP, and their data for the 2003 ESNHP is incomplete. SDG&E was unable to supply data for the ESNHP, the RARP, and the HEES programs, but was able to supply LIEE data. SCG only has data for the SFEER and MFRP programs. While SCG does not participate in the RARP, it does have an ESNHP and a small HEES program. As a result, there is not a consistent set of programs across all four utilities. Because we only have ESNHP construction for only one

utility and LIEE for only a different utility, it was not possible to build a multi-variate model across the four utilities. We therefore examine results for each utility on a separate basis.

A small manipulation was done to the data for PG&E's Residential Appliance Recycling and Home Energy Efficiency Survey programs. PG&E did not enter rebate level for these programs, but instead only provided the number of activities. We used $40 for the Appliance Recycling and $13.47 for the Residential Mail-in Audit Programs component of HEES. The latter value represents the average cost for SCE for these services.

2.4 Geo-locating the Participant Addresses

The next step in the methodology is to locate the exact latitude and longitude of each participant based on the home address. We were able to use different approaches for locating addresses. Many of the addresses pulled from customer records contain the latitude and longitude and these were used directly. A second option was to use the zip +4 codes to locate households. The zip +4 code represents a small street segment or segments all of which are contained within the same Census Block. Since our analysis is being performed at the higher order Census Block-group level, identifying the correct Block is all that is needed. We obtained a list from Sammanish Data System, Inc. of Bellevue, WA of California zip +4 centroids. These centroids identify the central point of each zip +4 code and that latitude and longitude was used as the location for each household within that zip +4 code.

Approximately one-third of the addresses we received had neither the latitude and longitude, nor the zip +4. For these addresses, we used the geo-location routine contained in ESRI's ArcView software and the 2004 California Street Atlas provided by ESRI. This geo-location routine tries to locate automatically the exact street segment and the correct side of the street by finding the provided street address among the Street Atlas database. When located, the routine enters the latitude and longitude into the database. After an automatic pass through the address list, the routine allows a manual examination of the address. This manual pass usually will catch typos, miss-spellings, and unrecognized street abbreviations. For this study, to accept an address using the manual geo-location routine, the address and city or the address and zip code needed to match.

The entire geo-coding process was able to locate virtually all of the addresses provided. Tables 2-2 through 2-5 provide the results of the geo-coding. For all of the programs, except ESNHP and LIEE, we were able to locate more than 98% of the households in the databases. The new construction data that were available proved to create problems for the geo-location routine. Many of the records did not have the real street address, but instead the builder's lot designation. In other cases, the street was so new as to not yet be in the database. The LIEE data received from SDG&E were not filtered through their customer information system, sometimes contained street directions (corner of 5th and Main), and not addresses with street numbers, which the geo-coder routine requires.

Table 2-2: Percent of Rebate Dollars Correctly Geo-located: PG&E

Program	Year	Total Dollars Rebates (events)	Dollars (Events Geocoded	Percent of Total Geocoded
Residential Appliance Recycling Program (RARP)	2002	599,360.00	$597,240.00	99.65%
Residential Appliance Recycling Program (RARP)	2003	493,280.00	$491,280.00	99.59%
Home Energy Efficiency Survey (HEES)	2002	368,672.15	$367,689.13	99.73%
Home Energy Efficiency Survey (HEES)	2003	582,337.17	$581,017.50	99.77%
Statewide Multi-Family Rebate Program (MFRP)	2002	$1,062,566.60	$1,008,014.60	94.87%
Statewide Multi-Family Rebate Program (MFRP)	2003	$3,428,754.05	$3,416,314.05	99.64%
Statewide Energy Star New Homes Program (ESNHP)	2002	$5,426,671.70	$1,220,250.00	22.49%
Statewide Energy Star New Homes Program (ESNHP)	2003	$1,667,250.00	$1,667,250.00	100.00%
Statewide Single Family Residential Rebate Program (SFEER)	2002	$5,408,323.24	$5,312,845.31	98.23%
Statewide Single Family Residential Rebate Program (SFEER)	2003	$10,615,521.54	$10,407,405.69	98.04%

Table 2-3: Percent of Rebate Dollars Correctly Geo-located: SCE

Program	Year	Total Dollars Rebates (events)	Dollars (Events Geocoded	Percent of Total Geocoded
Residential Appliance Recycling Program (RARP)	2002	$972,930.00	$966,875.00	99.38%
Residential Appliance Recycling Program (RARP)	2003	$1,194,305.00	$1,186,675.00	99.36%
Home Energy Efficiency Survey (HEES) Home	2002	$397,971.05	$395,345.31	99.34%
Home Energy Efficiency Survey (HEES) Home	2003	$410,363.91	$406,101.97	98.96%
Home Energy Efficiency Survey (HEES) Mail-in	2002	$318,355.92	$315,098.60	98.98%
Home Energy Efficiency Survey (HEES) Mail-in	2003	$347,914.08	$345,020.18	99.17%
Home Energy Efficiency Survey (HEES) Online	2002	$182,233.20	$180,580.80	99.09%
Home Energy Efficiency Survey (HEES) Online	2003	$84,456.00	$83,640.00	99.03%
Statewide Multi-Family Rebate Program (MFRP)	2002	$1,125,363.69	$1,100,299.69	97.77%
Statewide Multi-Family Rebate Program (MFRP)	2003	$1,659,893.49	$1,630,555.99	98.23%
Statewide Single Family Residential Rebate Program (SFEER)	2002	$3,278,927.55	$3,260,507.56	99.44%
Statewide Single Family Residential Rebate Program (SFEER)	2003	$5,108,086.11	$5,078,794.11	99.43%

Table 2-4: Percent of Rebate Dollars Correctly Geo-located: SCG

Program	Year	Total Dollars Rebates (events)	Dollars (Events Geocoded	Percent of Total Not Geocoded
Statewide Multi-Family Rebate Program (MFRP)	2002	$530,681.85	$522,981.85	98.55%
Statewide Multi-Family Rebate Program (MFRP)	2003	$1,209,242.50	$1,166,121.25	96.43%
Statewide Single Family Residential Rebate Program (SFEER)	2002	$2,835,549.90	$2,796,181.65	98.61%
Statewide Single Family Residential Rebate Program (SFEER)	2003	$3,272,029.85	$3,136,488.25	95.86%

Table 2-5: Percent of Rebate Dollars Correctly Geo-located: SDG&E

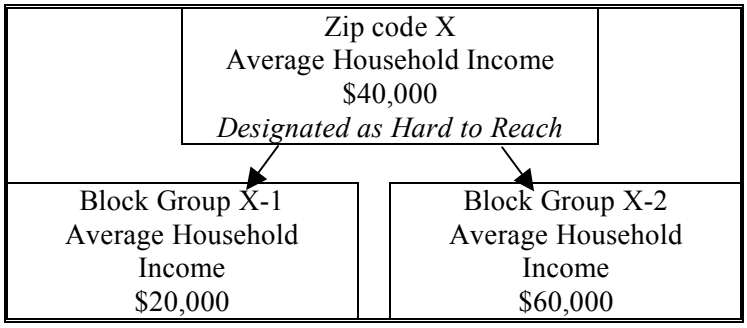
Program	Year	Total Dollars Rebates (events)	Dollars (Events Geocoded	Percent of Total Not Geocoded
Low-Income Energy Efficiency (LIEE)	2002	$11,306,198.57	$9,220,217.72	81.55%
Low-Income Energy Efficiency (LIEE)	2003	$11,808,953.09	$9,258,756.18	78.40%
Statewide Multi-Family Rebate Program (MFRP)	2002	$1,455,235.69	$1,455,235.69	100.00%
Statewide Multi-Family Rebate Program (MFRP)	2003	$2,198,784.25	$2,195,784.25	99.86%
Statewide Energy Star New Homes Program (ESNHP)	2002	$75,690.00	$38,640.00	51.05%
Statewide Single Family Residential Rebate Program (SFEER)	2003	$3,034,766.29	$2,978,421.74	98.14%
Statewide Single Family Residential Rebate Program (SFEER)	2002	$3,125,533.59	$3,000,284.89	95.99%

2.5 Attaching Census Data to Each Participant's Address

The next step in the process is to attach the underlying Census information on housing type, racial make-up, language spoken in the home, rural designation, and income to each participant. This process identifies the Census-Block-group associated with the address's latitude and longitude coordinates. Finally, the participants are assumed to have a distribution of characteristics equivalent to the characteristics of the block-group. If 25% of the block-group is moderate income, it is assumed that 25% of the participants from that block-group are moderate income. We make this assignment mindful that we are committing a potential application of ecological fallacy.

Ecological fallacy occurs when an analyst makes an inference about an individual based on aggregate data for a group. Figure 2-1 illustrates the issue, where the zip code average household income is $40,000. It is a misinterpretation of the data to assume that all households have a $40,000 income. In this case, a look at the block-group data shows that the zip code contains one area with only a $20,000 per household average income and another area with average household incomes of $60,000.

Figure 2-1: An Example of Ecological Fallacy



2.5.1 The Use of Block-Group as the Unit of Analysis

The US Census has established the block group as a set of homogenous blocks all of which are contained within the same census tract. There are generally about 600 to 3000 people in a block-group with 1500 persons being the optimal size. In our past analysis for the MFRP evaluation, we used the larger Census Tract as the unit of measure. There are normally 2500 to 8000 persons in census tract. The use of block-groups adds more precision to our analysis and more homogeneity when characterizing persons from the block-group average conditions. There are a little more than 22,000 block-groups in California.

2.5.2 Acquisition of the Census Data

Census data were obtained from a variety of sources. Most of the 2000 data that were needed was prepared by Applied Geographic Solutions. In addition, they provided 2004 estimates of housing numbers and composition to reflect changes in California since the census in 2000. Finally, Athens Research annually prepares for the utilities estimates of the number of low and moderate-income households by block-group. The Athens data also includes a designation for each block-group on the percent of households that are in rural areas.

2.5.3 Combining the Participant and Census Information

The third step in the process is to aggregate the individual participants in each program into totals for each block-group. We can then total across programs for each utility by year and for the two years combined. Because the block-groups are of different sizes, we express all rebate amounts as the rebate dollars per household. The analysis phase takes these dollar rebate per household values for each block-group and addresses the research questions raised in the Introduction.

2.6 Methodology Issues and Limitations

This report is the first attempt to assemble and analyze all of the California Energy Efficiency residential programs as a portfolio. It suffers from some missing data issues, and some weaknesses in the study approach. While the analysis does produce some important

findings, the limitations temper our ability to state definitive findings. Before presenting any results, the authors want to alert the readers to the study's issues and limitations.

The biggest limitation of this study results from missing data. Ideally, the study wanted to track every dollar of PGC funded rebate obtained by residential customers. The study did not achieve this objective. Data were only obtained for five residential programs (of which one was a non-rebate, education and information program) and one low-income program where address data are collected. None of the other statewide programs and none of the local programs run by third parties contributed data to this study. Either these programs do not have participant data available or the data does not contain an address to which to assign the participant. For example, the Lighting Upstream rebate is an in-store coupon for which only the redeemer's zip code is collected. Many other programs do not provide direct benefits to only one household.

This study is limited to the five statewide programs for which participant data are routinely collected; and even then, the study is missing most of the residential new construction program results and a few other data sets from the Residential Appliance Recycling and Home Energy Efficiency Survey[6] programs. In addition, only one utility provided data from the Low-Income Energy Efficiency (LIEE) program. While this is technically separate from the Energy Efficiency initiatives, the funds do flow to residential households. We cannot easily separate out the low-income households from the Census information, so the results are more informative when we also include the distribution of LIEE funds.

There is a second limitation to this study that we want all readers to appreciate in interpreting the results. Even though we have moved from an analysis based on the large zip code to the smaller block-group, we still are subject to the ecological fallacy problem. The Census Bureau selects Census block-groups to represent as homogeneous of population as possible. In this respect, the Census block-groups are far more homogeneous than the zip codes previously used to define HTR-designated areas. Even so, the values are the composite values of each Census-block, and not the actual characteristics of the participants.

We recognize this by expressing results as probabilities and not absolutes. For example, if there are five participants in a block-group with 500 households and 80% of these households are non-English speaking, the straight odds are that four of these participants are non-English speaking. Of course, this approach fails if there are true program barriers that make it more unlikely that non-English speakers are able and/or willing to participate. Only calls to individual participants can reveal that information within the block-group. However, based on probability, the study can confirm broad trends across all the block-groups, if those trends are pronounced.

The study is also limited in that the Census does not provide full cross-tabulations of all characteristics at the block-group level. The Census data can tell us what percentage of a block-group is non-English speaking and what percentage is renters. The Census data cannot tell us what percentage are simultaneously both non-English speaking and a renter. Because

[6] The Home Energy Efficiency Survey does not provide a financial rebate, but the service directly benefits a single household. The dollar figure used in this project reflects the cost of providing that service.

the five HTR characteristics are highly correlated, it is inaccurate to assume that multiple characteristics are proportionally distributed, yet there is no alternative when addressing multiple characteristics simultaneously. Accordingly, we are accurate when considering on e variable at a time, but much less so when combining characteristics.

3 Assessment of How Well Are the Hard-To-Reach (HTR) Communities Being Served?

3.1 Percentile Group Analysis

To answer this first question, we create percentiles categorized by the five HTR segments and measure the average rebate dollars per household across the different percentiles. These results are shown in the Tables 3-1 through Table 3-20. For example in Table 3-1, which shows the distribution of incentive dollars across non-English speaking household percentages in PG&E, we order each PG&E block-group from the block-group with the lowest percentage of non-English speaking households to the block-group with the highest percentage of non-English speaking households. We next group the block-groups into percentiles with cut-offs at the following:

- Percentile Group 1 –containing the 10% of block-groups with the lowest percentages of non-English speaking households. (In the PG&E's case, this percentile group includes all block-groups with non-English speaking percentages between 0% and 10.2% non-English speaking).
- Percentile Group 2 –containing the next 15% of Block-groups from the 10th to 25th percentile of block-groups with progressively higher non-English speaking percentages. (In the PG&E's case, this percentile group includes all block-groups with non-English speaking percentages between 10.2% and 16.7% non-English speaking).
- Percentile Group 3 –containing the next 25% of Block-groups from the 25th to 50th percentile of block-groups with progressively higher non-English speaking percentages. (In the PG&E's case, this percentile group includes all block-groups with non-English speaking percentages between 16.7% and 26.8% non-English speaking).
- Percentile Group 4 –containing the next 25% of Block-groups from the 50th to 75th percentile of block-groups with progressively higher non-English speaking percentages. (In the PG&E's case, this percentile group includes all block-groups with non-English speaking percentages between 26.8% and 43.5% non-English speaking).
- Percentile Group 5 –containing the next 15% of Block-groups from the 75th to 90th percentile of block-groups with progressively higher non-English speaking percentages. (In the PG&E's case, this percentile group includes all block-groups with non-English speaking percentages between 43.5% and 62.5% non-English speaking).
- Percentile Group 6 –containing the last 10% of Block-groups with the highest percentages of non-English speaking households. (In the PG&E's case, this percentile group includes all block-groups with non-English speaking percentages over 62.5%).

Table 3-1: The Distribution of 2003 Incentives across Percent Non-English Speaking Percentiles: PG&E

Percentiles by Percent of Households that Are Non-English Speaking (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Residential New Construction 2003	Appliance Recycling Program 2003	Mail in Audit 2003	Total Five Residential Programs 2003
Average all Block-groups	$0.50	$2.01	$0.34	$0.10	$0.12	$3.07
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Non-English Speaking (<10.2% Non-English Speaking)	$0.04	$2.01	$0.98	$0.07	$0.25	$3.35
Percentile Group 2: 10 to 25% (10.2% to 16.7% Non-English Speaking)	$0.04	$2.41	$0.13	$0.08	$0.18	$2.83
Percentile Group 3: 25 to 50% (16.7% to 26.8% Non-English Speaking)	$0.36	$2.58	$0.20	$0.10	$0.08	$3.31
Percentile Group 4: 50 to 75% (26.8% to 43.5% Non-English Speaking)	$0.90	$2.03	$0.44	$0.12	$0.11	$3.59
Percentile Group 5: 75 to 90% (43.5% to 62.5% Non-English Speaking)	$0.79	$1.40	$0.34	$0.12	$0.08	$2.73
Percentile Group 6: 10% of Block-groups with Highest Percentage of Non-English Speaking (>62.5% Non-English Speaking)	$0.54	$0.97	$0.16	$0.11	$0.12	$1.89

Tables 3-1 to 3-4 show the distribution of rebates funds across the non-English speaking percentile groups. The situation in Table 3-1 for PG&E is that most of the percentile groups are receiving on average similar amounts of funds per household. It is only the Percentile Group 6, which represents the group with the most non-English speakers who receive substantially less than the other groups. In Table 3-3 for SCG, we find a similar pattern. In contrast, in Tables 3-2 (SCE) and 3-4 (SDG&E), Percentile Group 6 receives on average the highest funding.

The high funding for Percentile Group 6 in Tables 3-2 and 3-4 is the result of large activity by the MFRP within Percentile Group 6. This illustrates an important trend that is seen in all of the subsequent tables. Each program attracts different sets of customers. The SFEER appears to be more utilized in block-groups with more English speaking households. This, may be because these household also generally are more likely to be homeowners of moderate and higher incomes. By contrast, the MFRP increases as one moves from Percentile Group 1 to Percentile Group 6.

Table 3-2: The Distribution of 2003 Incentives across Percent Non-English Speaking Percentiles: SCE

Percentiles by Percent of Households that Are Non-English Speaking (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Appliance Recycling Program 2003	Home/ Mail/ Online in Audit 2003	Total Four Residential Programs 2003
Average all Block-groups	$0.58	$1.04	$0.32	$0.40	$2.34
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Non-English Speaking (<14.4% Non-English Speaking)	$0.38	$1.52	$0.25	$0.41	$2.56
Percentile Group 2: 10 to 25% (14.4% to 22.7% Non-English Speaking)	$0.20	$1.63	$0.27	$0.37	$2.47
Percentile Group 3: 25 to 50% (22.7% to 37.3% Non-English Speaking)	$0.34	$1.41	$0.32	$0.35	$2.42
Percentile Group 4: 50 to 75% (37.3% to 60.1% Non-English Speaking)	$0.29	$0.83	$0.29	$0.38	$1.78
Percentile Group 5: 75 to 90% (60.1% to 81% Non-English Speaking)	$0.26	$0.53	$0.32	$0.45	$1.56
Percentile Group 6: 10% of Block-groups with Highest Percentage of Non-English Speaking (>81% Non-English Speaking)	$3.26	$0.15	$0.34	$0.67	$4.41

Table 3-3: The Distribution of 2003 Incentives across Percent Non-English Speaking Percentiles: SCG

Percentiles by Percent of Households that Are Non-English Speaking (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Total Two Residential Programs 2003
Average all Block-groups	$0.13	$0.36	$0.49
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Non-English Speaking (<14.7% Non-English Speaking)	$0.31	$0.37	$0.68
Percentile Group 2: 10 to 25% (14.7% to 23.1% Non-English Speaking)	$0.07	$0.49	$0.56
Percentile Group 3: 25 to 50% (23.1% to 37.9% Non-English Speaking)	$0.15	$0.49	$0.63
Percentile Group 4: 50 to 75% (37.9% to 60.7% Non-English Speaking)	$0.15	$0.34	$0.49
Percentile Group 5: 75 to 90% (60.7% to 81.1% Non-English Speaking)	$0.11	$0.20	$0.31
Percentile Group 6: 10% of Block-groups with Highest Percentage of Non-English Speaking (>81.1% Non-English Speaking)	$0.03	$0.11	$0.14

Table 3.4: The Distribution of 2003 Incentives across Percent Non-English Speaking Percentiles: SDG&E

Percentiles by Percent of Households that Are Non-English Speaking (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Low Income Energy Efficiency 2003	Total Three Residential Programs 2003
Average all Block-groups	$1.69	$2.68	$10.66	$15.04
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Non-English Speaking (<12.9% Non-English Speaking)	$0.33	$3.57	$6.35	$10.25
Percentile Group 2: 10 to 25% (12.9% to 18% Non-English Speaking)	$1.34	$3.40	$5.10	$9.84
Percentile Group 3: 25 to 50% (18% to 26.6% Non-English Speaking)	$0.51	$3.39	$6.96	$10.87
Percentile Group 4: 50 to 75% (26.6% to 43.9% Non-English Speaking)	$2.85	$2.44	$8.12	$13.40
Percentile Group 5: 75 to 90% (43.9% to 66.7% Non-English Speaking)	$1.94	$1.75	$17.72	$21.41
Percentile Group 6: 10% of Block-groups with Highest Percentage of Non-English Speaking (>66.7% Non-English Speaking)	$3.18	$0.97	$28.35	$32.50

Tables 3-5 to 3-8 show the distribution of funds across renter percentiles and Tables 3-9 to 3-12 show a similar pattern for the percentage of multi-family and mobile homes. In general, the patterns are similar to the non-English speaking tables. It seems logical that the more multi-family households present, the more funds distributed by the MFRP and the less funds distributed by the SFEER. Keen observers may question how it is that areas with no multi-family or mobile home housing have received funds from the MFRP. This occurs because the MFRP's and the Census's definition of multi-family differ slightly.

Table 3-5: The Distribution of 2003 Incentives across Percent Renter Percentiles: PG&E

Percentiles by Percent of Households that Are Renters (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Residential New Construction 2003	Appliance Recycling Program 2003	Mail in Audit 2003	Total Five Residential Programs 2003
Average all Block-groups	$0.50	$2.01	$0.34	$0.10	$0.12	$3.07
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Renters (<10% Renters)	$0.00	$4.49	$1.02	$0.13	$0.15	$5.80
Percentile Group 2: 10 to 25% (10% to 19% Renters)	$0.03	$3.19	$0.08	$0.12	$0.13	$3.54
Percentile Group 3: 25 to 50% (19% to 35% Renters)	$0.24	$2.15	$0.12	$0.09	$0.14	$2.73
Percentile Group 4: 50 to 75% (35% to 56% Renters)	$0.44	$1.53	$0.07	$0.09	$0.11	$2.23
Percentile Group 5: 75 to 90% (56% to 76% Renters)	$1.11	$0.93	$0.78	$0.09	$0.00	$3.01
Percentile Group 6: 10% of Block-groups with Highest Percentage of Renters (>76% Renters)	$1.77	$0.39	$0.86	$0.08	$0.00	$3.18

Table 3-6: The Distribution of 2003 Incentives across Percent Renters Percentiles: SCE

Percentiles by Percent of Households that Are Renters (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Appliance Recycling Program 2003	Home/ Mail/ Online in Audit 2003	Total Four Residential Programs 2003
Average all Block-groups	$0.58	$1.04	$0.32	$0.40	$2.34
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Renters (<9% Renters)	$0.03	$2.66	$0.39	$0.35	$3.43
Percentile Group 2: 10 to 25% (9% to 16% Renters)	$0.02	$1.80	$0.32	$0.20	$2.34
Percentile Group 3: 25 to 50% (16% to 33% Renters)	$0.08	$1.20	$0.29	$0.20	$1.76
Percentile Group 4: 50 to 75% (33% to 59% Renters)	$0.39	$0.63	$0.25	$0.13	$1.41
Percentile Group 5: 75 to 90% (59% to 78% Renters)	$0.46	$0.24	$0.22	$0.13	$1.05
Percentile Group 6: 10% of Block-groups with Highest Percentage of Renters (>78% Renters)	$4.00	$0.06	$0.31	$0.10	$4.48

Table 3-7: The Distribution of 2003 Incentives across Percent Renters Percentiles: SCG

Percentiles by Percent of Households that Are Renters (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Total Two Residential Programs 2003
Average all Block-groups	$0.13	$0.36	$0.49
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Renters (<9% Renters)	$0.00	$1.04	$1.04
Percentile Group 2: 10 to 25% (9 to 17.25% Renters)	$0.02	$0.59	$0.61
Percentile Group 3: 25 to 50% (17.25% to 37% Renters)	$0.06	$0.36	$0.41
Percentile Group 4: 50 to 75% (37% to 64% Renters)	$0.22	$0.24	$0.46
Percentile Group 5: 75 to 90% (64% to 83% Renters)	$0.15	$0.13	$0.28
Percentile Group 6: 10% of Block-groups with Highest Percentage of Renters (>83% Renters)	$0.34	$0.05	$0.39

Table 3.8: The Distribution of 2003 Incentives across Percent Renters Percentiles: SDG&E

Percentiles by Percent of Households that Are Renters (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Low Income Energy Efficiency 2003	Total Three Residential Programs 2003
Average all Block-groups	$1.69	$2.68	$10.66	$15.04
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Renters (<9% Renters)	$0.39	$6.13	$2.50	$9.01
Percentile Group 2: 10 to 25% (9% to 15% Renters)	$0.93	$4.32	$5.73	$10.98
Percentile Group 3: 25 to 50% (15% to 35% Renters)	$0.70	$3.09	$6.34	$10.13
Percentile Group 4: 50 to 75% (35% to 67% Renters)	$2.99	$1.84	$9.87	$14.70
Percentile Group 5: 75 to 90% (67% to 84% Renters)	$2.46	$0.95	$14.19	$17.61
Percentile Group 6: 10% of Block-groups with Highest Percentage of Renters (>84% Renters)	$2.60	$0.40	$15.40	$18.39

Table 3-9: The Distribution of 2003 Incentives across Percent Multi-Family and Mobile Homes Percentiles: PG&E

Percentiles by Percent of Households that Are Multi-Family and Mobile Homes (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Residential New Construction 2003	Appliance Recycling Program 2003	Mail in Audit 2003	Total Five Residential Programs 2003
Average all Block-groups	$0.50	$2.01	$0.34	$0.10	$0.12	$3.07
Percentile Group 1: 10% of Block-groups with the Lowest Percentage of Multi-Family and Mobile Homes (0 Multi-Family and Mobile Homes)	$0.05	$3.46	$0.00	$0.10	$0.09	$3.71
Percentile Group 2: 10 to 25% (0 to 2% Multi-Family and Mobile Homes)	$0.04	$3.05	$0.27	$0.09	$0.05	$3.50
Percentile Group 3: 25 to 50% (2% to 12% Multi-Family and Mobile Homes)	$0.13	$2.14	$0.12	$0.09	$0.14	$2.63
Percentile Group 4: 50 to 75% (12% to 31% Multi-Family and Mobile Homes)	$0.56	$1.65	$0.39	$0.12	$0.16	$2.88
Percentile Group 5: 75 to 90% (31% to 53% Multi-Family and Mobile Homes)	$0.75	$1.17	$0.27	$0.07	$0.08	$2.35
Percentile Group 6: 10% of Block-groups with Highest Percentage of Multi-Family and Mobile Homes (>53% Multi-Family and Mobile Homes)	$1.55	$0.56	$1.70	$0.10	$0.08	$3.99

Table 3-10: The Distribution of 2003 Incentives across Percent Multi-Family and Mobile Homes Percentiles: SCE

Percentiles by Percent of Households that Are Multi-Family and Mobile Homes (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Appliance Recycling Program 2003	Home/ Mail/ Online in Audit 2003	Total Four Residential Programs 2003
Average all Block-groups	$0.58	$1.04	$0.32	$0.40	$2.34
Percentile Group 1: 10% of Block-groups with Lowest Percentage of Multi-Family and Mobile Homes (0 Multi-Family and Mobile Homes)	$0.00	$1.77	$0.37	$0.25	$2.39
Percentile Group 2: 10 to 25% (>0% to 1% Multi-Family and Mobile Homes)	$0.18	$1.61	$0.33	$0.22	$2.34
Percentile Group 3: 25 to 50% (1% to 11% Multi-Family and Mobile Homes)	$0.12	$1.21	$0.29	$0.17	$1.78
Percentile Group 4: 50 to 75% (11% to 35% Multi-Family and Mobile Homes)	$0.31	$0.75	$0.27	$0.16	$1.49
Percentile Group 5: 75 to 90% (35% to 60% Multi-Family and Mobile Homes)	$0.65	$0.50	$0.20	$0.15	$1.50
Percentile Group 6: 10% of Block-groups with Highest Percentage of Multi-Family and Mobile Homes (>60% Multi-Family and Mobile Homes)	$1.03	$0.24	$0.23	$0.11	$1.61

Table 3-11: The Distribution of 2003 Incentives across Percent Multi-Family and Mobile Homes Percentiles: SCG

Percentiles by Percent of Households that Are Multi-Family and Mobile Homes (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Total Two Residential Programs 2003
Average all Block-groups	$0.13	$0.36	$0.49
Percentile Group 1: 10% of Block-groups with Lowest Percentage of Multi-Family and Mobile Homes (0 Multi-Family and Mobile Homes)	$0.15	$0.68	$0.83
Percentile Group 2: 10 to 25% (>0 to 2% Multi-Family and Mobile Homes)	$0.03	$0.55	$0.58
Percentile Group 3: 25 to 50% (2% to 14% Multi-Family and Mobile Homes)	$0.03	$0.36	$0.38
Percentile Group 4: 50 to 75% (14% to 39% Multi-Family and Mobile Homes)	$0.10	$0.28	$0.38
Percentile Group 5: 75 to 90% (39% to 65% Multi-Family and Mobile Homes)	$0.21	$0.19	$0.40
Percentile Group 6: 10% of Block-groups with Highest Percentage of Multi-Family and Mobile Homes (>65% Multi-Family and Mobile Homes)	$0.37	$0.08	$0.44

Table 3.12: The Distribution of 2003 Incentives across Percent Multi-Family and Mobile Homes Percentiles: SDG&E

Percentiles by Percent of Households that Are Multi-Family and Mobile Homes (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Low Income Energy Efficiency 2003	Total Three Residential Programs 2003
Average all Block-groups	$1.69	$2.68	$10.66	$15.04
Percentile Group 1: 10% of Block-groups with Lowest Percentage of Multi-Family and Mobile Homes 0 Multi-Family and Mobile Homes)	$0.81	$4.86	$4.52	$10.20
Percentile Group 2: 10 to 25% (>0 to 2% Multi-Family and Mobile Homes)	$0.00	$3.31	$3.73	$7.04
Percentile Group 3: 25 to 50% (2% to 18% Multi-Family and Mobile Homes)	$0.55	$2.94	$9.15	$12.64
Percentile Group 4: 50 to 75% (18% to 47% Multi-Family and Mobile Homes)	$1.68	$2.11	$9.87	$13.66
Percentile Group 5: 75 to 90% (47% to 69% Multi-Family and Mobile Homes)	$3.30	$1.18	$13.50	$17.97
Percentile Group 6: 10% of Block-groups with Highest Percentage of Multi-Family and Mobile Homes (>69% Multi-Family and Mobile Homes)	$4.98	$0.72	$11.13	$16.84

Tables 3.13 through 3.16 show a similar pattern for the moderate-income characteristic.

Table 3-13: The Distribution of 2003 Incentives across Percent Moderate Income Percentiles: PG&E

Percentiles by Percent of Households that Are Moderate Income (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Residential New Construction 2003	Appliance Recycling Program 2003	Mail in Audit 2003	Total Five Residential Programs 2003
Average all Block-groups	$0.50	$2.01	$0.34	$0.10	$0.12	$3.07
Percentile Group 1: 10% of Block-groups with Lowest Percentage of Moderate Income (<22.5% Moderate Income)	$0.18	$3.62	$0.00	$0.17	$0.03	$4.00
Percentile Group 2: 10 to 25% (22.5% to 27.6% Moderate Income)	$0.32	$2.48	$0.00	$0.17	$0.03	$3.01
Percentile Group 3: 25 to 50% (27.6% to 33.3% Moderate Income)	$0.89	$1.82	$0.00	$0.14	$0.04	$2.89
Percentile Group 4: 50 to 75% (33.3% to 37.4% Moderate Income)	$0.49	$1.73	$0.00	$0.13	$0.07	$2.42
Percentile Group 5: 75 to 90% (37.4% to 40.4% Moderate Income)	$0.30	$1.51	$0.00	$0.12	$0.11	$2.04
Percentile Group 6: 10% of Block-groups with Highest Percentage of Moderate Income (>40.4% Moderate Income)	$0.38	$1.67	$0.00	$0.07	$0.17	$2.29

Table 3-14: The Distribution of 2003 Incentives across Percent Moderate Income Percentiles: SCE

Percentiles by Percent of Households that Are Moderate Income (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Appliance Recycling Program 2003	Home/ Mail/ Online in Audit 2003	Total Four Residential Programs 2003
Average all Block-groups	$0.58	$1.04	$0.32	$0.40	$2.34
Percentile Group 1: 10% of Block-groups with Lowest Percentage of Moderate Income (<26.4% Moderate Income)	0.06	1.72	0.37	0.56	$2.71
Percentile Group 2: 10 to 25% (26.4% to 30.4% Moderate Income)	0.06	1.72	0.37	0.56	$2.71
Percentile Group 3: 25 to 50% (30.4% to 34.3% Moderate Income)	0.11	1.60	0.32	0.43	$2.46
Percentile Group 4: 50 to 75% (34.3% to 37.4% Moderate Income)	0.18	1.29	0.31	0.41	$2.19
Percentile Group 5: 75 to 90% (37.4% to 39.9% Moderate Income)	0.24	1.13	0.32	0.40	$2.08
Percentile Group 6: 10% of Block-groups with Highest Percentage of Moderate Income (>39.9% Moderate Income)	3.38	0.83	0.32	0.47	$5.00

Table 3-15: The Distribution of 2003 Incentives across Percent Moderate Income Percentiles: SCG

Percentiles by Percent of Households that Are Moderate Income (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Total Two Residential Programs 2003
Average all Block-groups	$0.13	$0.36	$0.49
Percentile Group 1: 10% of Block-groups with Lowest Percentage of Moderate Income (<25.1% Moderate Income)	$0.11	$0.48	$0.59
Percentile Group 2: 10 to 25% (25.1% to 29.5% Moderate Income)	$0.09	$0.64	$0.73
Percentile Group 3: 25 to 50% (29.5% to 33.7% Moderate Income)	$0.19	$0.39	$0.58
Percentile Group 4: 50 to 75% (33.7% to 36.9% Moderate Income)	$0.08	$0.28	$0.35
Percentile Group 5: 75 to 90% (36.9% to 39.6% Moderate Income)	$0.15	$0.22	$0.36
Percentile Group 6: 10% of Block-groups with Highest Percentage of Moderate Income (>39.6% Moderate Income)	$0.19	$0.19	$0.37

Table 3-16: The Distribution of 2003 Incentives across Percent Moderate Income Percentiles: SDG&E

Percentiles by Percent of Households that Are Moderate Income (range of values)	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Low Income Energy Efficiency 2003	Total Three Residential Programs 2003
Average all Block-groups	$1.69	$2.67	$11.09	$15.45
Percentile Group 1: 10% of Block-groups with Lowest Percentage of Moderate Income (<27.8% Moderate Income)	$0.71	$4.79	$6.88	$12.38
Percentile Group 2: 10 to 25% (27.8% to 31.4% Moderate Income)	$0.85	$3.47	$10.45	$14.76
Percentile Group 3: 25 to 50% (31.4% to 35.2% Moderate Income)	$1.00	$2.67	$10.35	$14.02
Percentile Group 4: 50 to 75% (35.2% to 38.2% Moderate Income)	$2.13	$2.27	$12.56	$16.96
Percentile Group 5: 75 to 90% (38.2% to 40.4% Moderate Income)	$1.71	$1.78	$13.17	$16.67
Percentile Group 6: 10% of Block-groups with Highest Percentage of Moderate Income (>40.4% Moderate Income)	$4.45	$1.70	$11.33	$17.48

The final HTR criterion is that of rural households. We use the data supplied by Athens Research to define rural. This designation measures the percent of households in the block-group that meet the rural definition. Because the vast majority of block-groups (82% in PG&E, 91% in SCE and SCG and, 93% in SDG&E) in each utility are 100% urban, that is they have less than .01 percent of the households designated as rural, we do not establish the same Percentile Groups as in the analysis of the previous HTR household characteristics. For the rural case, we look at funds distributions across the actual rural percent.

As Table 3-17 to Table 3-20 show, PG&E, SCG, and SDG&E distributed a higher average rebate amount to the households in urban areas as opposed the average rebate amount distributed to households in rural areas. The distribution is more evenly balanced for SCE block-groups. A major factor in the unequal distribution is the fact that the MFRP does not reach the block-groups considered rural. This reflects the fact that rural areas have little multi-family housing to begin with.

Table 3-17: The Distribution of 2003 Incentives across Rural Percentiles: PG&E

	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Residential New Construction 2003	Appliance Recycling Program 2003	Mail in Audit 2003	Total Five Residential Programs 2003
Average all Block-groups	$0.50	$2.01	$0.34	$0.10	$0.12	$3.07
Block-Groups Less Than 0.01% Rural (82% of Block-groups)	$0.61	$2.04	$0.44	$0.12	$0.09	$3.30
Block-groups Between 0.01% And 100% Rural (18% of Block-groups)	$0.11	$1.45	$0.03	$0.11	$0.15	$1.85

Table 3-18: The Distribution of 2003 Incentives across Rural Percentiles: SCE

	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Appliance Recycling Program 2003	Home/ Mail/ Online in Audit 2003	Total Four Residential Programs 2003
Average all Block-groups	$0.58	$1.04	$0.32	$0.40	$2.34
Block-Groups Less Than 0.01% Rural (91% of Block-groups)	$0.63	$1.03	$0.31	$0.38	$2.35
Block-groups Between 0.01% And 100% Rural (9% of Block-groups)	$0.06	$1.16	$0.39	$0.68	$2.28

Table 3-19: The Distribution of 2003 Incentives across Rural Percentiles: SCG

	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Total Two Residential Programs 2003
Average all Block-groups	$0.13	$0.36	$0.49
Block-Groups Less Than 0.01% Rural (91% of Block-groups)	$0.15	$0.38	$0.52
Block-groups Between 0.01% And 100% Rural (9% of Block-groups)	$0.03	$0.26	$0.29

Table 3-20: The Distribution of 2003 Incentives across Rural Percentiles: SDG&E

	Multi-Family Rebate Program 2003	Single Family Rebate Program 2003	Low Income Energy Efficiency 2003	Total Three Residential Programs 2003
Average all Block-groups	$1.69	$2.63	$10.63	$14.95
Block-Groups Less Than 0.01% Rural (93% of Block-groups)	$1.83	$2.48	$11.85	$16.17
Block-groups Between 0.01% And 100% Rural (7% of Block-groups)	$0.26	$3.50	$6.55	$10.31

The analysis presented above gives an overall assessment of where PGC funds have been distributed in 2003 across the five main statewide energy efficiency programs. The analysis suffers from a number of weaknesses stemming from participation data unavailability and limitations in the use of the background census data. We discuss two of the most important weaknesses in this section. The areas to be discussed include:

- The influence of missing participation data, especially the new construction program.
- The inclusion of low-income households in the analysis.

3.2 The Influence of Missing Participation Data

The results in Table 3-1 thru 3-20 include all of the participation data that were made available to us by the utilities. Yet, this total represents only the rebate amounts for the five statewide programs that distribute PGC benefits in direct monetary terms in the form of incentives or free Home Energy Efficiency Surveys to an identifiable household. In addition, there are other programs, statewide and local, that distribute benefits to households or to specific geographic areas not directly observable by the households. It cannot be determine how exactly these benefits are distributed to every household across the service territories.

There is whole class of programs, both statewide and local, and non-utility third party programs that do not have identifiable participants. Included in this list are programs that provided financial incentive upstream and/or have a Point-of- Sale nature that prohibits the ability to capture individual households' information so that we can determine the recipients of these benefits. In other cases, such as non-utility third party program, the individual household data are simply not accessible. If the CPUC feels it important to include all programs into this type of analysis, then, where possible, data needs to be captured and made available and accessible for this type of analysis. Including such data in this analysis would require determining the area or characteristic of households that were affected by the program and distributing those benefits over all affected households. Including these issues in an analysis would extend the analysis beyond the five included programs and closer to an assessment of the entire mix of PGC-residential funds.

Not all of the data for the five specified programs was made available for this analysis. Of the $75 million spent in 2003 for these five programs by the four utilities, only 47% of the expenditures have been included in the analysis tables and maps. There are several reasons why 53% of 2003 expenditures are not included. We estimate that half of the 53% that is not included represents administrative costs of these programs, and the other half is from the missing data from SDG&E and the ESNHP program.

Not having the new home construction data is a major weakness to this analysis, but one that is not easily remedied. ESNHP represents about 25% of the four utilities' combined total expenditures for the five analyzed programs in 2003. For 2003, we have included only $1.6 million in rebates, all from PG&E.

From the locations that we do have we can try to characterize where the new construction program funds tend to go. It is clear that the benefits from ESNHP tend to concentrate in a few block-groups. The $1.6 million was distributed to only 20 of 9101 block-groups contained in the PG&E service territory. These 20 block-groups were all 100% urban, but had a range of values for the other HTR household characteristics. For example, moderate-income percentage ranged from 21% to 42% and non-English speaking ranged from 0% to 72%. While these ranges look as though some of the benefits are reaching HTR communities, there is need for much caution based on this small sample. We do not know if the few sites we do have data for are similar to those where the data are not yet available. More importantly, we do not know the characteristics of the buyers of these homes. Areas with large amounts of new home construction activity can undergo radical changes in the

composition of the households, especially when the new home occupants come from other areas and/or low-density areas are quickly developed.

3.3 The Influence of Excluding Low-Income Programs in the Analysis

The energy efficiency programs are intended to serve households above 175% of the poverty level. The low-income customers are to be served via another set of programs, principally the Low Income Energy Efficiency (LIEE) Program. However, there is a large overlap between low-income customers and HTR customers.

Table 3-21 shows that the HTR characteristics of non-English speaking, multifamily housed, and renters are strongly correlated with being low-income customers, perhaps even more strongly than with being moderate-income customers. When a portfolio-level analysis of HTR participation excludes LIEE activity, it underestimates the number of HTR customers that have been successfully received PGC funds.

Table 3-21: Correlation between Percent of Households below 175 and Other HTR Factors

		Percent of Households <175% of Poverty	Percent of Households between 175% and 400% of Poverty
Percent of Households <175% of Poverty	Pearson Correlation	1	.356
	Sig. (2-tailed)	.	.000
Percent of Households between 175% and 400% of Poverty	Pearson Correlation	.356	1
	Sig. (2-tailed)	.000	.
Percent of Households that Speak Language other than English in Home	Pearson Correlation	.434	.146
	Sig. (2-tailed)	.000	.000
Percent of Households Designated Rural	Pearson Correlation	.069	.092
	Sig. (2-tailed)	.000	.000
Percent of Households Living in Multi-family Housing	Pearson Correlation	.211	.007
	Sig. (2-tailed)	.000	.219
Percent of Renter Households	Pearson Correlation	.491	.160
	Sig. (2-tailed)	.000	.000

4. Assessment of the Characteristics of Block-groups in PG&E Territory

The purpose of this chapter is to examine the attributes of communities that are not receiving enough benefits or are receiving a disproportionate share of program benefits. This examination will include HTR characteristics and other factors that may contribute to non-participation.

The first step is to examine the distribution of funds across the PG&E service territory. We do this both statistically and spatially.

4.1 The Distribution of Funds in the PG&E Service Territory

Table 4-1 provides a summary of the distribution of program funds across the five Statewide programs for the PY2002 and PY 2003 combined. The results indicate that a small number of block-groups have grabbed a large share of the total benefits. This skew is evidenced by the fact that the median amount of $2.29 is less than one-half of the mean amount of all of the block-groups. More than 73% of the block-groups received less than the mean amount of $4.66 /household in benefits over the two years.

Table 4-1: The Distribution of PY2002-03 Funds for PG&E by Block-Group

	$/household
Block-Group Mean	$4.66
Block-Group Standard Deviation	$14.19
Block-Group Minimum	$0.00
Percentile 10%	$0.25
Percentile 25%	$0.87
Percentile 50%	$2.29
Percentile 75%	$5.00
Percentile 90%	$9.37
Block-Group Maximum	$597.92

The next step in this process is to examine maps of each utility showing how the rebate funds were distributed across the service territories. Figure 4-1 through Figure 4-4 show the distribution of rebate dollars for PG&E in PY2002, PY 2003, and PY2002 and PY 2003 combined. Areas in the orange color ranges are receiving less than half of the average household rebate amount. Those in the pink to blue range are receiving at least twice the average amount. In general, the blank areas received no benefits, though a few of these represent block-groups that were not identified. In PY 2002 and PY 2003, there are block-groups in the service territory where no benefits have been received. The majority of these are on the boundary edges of the PG&E service territory.

Figure 4-1: Distribution of Rebates for PG&E in PY2002

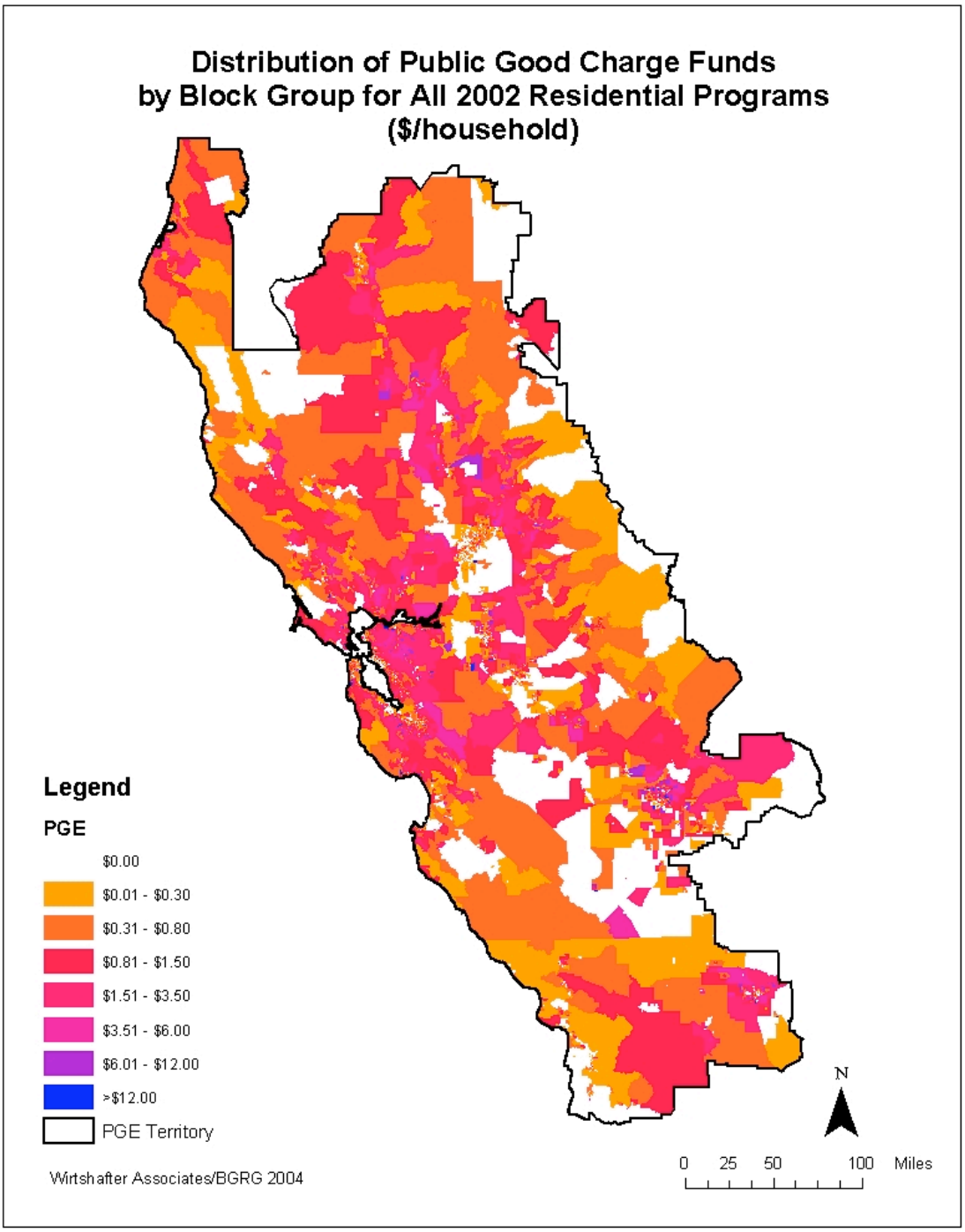


Figure 4-2: Distribution of Rebates for PG&E in PY2003

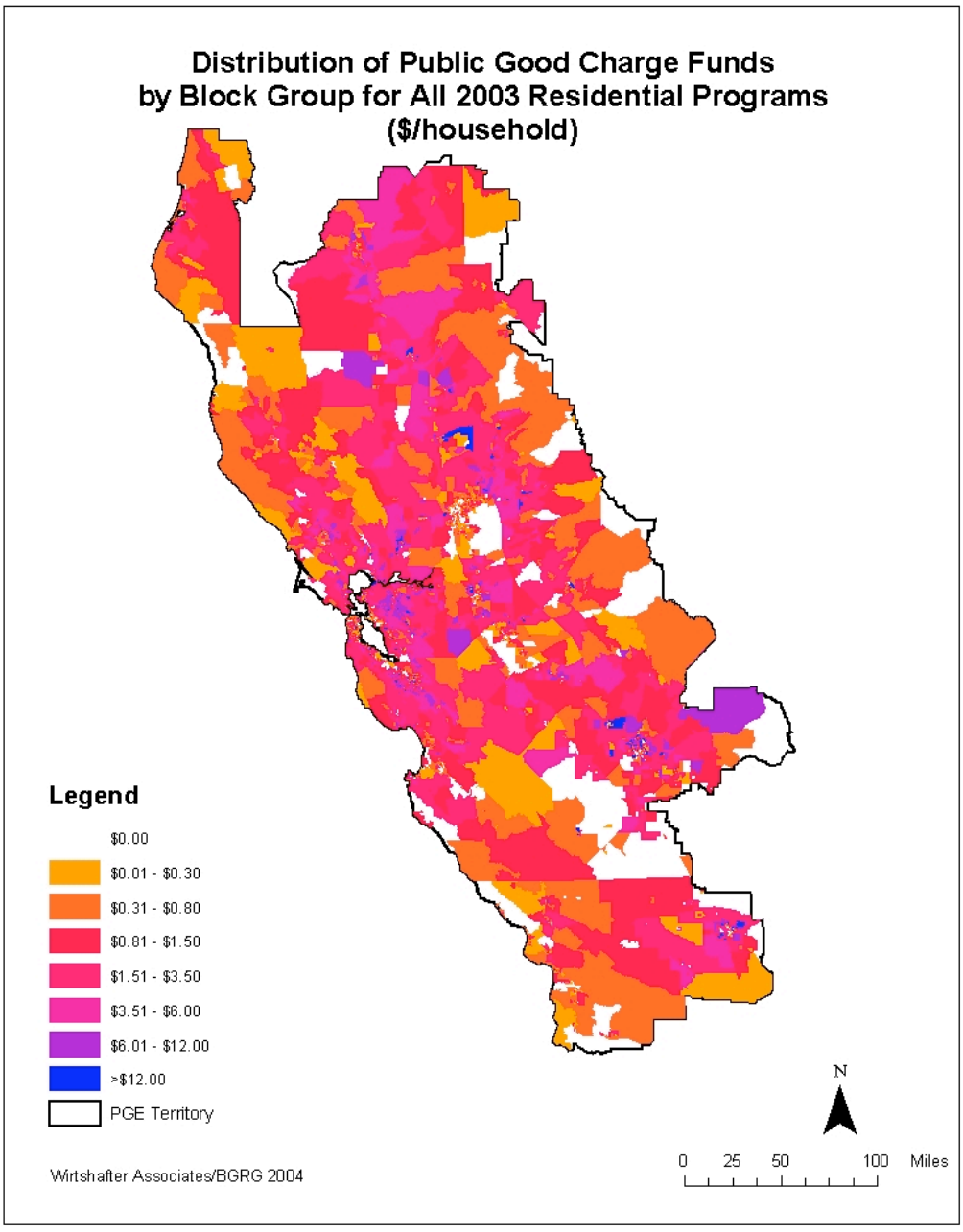


Figure 4-3: Distribution of Rebates for PG&E in PY2002 and PY2003 Combined

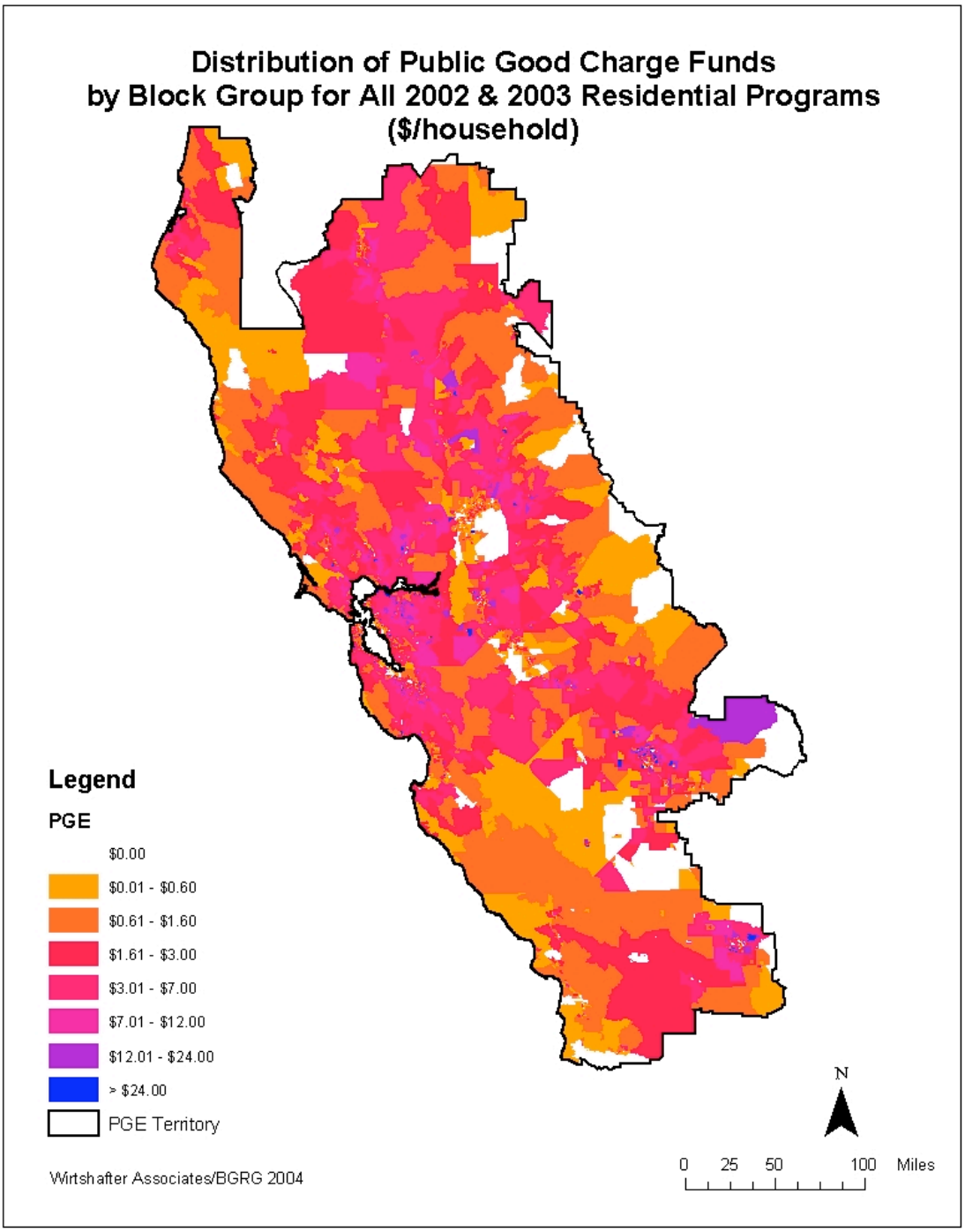
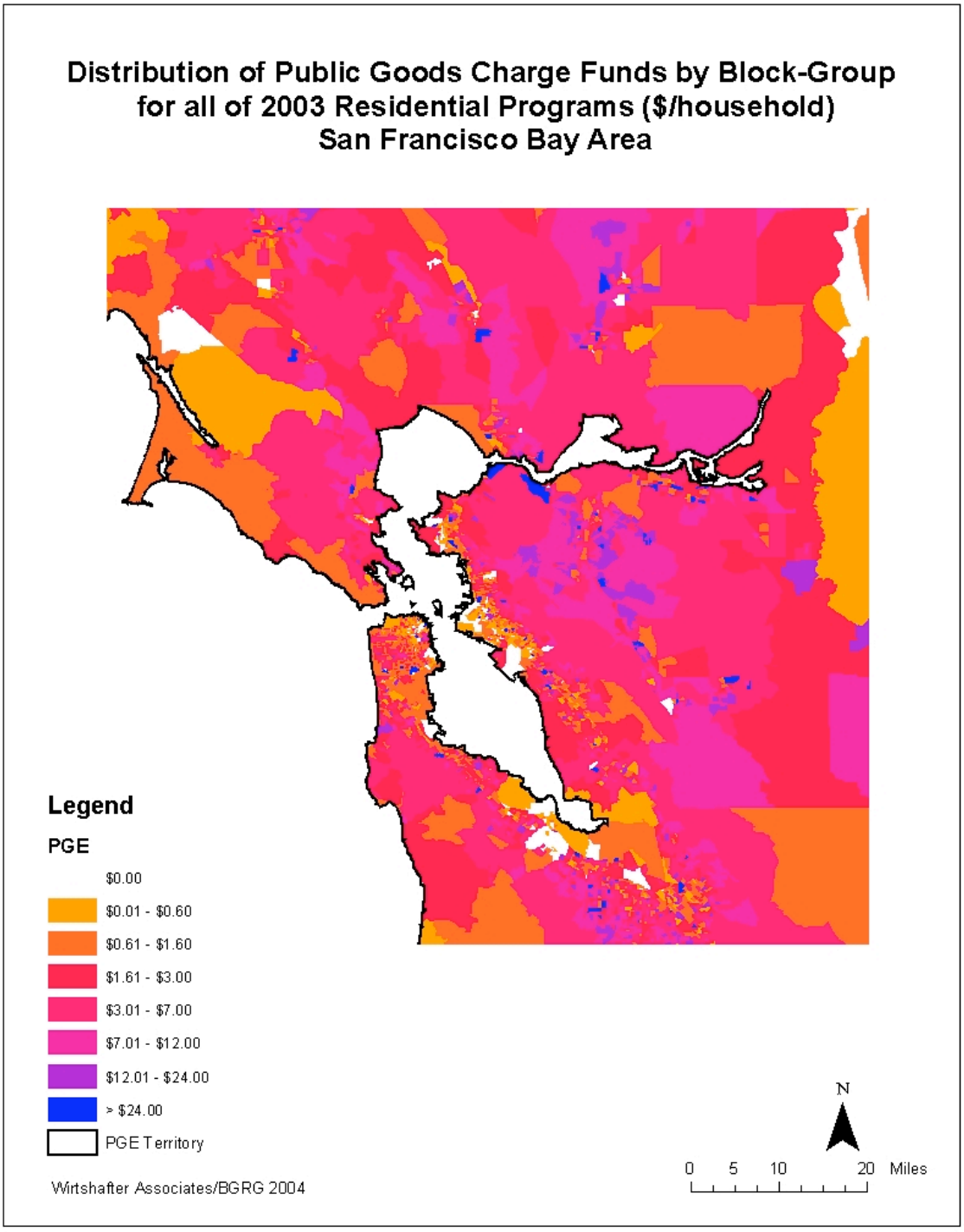


Figure 4-4: PY 2003 Program Activity--Close Up of San Francisco Area



4.2 Examination of PG&E Block-groups Receiving Large Fund Amounts

One way to understand the distribution of funds is to look at top fund receivers and those block-groups receiving the least funding to see if there are discernable differences. In these comparisons, we have the ability to define what we mean by the top and the bottom. For the purposes of this study, we look at two definitions of the top:

- The extreme top of the PG&E territory: this represents those block-groups receiving funding more than two standard deviations above the block-group mean. There were 96 block-groups, approximately 1 % of the total number of block-groups in PG&E's territory, at or above $33.04, which is plus two standard deviations above the mean. At this high end of the distribution, 26 block-groups received more than $100/household and 55 block-groups received more than $50 per household.
- The upper portion of the entire set of block-groups in the PG&E territory: this represents all block-groups receiving above the mean amount of rebate per household.

4.2.1 PG&E's Extreme Top

There are 96 block-groups in PG&E's territory that were more than two standard deviations above the mean funding level. The extreme top of the list is principally composed of block-groups that received ESNHP and/or MFRP funds. The payments are skewed because the majority of funds from these programs go to large developments.

In fact, there were only 30 block-groups that received any funding from the 2002 ESNHP program and 26 of these block-groups made the 96 extreme top list. Only four block-groups receiving ESNHP benefits are not in the 96 highest block-groups. Most of the rest of the block-groups among the 96 highest, (55 of the remaining 70), are in the 96 because they received large amounts of benefits in the MFRP. Fifty of the 96 block-groups are designated as HTR under current utility HTR-designation process.

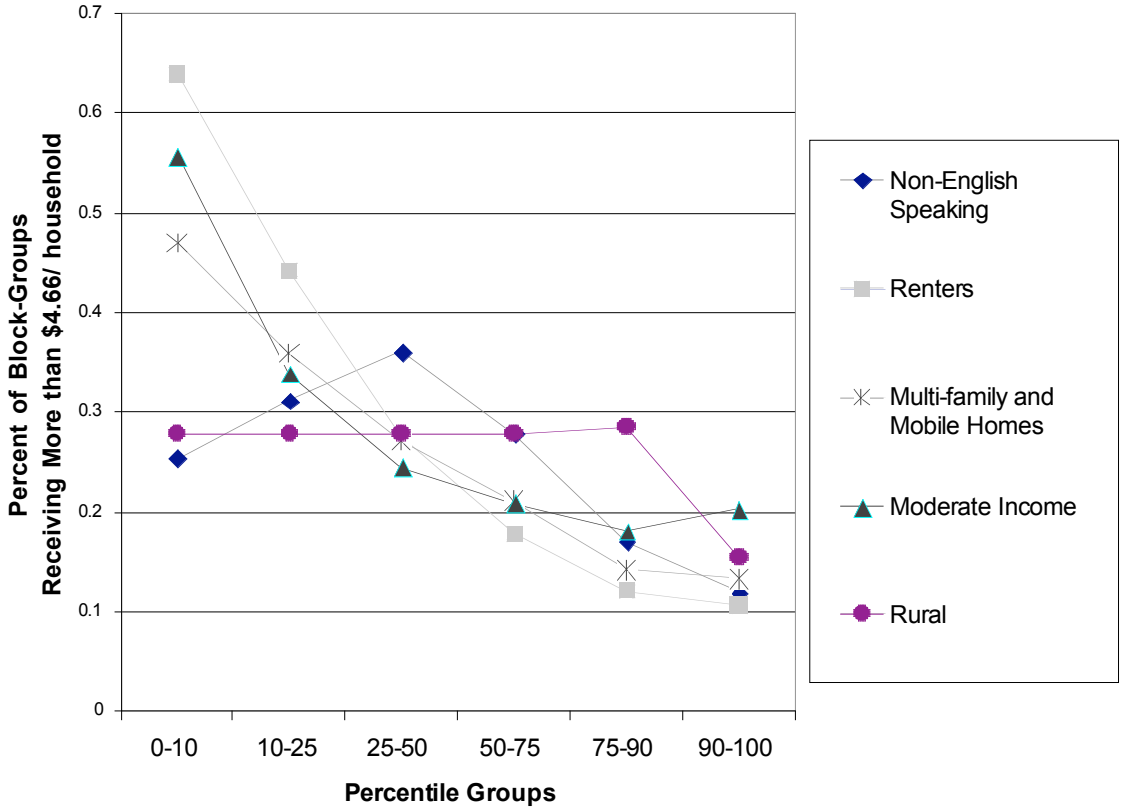
4.2.2 PG&E's Upper Portion

We next looked at the composition of the "upper portion", the set of block-groups that received more than the mean amount of benefits, to see if any characteristics describe this group. The upper portion represents 27% (2436 block-groups) of the total block-groups in PG&E. Yet they received 100% of the ESNHP dollars, 96% of the MFRP dollars, 91% of the Residential Appliance Recycling Program (RARP) dollars, 83% of the Home Energy Efficiency Survey (HEES) dollars, and 60% of the SFEER dollars.

Figure 4-5 shows that the percentile groups with the most HTR households have the fewest block-groups where the average funds received exceeded $4.66. For the Percentile Group 1, the group with the highest number of households with HTR-criteria, a large portion of these

block-groups did receive at least $4.66/household on average over the 2002 and 2003 period.

Figure 4-5: The Distribution of Block-groups Receiving More Than $4.66 from 2002-03 at PG&E.



4.3 Examination of Block-Groups in PG&E Receiving Little Program Activity

At the other end of the distribution 28.3% of block-groups received average benefits of less than $1.00 per household. There are 539 block-groups (5.9%) with no program activity in PY2002 or PY2003.

Table 4-2 shows the characteristics of the block-groups that received no activity in either PY 2002 or PY 2003. For all HTR household characteristics except moderate income, the block-groups with no activity have a higher mean saturation than the mean saturations for the entire PG&E service territory.

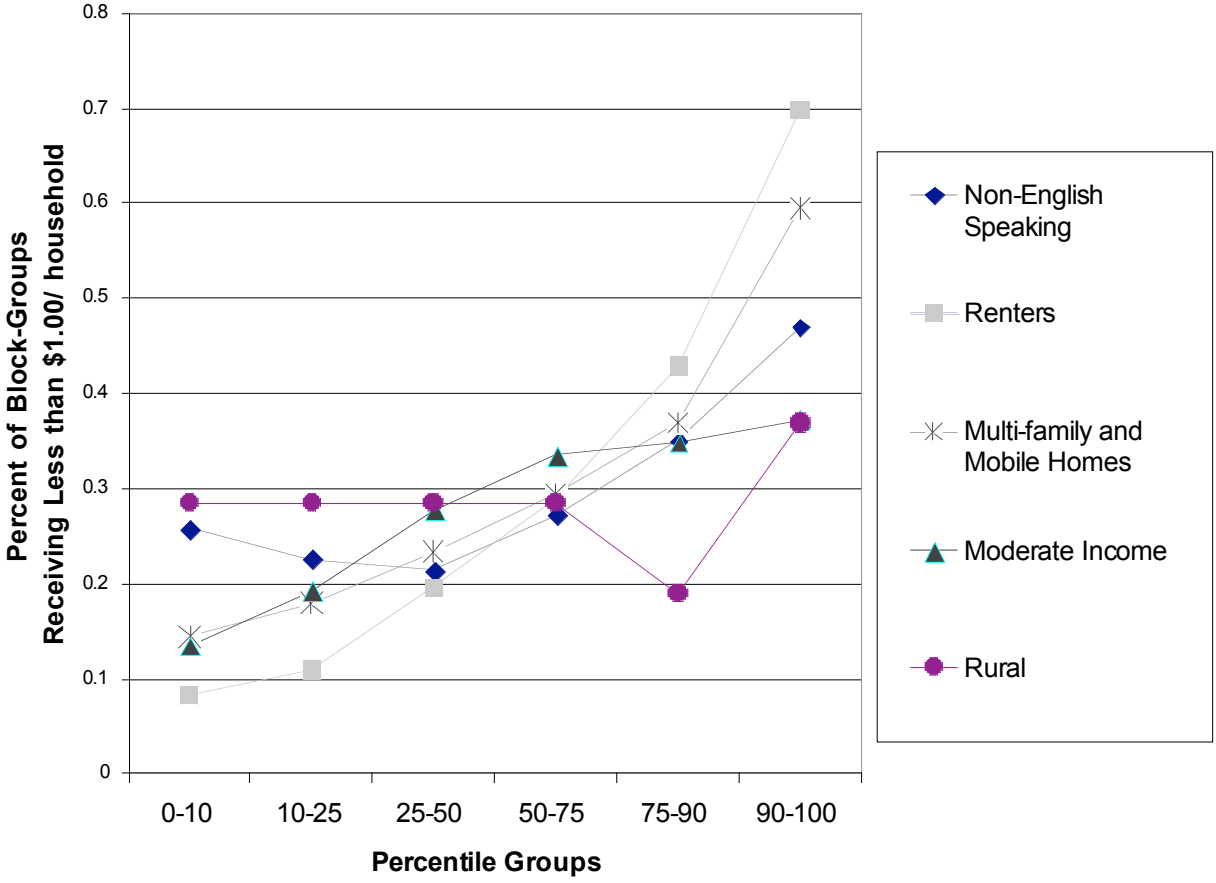
Table 4-2: Characteristics of Block-groups with No Activity

		Values for Block-groups with No Program Activity					
	All Block-group Mean	Mean	Minimum	Maximum	Percentiles		
					25	50	75
Is Designated HTR	47%	57%	0%	100%	0%	100%	100%
Percent Non-English Speaking	32%	37%	0%	100%	17%	31%	54%
Percent Rural	13%	25%	0%	100%	0%	0%	35%
Percent Moderate Income	32%	32%	0%	69%	28%	34%	38%
Percent Renters	39%	38%	0%	100%	31%	57%	85%
Percent Multi-family or Mobile Home	20%	32%	0%	100%	7%	23%	50%
Percent Low-Income*	21%	29%	5%	59%	19%	29%	39%

*This is not an HTR criterion.

For this study, we have selected the value of $1.00/household as benchmark for low activity at PG&E for the combined 2002-03 program. Figure 4.6 shows the distribution of block-groups receiving less than $1.00/household for the two-year period. This chart presents the opposite picture from Figure 4-5, in that the block-groups with the most HTR household characteristics more frequently receive the lowest amount of incentives.

Figure 4-6: The Distribution of Block-groups Receiving Less Than $1.00 from 2002-03 at PG&E.



The problem with Figures 4-5 and 4-6 is that it again includes all block-groups even those that are being served by the LIEE program. Looking at these figures and ignoring the contribution that the LIEE makes is likely to lead to a conclusion that the block-groups with large concentrations of households with HTR household characteristics are being under-served. We caution the reader to first examine the case study for SDGE, which includes LIEE funds, before drawing such a conclusion.

4.4 Characteristics Associated With Program Activity in the PG&E Territory

The last step in the process is to determine what factors are associated with block-group participation. Table 4-3 shows the correlation between Total Funds Received in PY2002-03 with a number of characteristics that could possibly be related to block-groups activity. However, results show that for the entire model with all 9101 block-groups in PG&E, the correlations were too small for any of the characteristics to explain program activity in PG&E.

Table 4-3: Correlation of Total Funds Received with Possible Explanatory Variables for Block-Group Activity in PG&E in PY 2002-03

	Pearson Correlation to Total Funds per Household in PY 2002-03	Significance
Is in Designated HTR Zip Code	-0.016	.126
Percent Moderate Income	-0.054	.000
Percent Multi-family	-0.010	.361
Percent Multi-family and Mobile Home	-0.004	.678
Percent Non-English Speaking	-0.024	.024
Percent Renters	-0.064	.000
Percent Rural	-0.051	.000
Distance from Stockton Training Center*	-0.031	.003
Percent Below 175% of Poverty Level*	-0.040	.000
Percent Hispanic*	-0.036	.001
Percent Non-White*	-0.047	.000

*This is not an HTR criterion.

5 Assessment of the Characteristics of Block-groups in SCE Territory

5.1 The Distribution of Funds in the SCE Service Territory

Table 5-1 provides a summary of the distribution of program funds for SCE across four of the Statewide programs for the PY2002 and PY 2003 combined. No data were received for the ESNHP. The results indicate that a small number of block-groups have grabbed a large share of the total benefits, though the results are not as skewed as they were for PG&E, largely because SCE does not have the ESNHP values. This is evidenced by the fact that the median amount of $1.62 is about one-half of the mean amount of all of the block-groups. More than 59% of the block-groups received less than the mean amount of $3.07 /household in benefits over the two years.

Table 5-1: The Distribution of PY2002-03 Funds for SCE by Block-Group

	$/household
Block-Group Mean	$3.07
Block-Group Standard Deviation	$6.43
Block-Group Minimum	$0.00
Percentile 10%	$0.00
Percentile 25%	$0.62
Percentile 50%	$1.62
Percentile 75%	$3.76
Percentile 90%	$6.95
Block-Group Maximum	$267.36

Figure 5-1 through Figure 5-4 represent the same four maps as above except these maps are of the SCE territory. While there are more areas with no activity, there also appears to be a more even distribution across block-groups.

Figure 5-1: Distribution of Rebates for SCE in PY2002

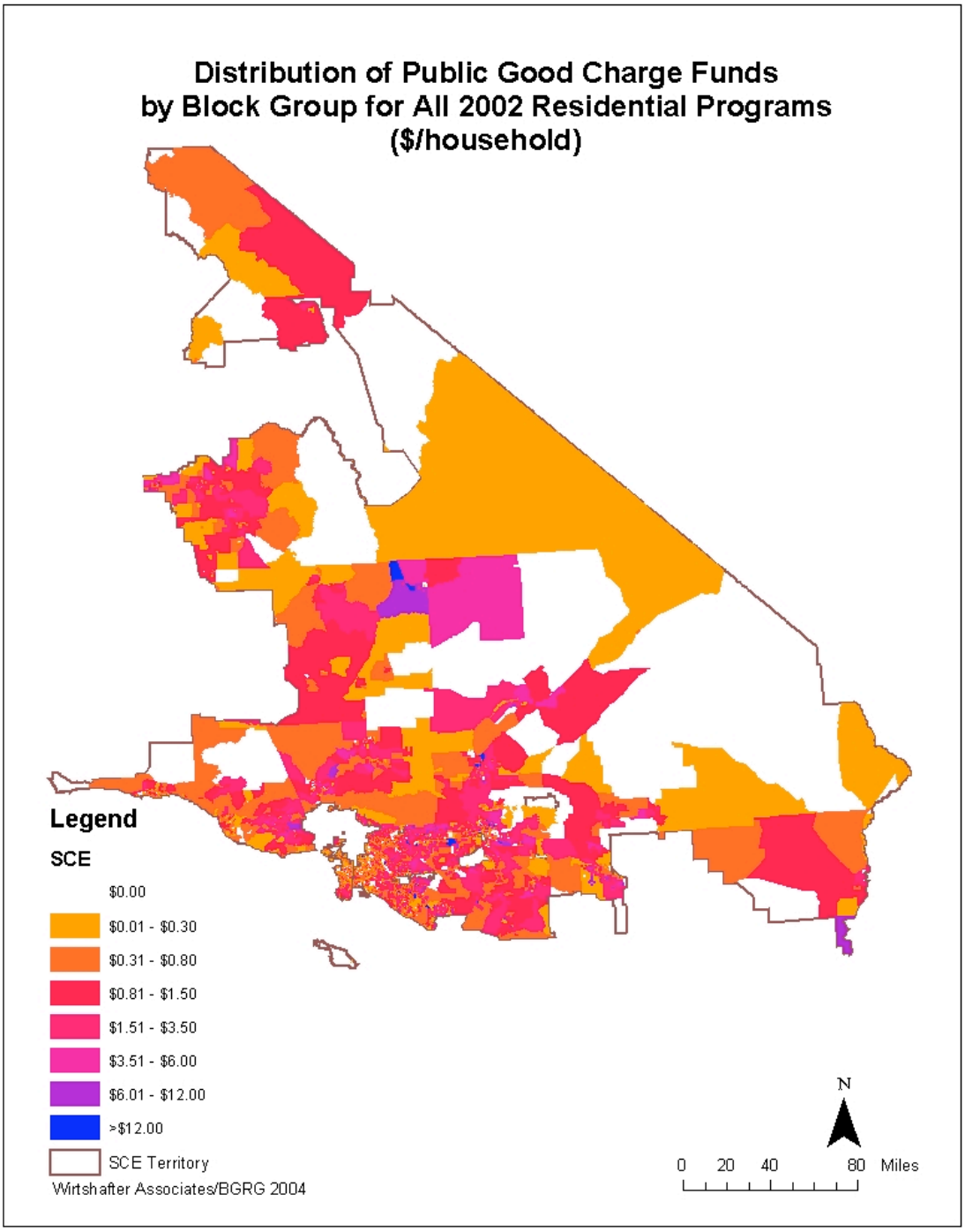


Figure 5-2: Distribution of Rebates for SCE in PY2003

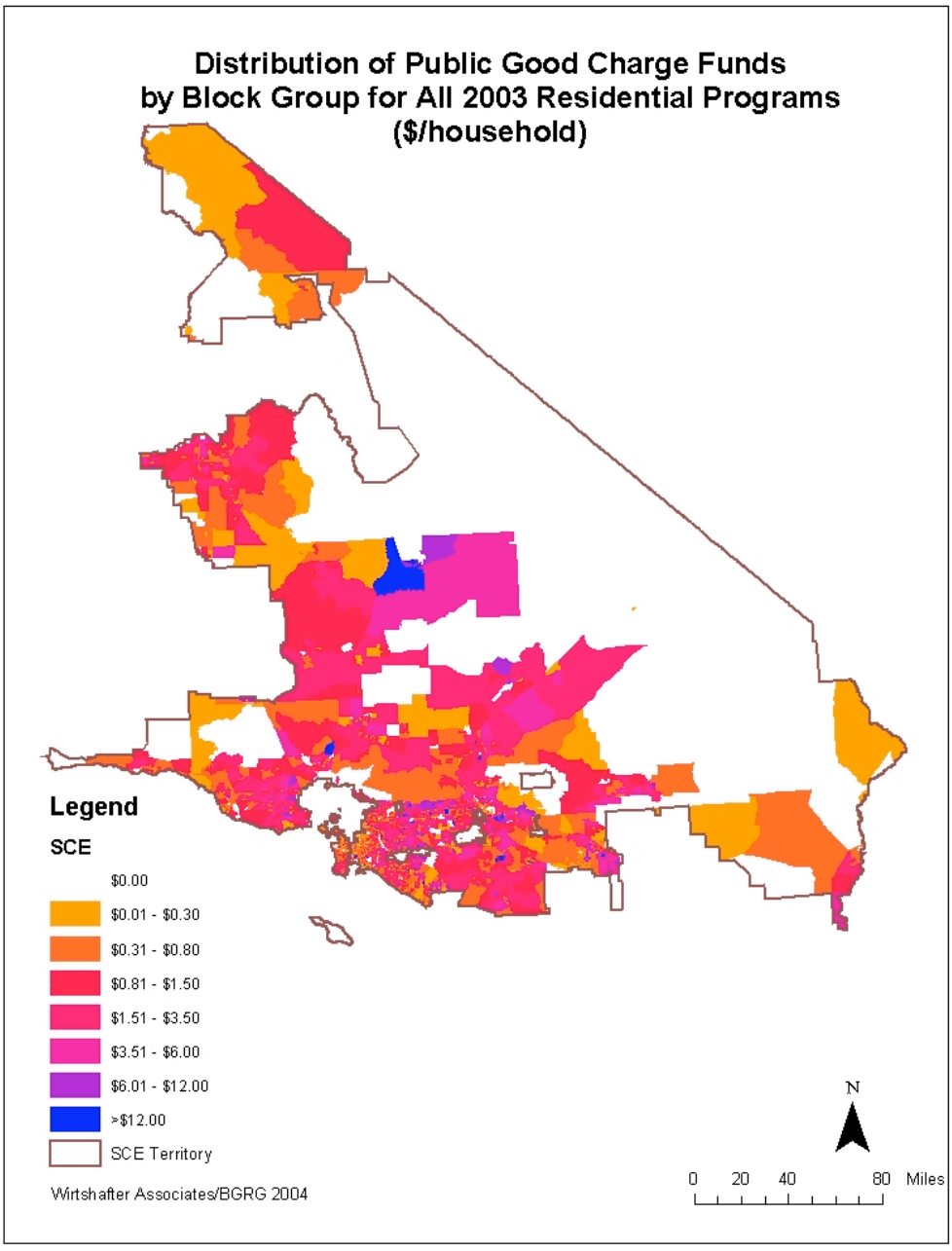


Figure 5-3: Distribution of Rebates for SCE in PY2002 and PY2003 Combined

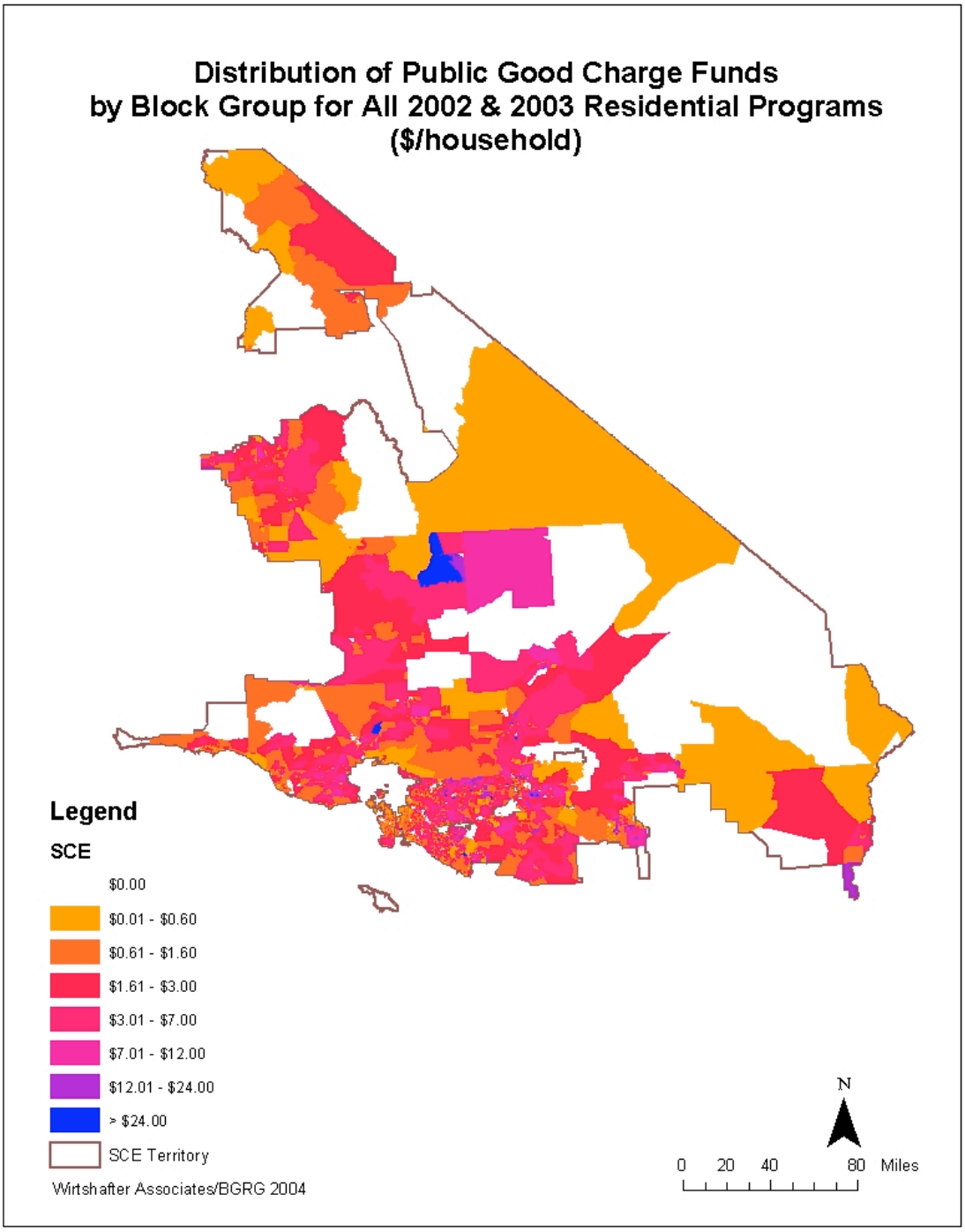
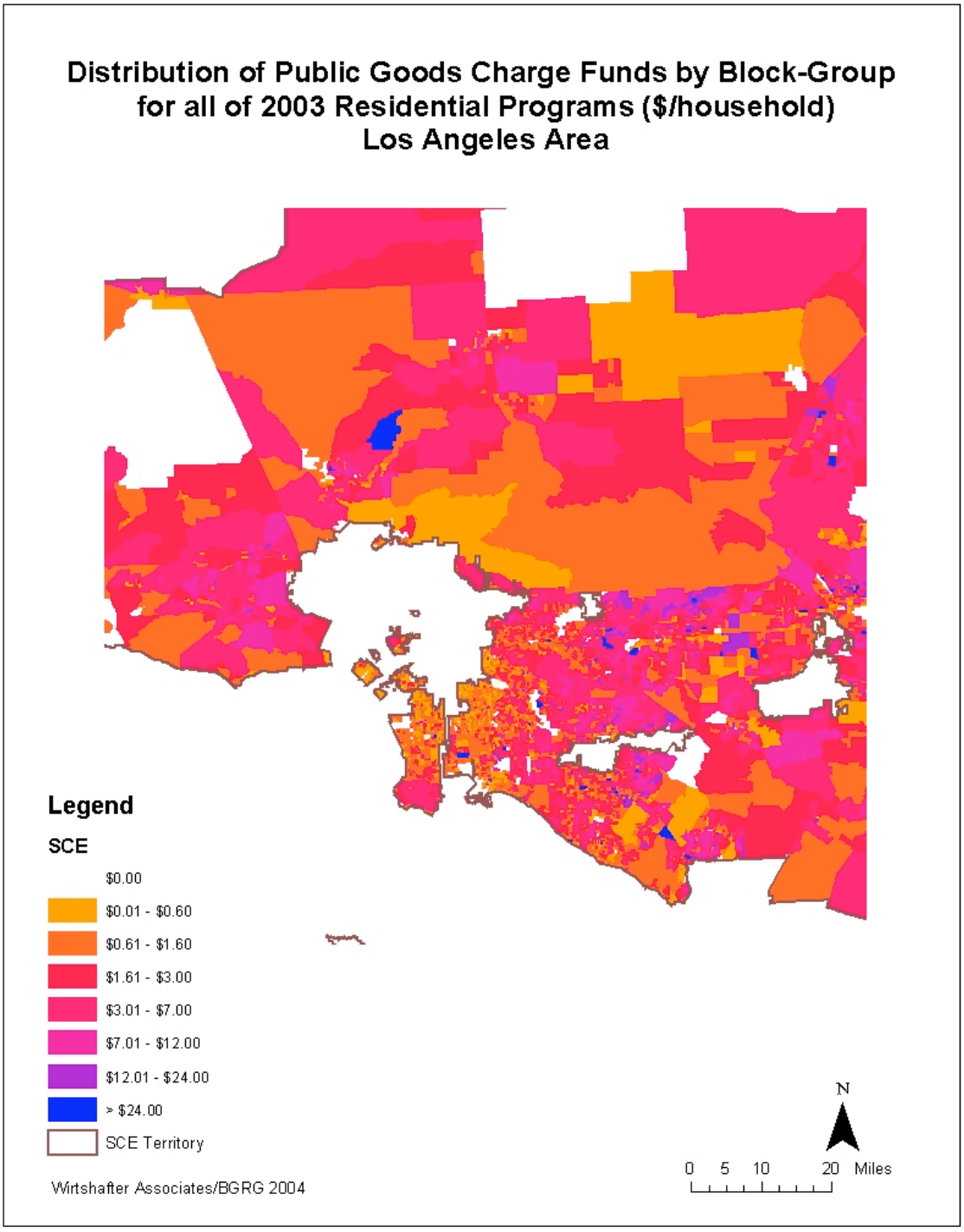


Figure 5-4: PY 2003 Program Activity--Close Up of Los Angeles Area



5.2 Examination of SCE Block-Groups Receiving Large Fund Amounts

To better understand the distribution, we examine the ends of the distribution to see why some block-groups have so much activity and others have no or little activity.

For the purposes of this study, we look at two definitions of the top:

- The extreme top of the SCE territory: this represents those block-groups receiving funding more than two standard deviations above the block-group mean. Because we were unable to include the ESNHP data in the SCE analysis, there were far fewer block-groups in SCE that received more than $50. At the high end of the distribution, six block-groups received more than $100/household and nine block-groups received more than $50 per household. There were 140 block-groups, approximately 1.7 % of the total number of block-groups in SCE's territory, at or above $15.93, which is plus two standard deviations above the mean.
- The upper portion of the entire set of block-groups in the SCE territory: this represents all block-groups receiving above the mean amount of rebate per household.

5.2.1 SCE's Extreme Top

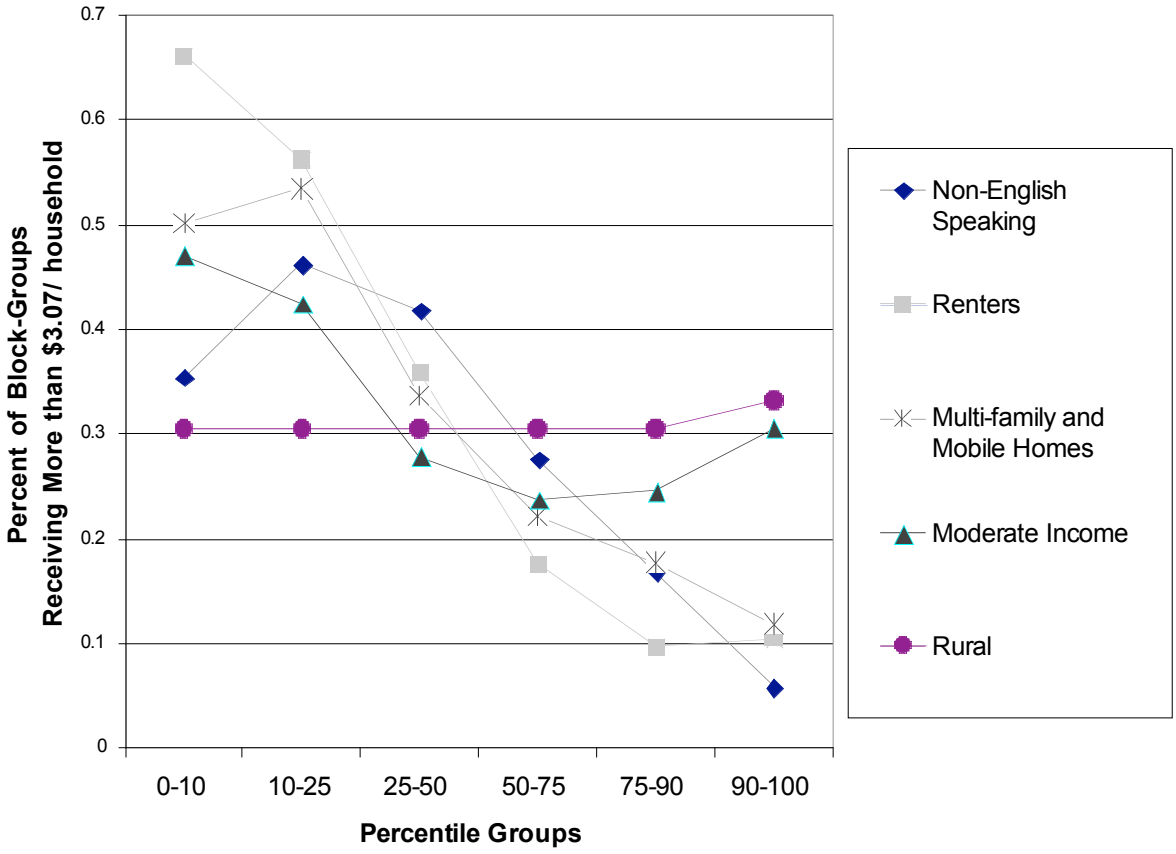
There were 140 block-groups, approximately 1.7 % of the total number of block-groups in SCE's territory, at or above $15.93, which is plus two standard deviations above the mean. The list is principally composed of block-groups that received MFRP funds. At values below $20/household, we find 46 block-groups with more than $15.00 worth of SFEER activity. In addition, there are four block-groups with high Residential Appliance Recycling Program activity and three with high Home Energy Efficiency Survey activity. Seventy-one of the 140 block-groups are designated as HTR under current CPUC criteria.

5.2.2 SCE's Upper Portion

We looked at the composition of the set of block-groups that received more than the mean amount of benefits to see if any characteristics describe this group. Figure 5-5 shows some of the key results.

This group of 2585 block-groups represents 31% of the total block-groups in SCE. Yet they receive 96% of the MFRP funds, 80% of the SFEER funds, 55% of the Home Energy Efficiency Survey funds, and 44% of the Appliance Recycling funds. As Figure 5-5 shows, the Percentile Groups with the lowest concentration of HTR household characteristics have the most block-groups receiving more than $3.07/household over the two years. The Percentile Groups with the highest concentration of HTR household characteristics have the fewest block-groups receiving more than $3.07/household.

Figure 5-5: The Distribution of Block-groups Receiving More Than $3.07 from 2002-03 at SCE.



5.3 Examination of Block-Groups in SCE Receiving Little Program Activity

At the other end of the distribution 31% of block-groups received average benefits of less than $1.00 per household. Table 5-2 shows the characteristics of these block-groups. There are 924 block-groups (11%) with no program activity in PY2002 or PY2003. Of the 924 inactive block-groups, 70% of them are designated as HTR zip code areas. This represents a disproportionate percentage of the HTR zip codes. The block-group mean for percentage of renters and multi-family units is also higher for the no activity group in SCE than it is for all block-groups in SCE.

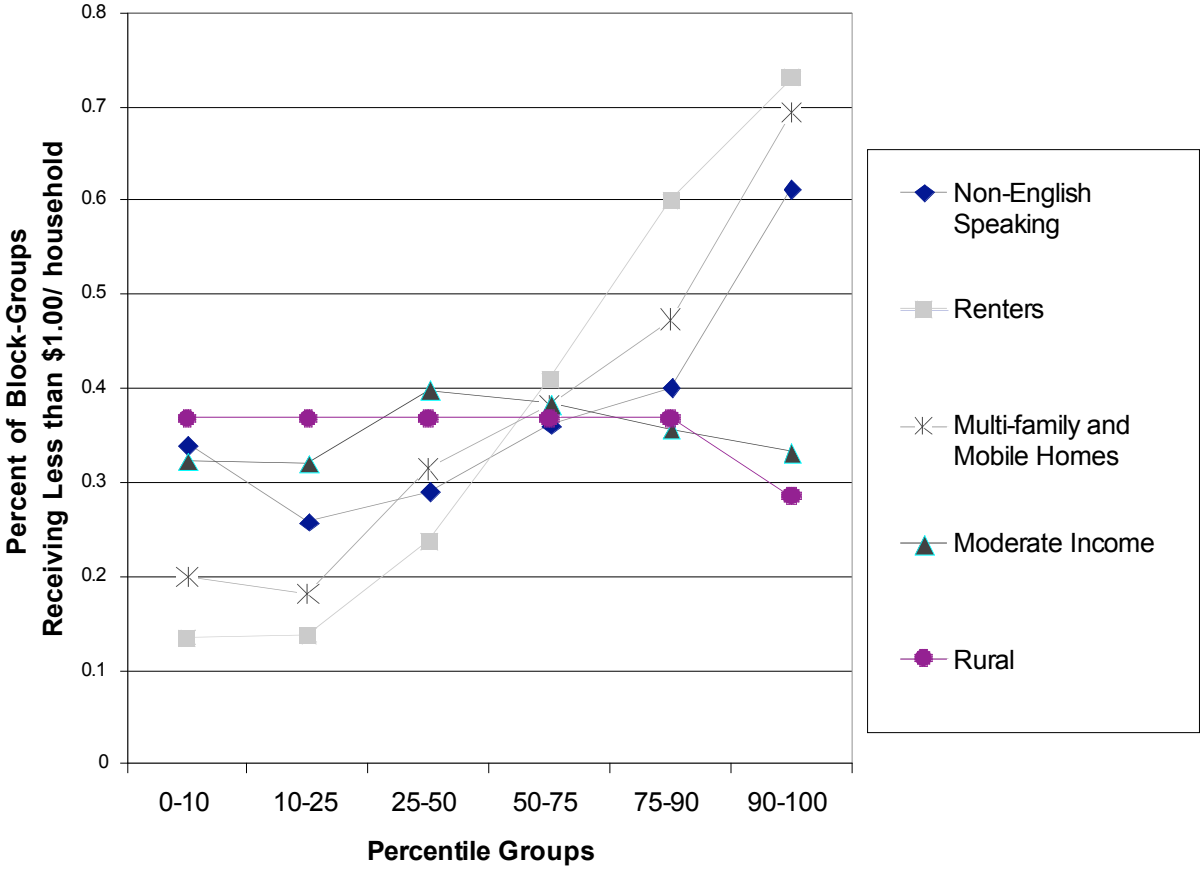
Table 5-2: Characteristics of SCE Block-groups with No Activity

		Values for Block-groups with No Program Activity					
	All Block-group Mean	Mean	Minimum	Maximum	Percentiles		
					25	50	75
Is in Designated HTR Zip Code	59%	70%	0%	100%	0%	100%	100%
Percent Moderate Income	34%	33%	0%	66%	29%	34%	38%
Percent Multi-family	17%	23%	0%	100%	0%	11%	40%
Percent Non-English Speaking	43%	43%	0%	100%	25%	40%	58%
Percent Renter	39%	47%	0%	100%	22%	44%	70%
Percent Low-Income	24%	25%	8%	64%	18%	23%	29%
Percent Rural	5%	8%	0%	100%	0%	0%	0%
Percent Hispanic*	31%	30%	0%	100%	10%	23%	46%
Percent Low-Income*	24%	25%	8%	64%	18%	23%	29%
Percent Non-White*	40%	44%	0%	100%	25%	40%	58%

*This is not an HTR criterion.

For this study, we have selected the value of $1.00/household as the benchmark for low activity. Figure 5-6 shows the characteristics of the block-groups receiving less than $1.00 per household in PY2002-03 activity. Again, as in the case of PG&E, the positions have flipped from those found in Figure 5-5. In Figure 5-6, the Percentile Groups with the greatest concentration of households with HTR characteristic have a larger percentage of their block-groups where funds received averaged less than $1.00/household over the two years. It is worth noting that the rural and moderate-income distributions for SCE are relatively flat. We are not sure why this has occurred.

Figure 5-6: The Distribution of Block-groups Receiving Less Than $1.00 from 2002-03 at SCE.



Again, the problem with Figures 5-5 and 5-6 is that they includes all block-groups even those that are being served by the LIEE program.

5.4 Characteristics Associated with Program Activity in the SCE Territory

The last step in the process is to determine what factors are correlated to block-groups not receiving program activity. Table 5-3 shows the correlation between Total Funds Received in PY2002-03 versus a number of characteristics that could possibly explain the reason these block-groups are not active. For the entire model with all 8423 block-groups in SCE, however, the results show that the correlations, though perhaps statistically significant, are too small to account for any program effects.

Table 5-3: Correlation of Total Funds Received with Possible Correlated Variables for Block-Group Activity in SCE in PY 2002-03

	Pearson Correlation to Total Funds per Household in PY 2002-03	Significance
Is in Designated HTR Zip Code	-0.036	.001
Percent Non-English Speaking	-0.002	.846
Percent Moderate Income	0.009	.403
Percent Multi-family and Mobile Homes	-0.027	.015
Percent Renter	-0.008	.453
Percent Rural	0.000	.968
Distance from CTAC*	-0.009	.414
Percent Below 175% of Poverty Level*	-0.022	.043
Percent Hispanic*	-0.037	.001
Percent Non-White*	-0.008	.443

*This is not an HTR criterion

6. Assessment of the Characteristics of Block-groups in SCG Territory

6.1 The Distribution of Funds in the SCG Service Territory

Table 6-1 provides a summary of the distribution of program funds for SCG across two of the Statewide programs for the PY2002 and PY 2003 combined. No data were received for the ESNHP, RARP or HEES. The results indicate that a small number of block-groups have grabbed a large share of the total benefits, and that a large number of block groups have very little activity. Many of these are block-groups in the SCG territory but without gas supply. The skewness is very severe as evidenced by the fact that the median amount of $0.15 is about one-fifth of the mean amount of all of the block-groups. More than 72% of the block-groups received less than the mean amount of $0.86 /household in benefits over the two years.

Table 6-1: The Distribution of PY2002-03 Funds for SCG by Block-Group

	$/household
Block-Group Mean	$0.86
Block-Group Standard Deviation	$4.13
Block-Group Minimum	$0.00
Percentile 10%	$0.00
Percentile 25%	$0.00
Percentile 50%	$0.15
Percentile 75%	$1.04
Percentile 90%	$2.31
Block-Group Maximum	$443.75

The values for SCG appear low. There are two reason for this. First, SCG only runs two programs: SFEER and MFRP. Second, the SCG territory boundary that was used represents the full area over which the company has jurisdiction. Only a portion of this territory is actually equipped to provide gas to households.

Figure 6-1 through Figure 6-4 show the distribution of program activity. There are large areas of the periphery that show no funds distributed. Unfortunately, we are unable to distinguish whether these areas are served by SCG and have no program activity, or these are areas where the SCG distribution network does not reach.

Figure 6-1: Distribution of Rebates for SCG in PY2002

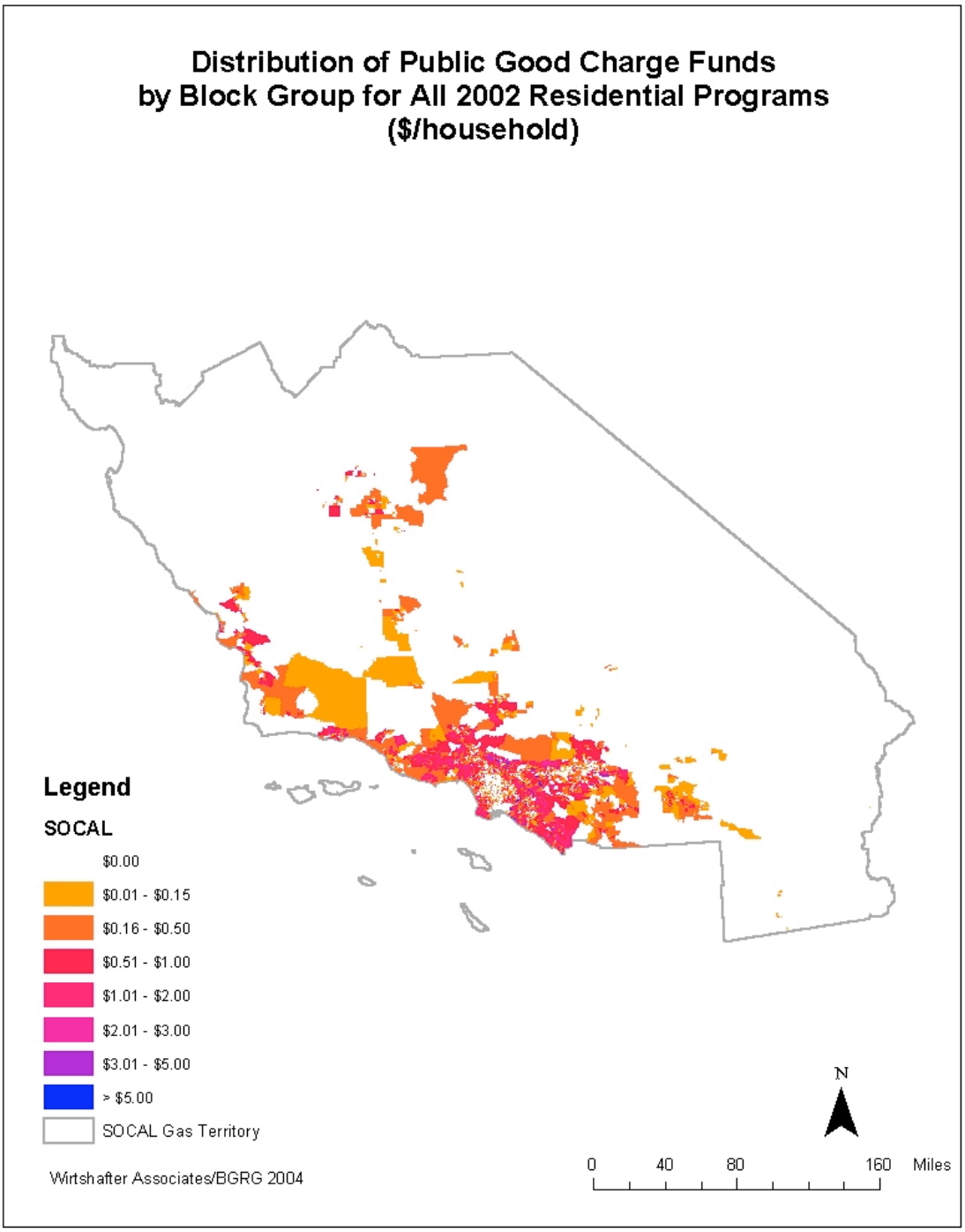


Figure 6-2: Distribution of Rebates for SCG in PY2003

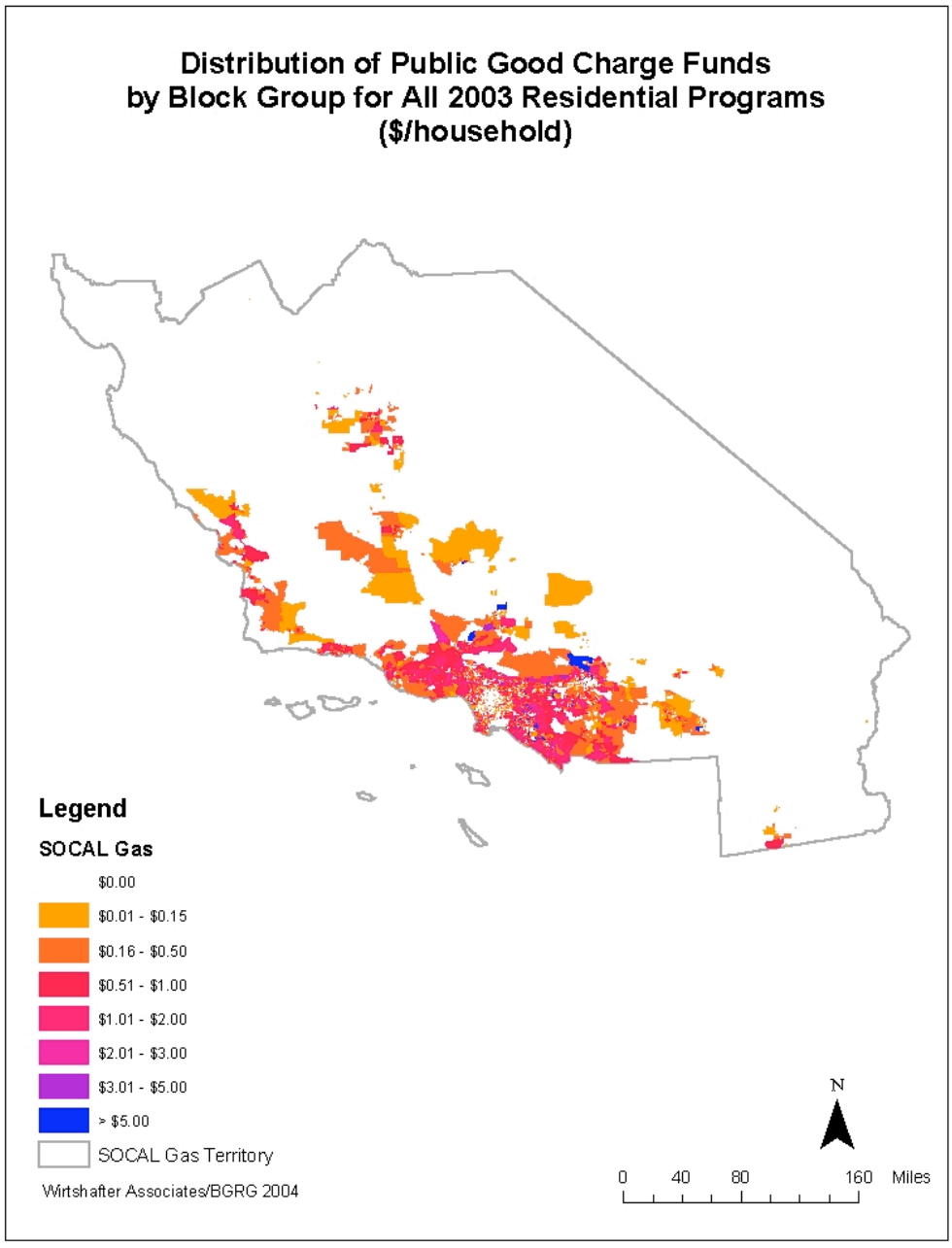


Figure 6-3: Distribution of Rebates for SCG in PY2002 and PY2003 Combined

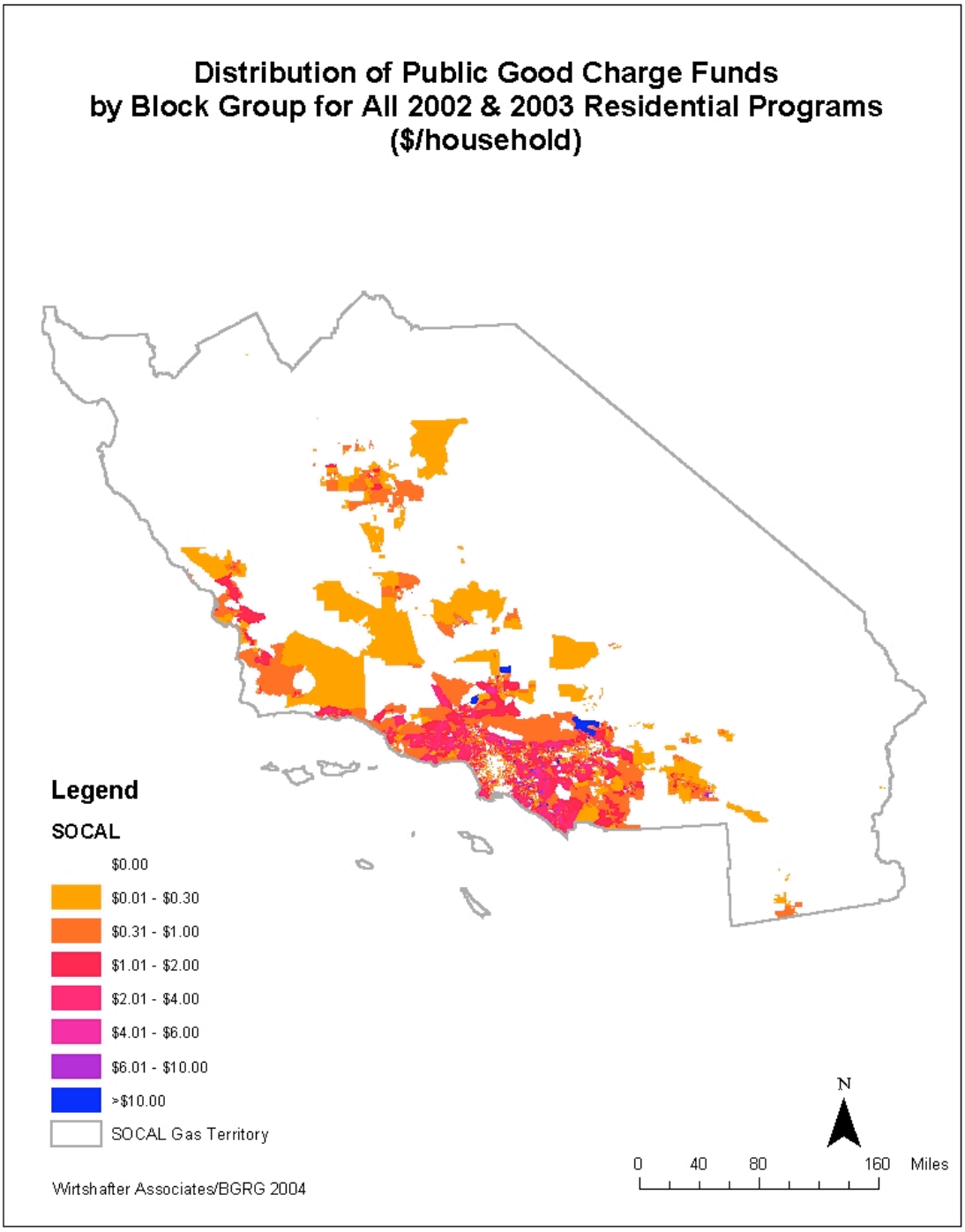
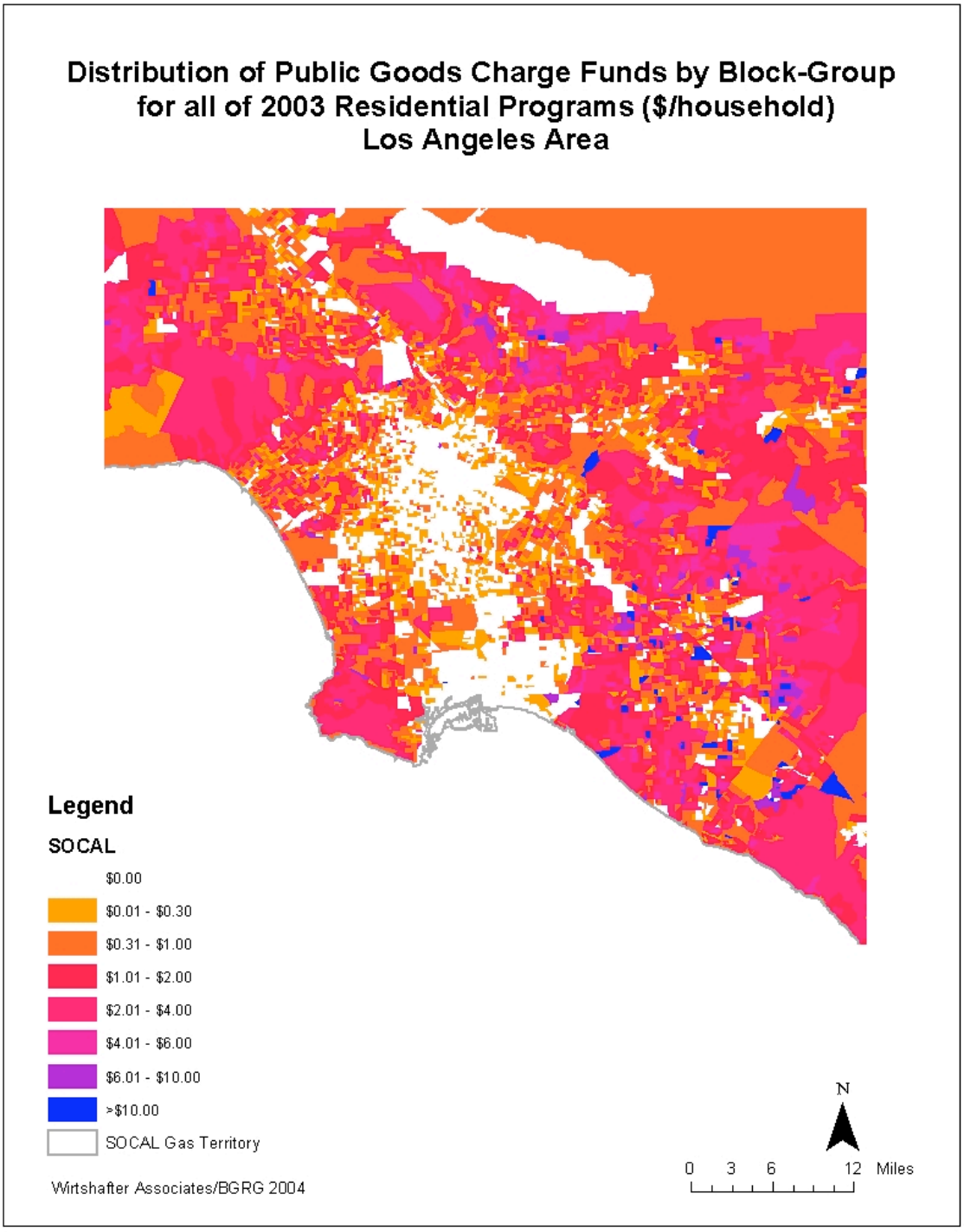


Figure 6-4: PY 2003 Program Activity--Close Up of Los Angeles Area



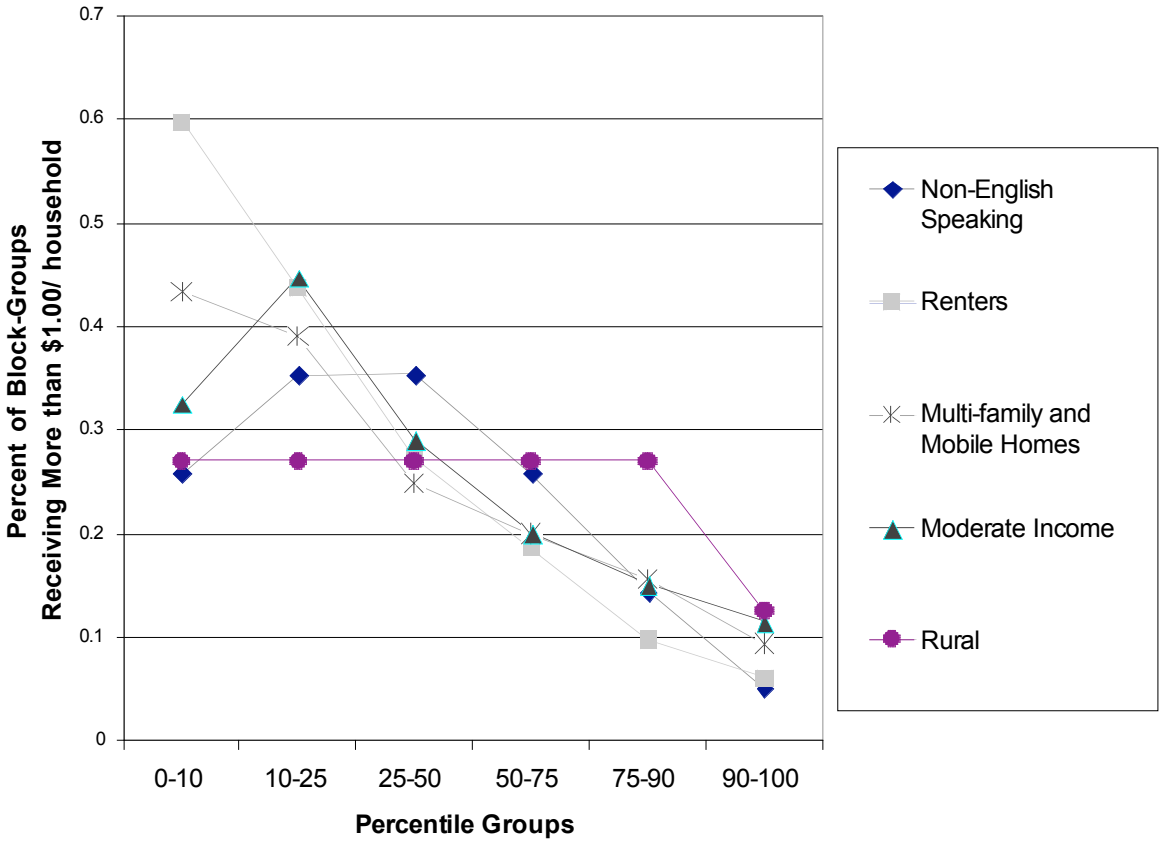
6.2 Examination of SCG Block-Groups Receiving Large Fund Amounts

We examined the ends of the distribution to see why some block-groups have so much activity and others have no or little activity. Because SCG only has two programs, there

were far fewer block-groups in SCG that received more than $50. At the high end of the distribution, six block-groups received more than $50/household and 12 block-groups received more than $25 per household. There were 101 block-groups, approximately 0.6 % of the total number of block-groups in SCG's territory, at or above $9.12, which is plus two standard deviations above the mean.

The list is principally composed of block-groups that received MFRP funds. We find 18 block-groups with more than $9.00 worth of SFEER activity. All the rest are in this group because of MFRP activity. We looked at the composition of the set of block-groups that received more than the mean amount of benefits to see if any characteristics describe this group. This group of 4627 block-groups represents 28% of the total block-groups in SCG including those un-served by the system. Yet they receive 98% of the MFRP funds and 82% of the SFEER funds. Figure 6-5 shows some of the key results.

Figure 6-5: The Distribution of Block-groups Receiving More Than $1.00 from 2002-03 at SCG.



6.3 Examination of Block-Groups in SCG Receiving Little Program Activity

At the other end of the distribution 63% of block-groups received average benefits of less than $0.50 per household. There are 7356 block-groups (45%) with no program activity in PY2002 or PY2003. As noted, many of these are in areas where SCG has jurisdiction but

does not have the gas distribution network to serve these households. Table 6-2 shows the characteristics of these block-groups. None of the characteristics of the no activity block-groups is that different from the characteristics of all block-groups in SCG.

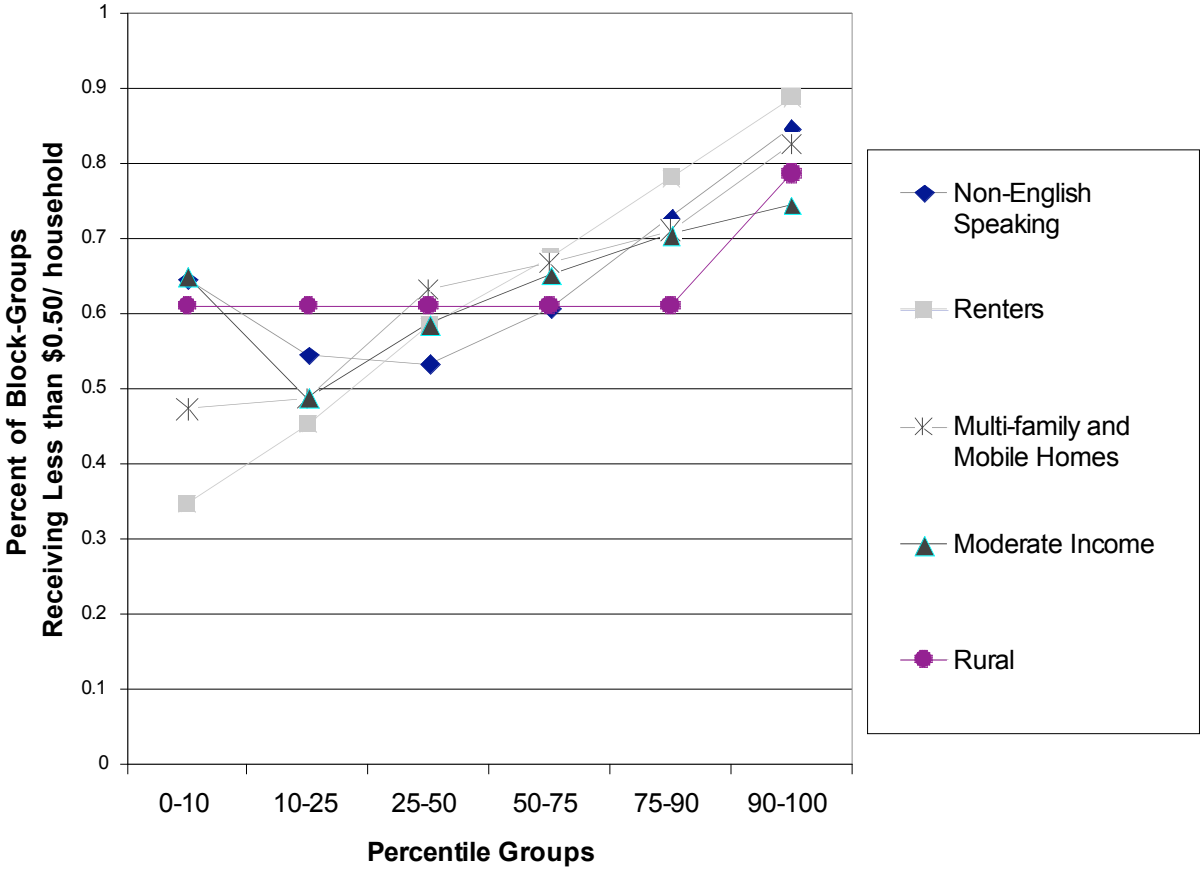
Table 6-2: Characteristics of SCG Block-groups with No Activity

		Values for Block-groups with No Program Activity					
	All Block-group Mean	Mean	Minimum	Maximum	Percentiles		
					25	50	75
Is in Designated HTR Zip Code	42%	39%	0%	100%	0%	0%	100%
Percent Moderate Income	33%	32%	0.%	66%	29%	34%	37%
Percent Multi-family	20%	22%	0%	100%	0%	10%	36%
Percent Non-English Speaking	43%	45%	0%	100%	23%	40%	65%
Percent Rural	42%	47%	0%	100%	21%	34%	70%
Percent Rural	5%	9%	0%	100%	0%	0%	0%
Percent Hispanic*	30%	32%	0%	100%	10%	23%	49%
Percent Low-Income*	24%	25%	5%	64%	15%	24%	35%
Percent Non-White*	39%	42%	0%	100%	21%	39%	61%

*This is not an HTR criterion

For this study, we have selected the value of $0.50/household as the benchmark for low activity in SCG. Figure 6-6 shows the distribution of these block-groups with less than $0.50 per household in PY2002-03 activity.

Figure 6-6: The Distribution of Block-groups Receiving Less Than $0.50 from 2002-03 at SCG.



6.4 Characteristics Associated with Program Activity in the SCG Territory

The last step in the process is to determine what factors are associated with block-group activity. Table 6-3 shows the correlation between Total Funds Received in PY2002-03 versus a number of characteristics that could possibly be associated with funds received by block-groups. For the entire model with all 16,255 block-groups in SCG, the HTR factors are negatively correlated with the amount of rebate dollars per household. At the same time, the HTR zip code designation is positively correlated with dollars received per household. As we will show in Chapter 8, this is due in part to the fact that the HTR designation is not always accurate in locating areas with high HTR characteristics.

Table 6-3: Correlation of Total Funds Received with Possible Explanatory Variables for Block-Group Activity in SCG in PY 2002-03

	Pearson Correlation to Total Funds per Household in PY 2002-03	Significance
Is in Designated HTR Zip Code	0.024	.002
Percent Moderate Income	-0.041	.000
Percent Multi-family	-0.027	.001
Percent Multi-family and Mobile Homes	-0.040	.000
Percent Non-English Speaking	-0.064	.000
Percent Renters	-.0.070	.000
Percent Rural	-0.031	.000
Percent Below 175% of Poverty Level*	-0.088	.000
Distance from Downey*	-0.111	.000
Percent Hispanic*	-0.061	.000
Percent Non-White*	-0.073	.000

*This is not an HTR criterion

7. Assessment of the Characteristics of Block-groups in SDG&E Territory

7.1 The Distribution of Funds in the SDG&E Service Territory

Table 7-1 provides a summary of the distribution of program funds for SDG&E across two of the Statewide programs for the PY2002 and PY 2003 combined. No data were received for the ESNHP, RARP or HEES. SDG&E were able to supply LIEE data. The results indicate that a small number of block-groups have grabbed a large share of the total benefits, though the results are not as skewed as they were for PG&E, largely because SDG&E does not have the ESNHP values. This is evidenced by the fact that the median amount of $4.96 is about one-half of the mean amount of all of the block-groups. More than 70% of the block-groups received less than the mean amount of $8.44 /household in benefits over the two years.

Table 7-1: The Distribution of PY2002-03 Funds for SDG&E by Block-Group

	Energy Efficiency Programs $/household	Energy Efficiency and Low Income Programs $/household
Block-Group Mean	$8.44	$25.23
Block-Group Standard Deviation	$18.41	$32.79
Block-Group Minimum	$0.00	$0.00
Percentile 10%	$0.64	$2.89
Percentile 25%	$2.10	$7.04
Percentile 50%	$4.96	$15.32
Percentile 75%	$9.80	$30.28
Percentile 90%	$17.25	$59.31
Block-Group Maximum	$583.39	$583.39

Figures 7-1 through Figure 7-4 show the distribution of program activity excluding LIEE. Most of the territory except for areas downtown has had some activity. The periphery and some of the more urbanized areas have received fewer rebate dollars.

Figure 7-1: Distribution of Rebates for SDG&E in PY2002

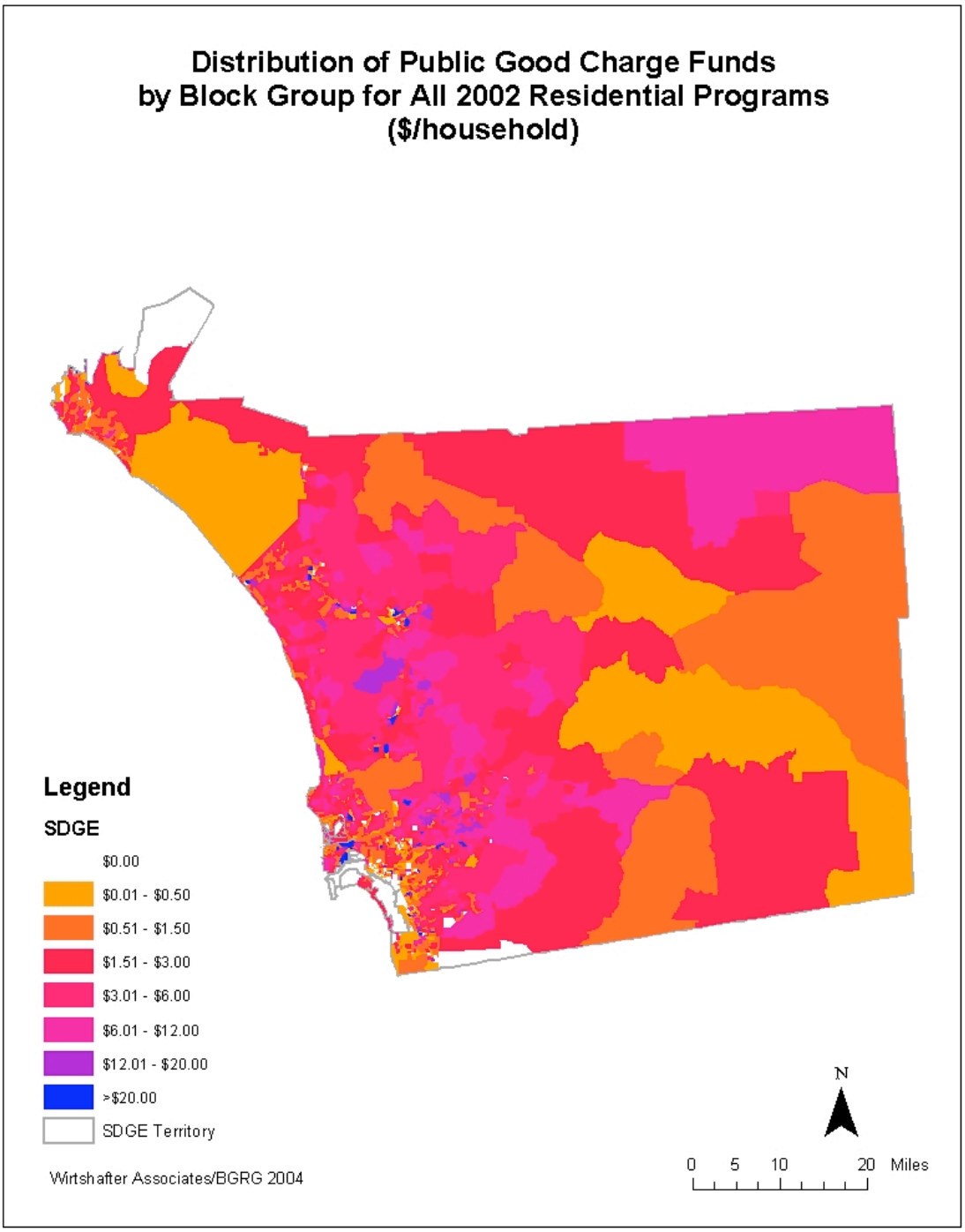


Figure 7-2: Distribution of Rebates for SDG&E in PY2003

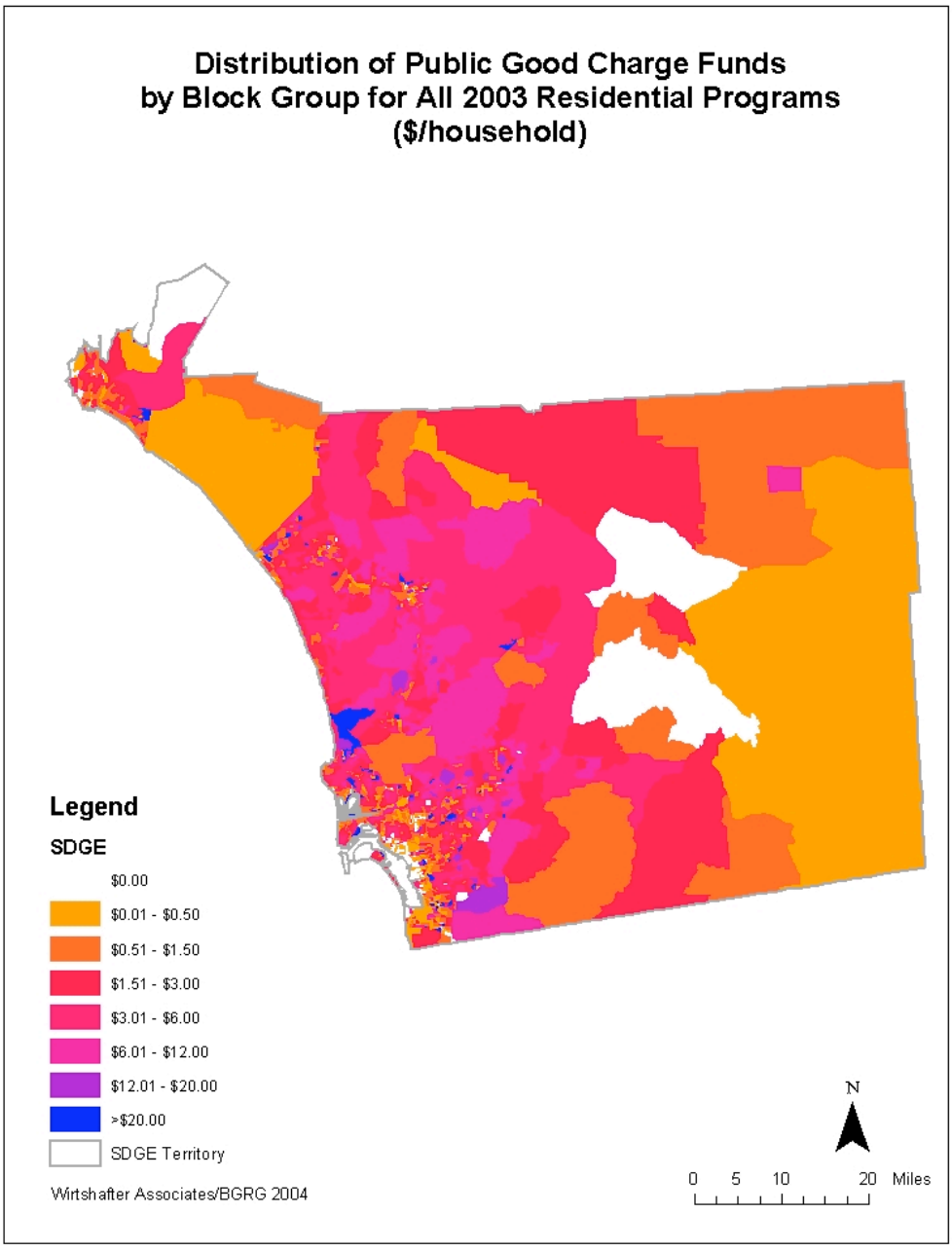


Figure 7-3: Distribution of Rebates for SDG&E in PY2002 and PY2003 Combined

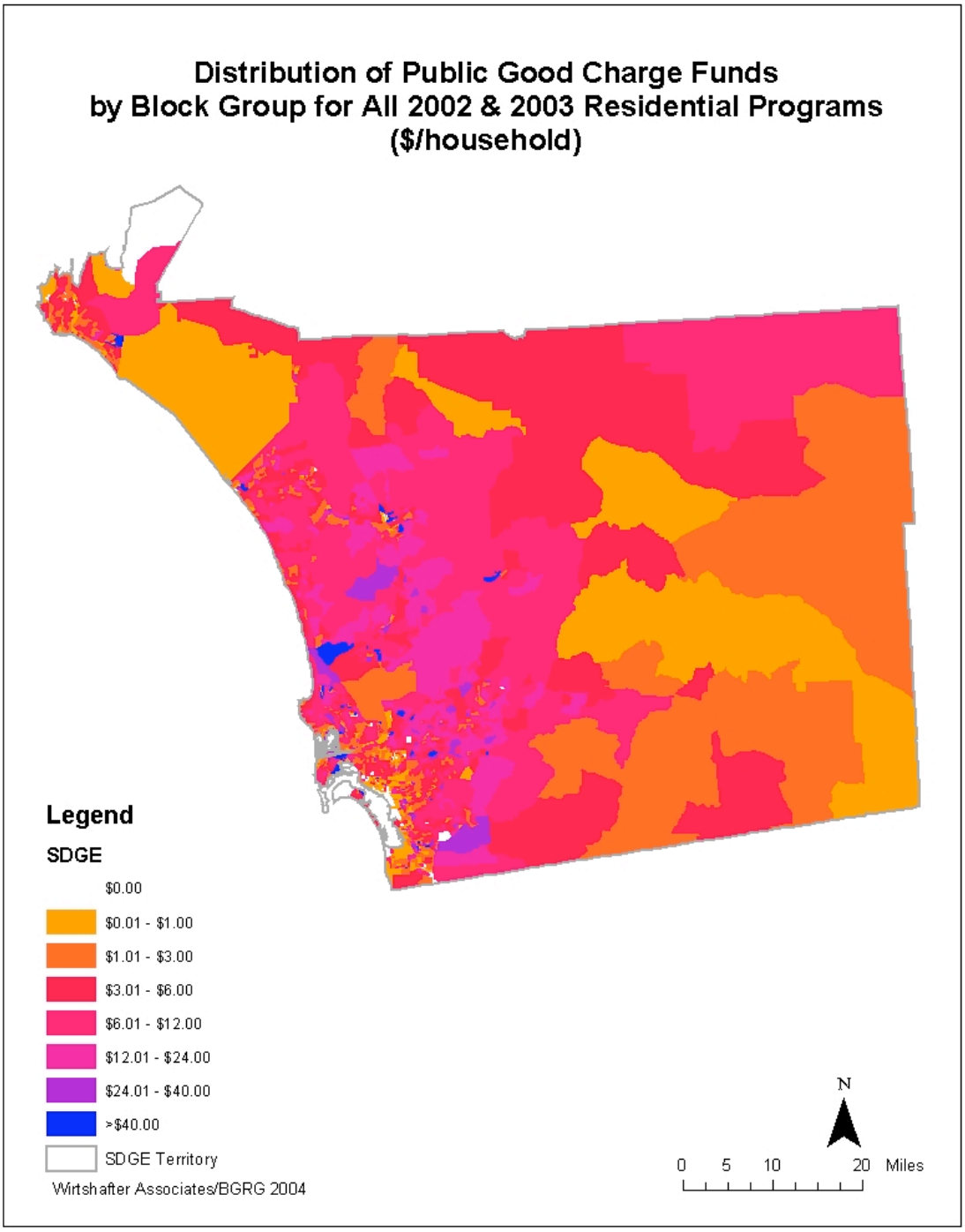
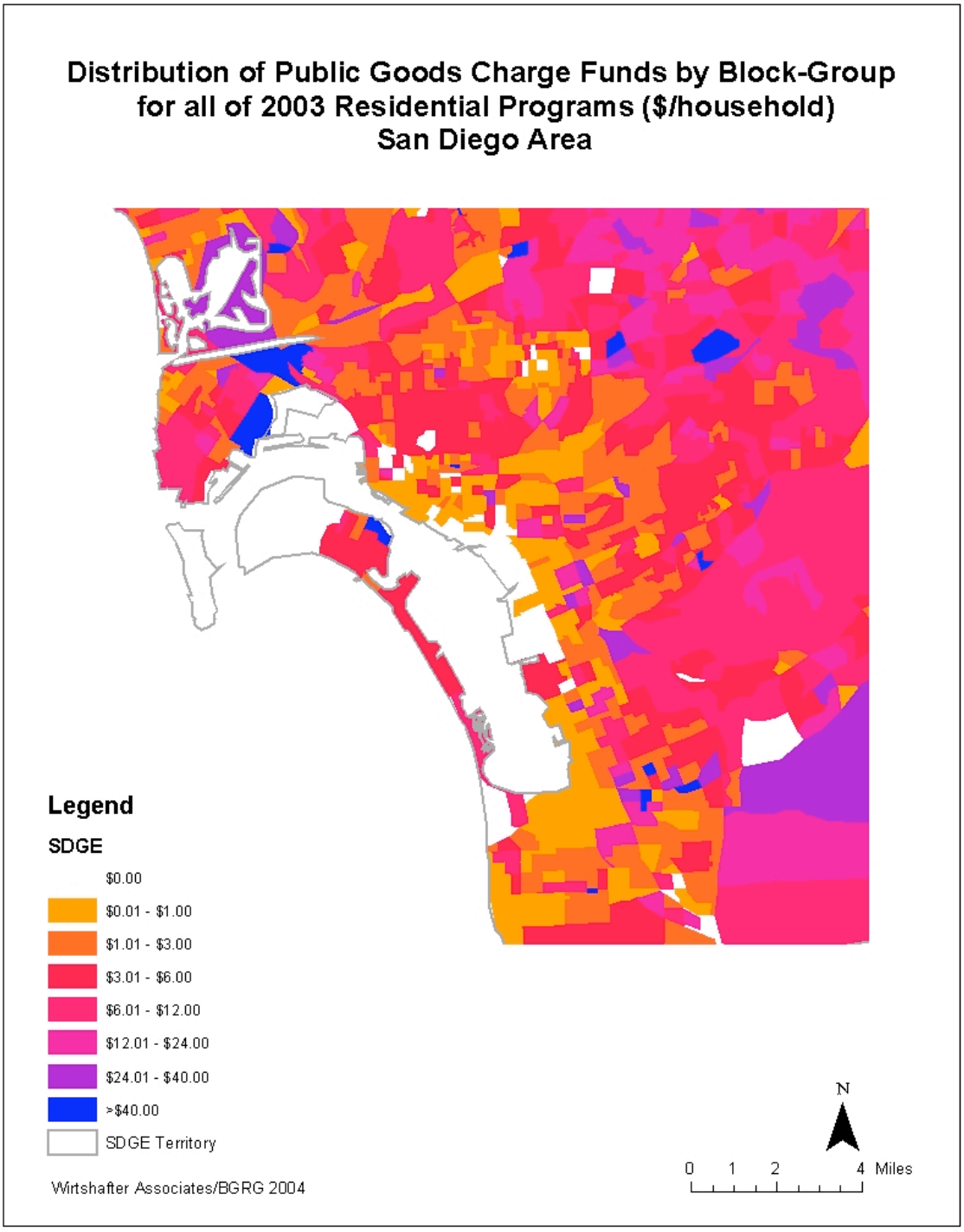


Figure 7-4: PY 2003 Program Activity--Close Up of San Diego Area



We have prepared a second set of maps for SDG&E in which we have included the LIEE dollars. Figure 7-5 through Figure 7-6 show the distribution across the SDG&E territory for PY 2002 and PY2003. It should be noted that there are numerous block-groups where the average household is receiving more than $50 in program benefits per year, while at the same time there are many areas where benefits do not reach $2.00 per household per year.

Figure 7-5: Distribution of Rebates for SDG&E in PY2002 including LIEE Program Benefits

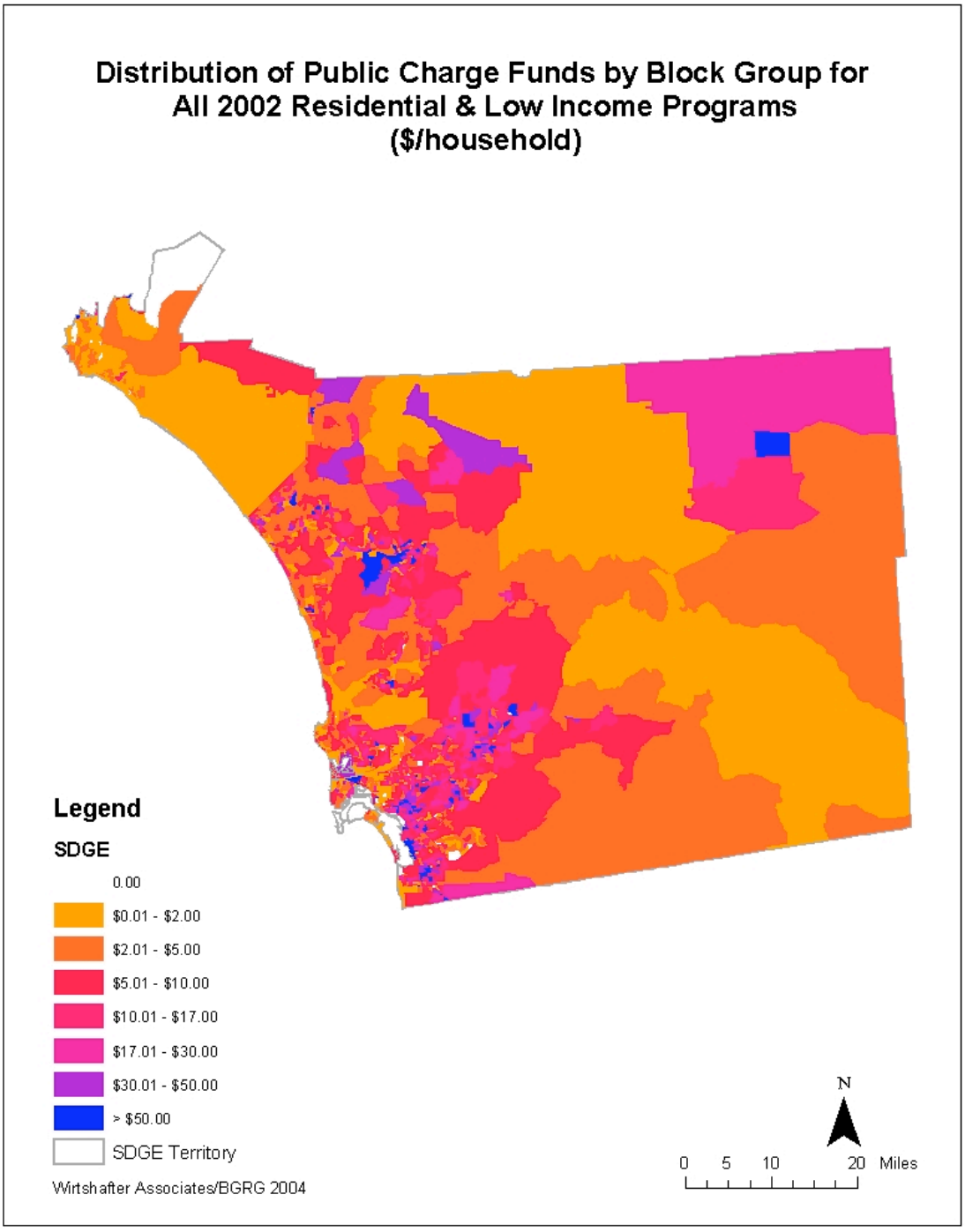


Figure 7-6: Distribution of Rebates for SDG&E in PY2003 including LIEE Program Benefits

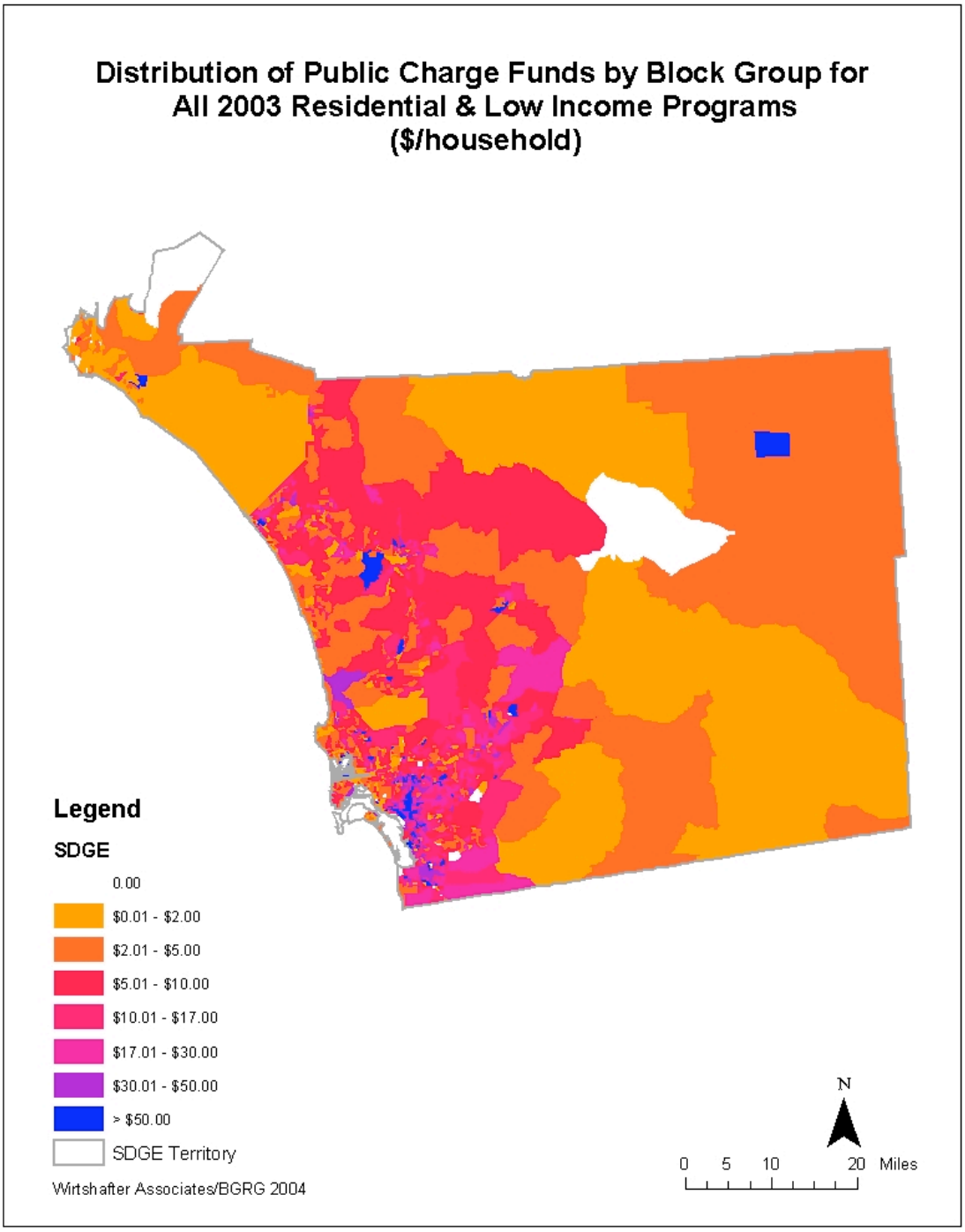


Figure 7-5: Distribution of Rebates for SDG&E in PY2002 including LIEE Program Benefits

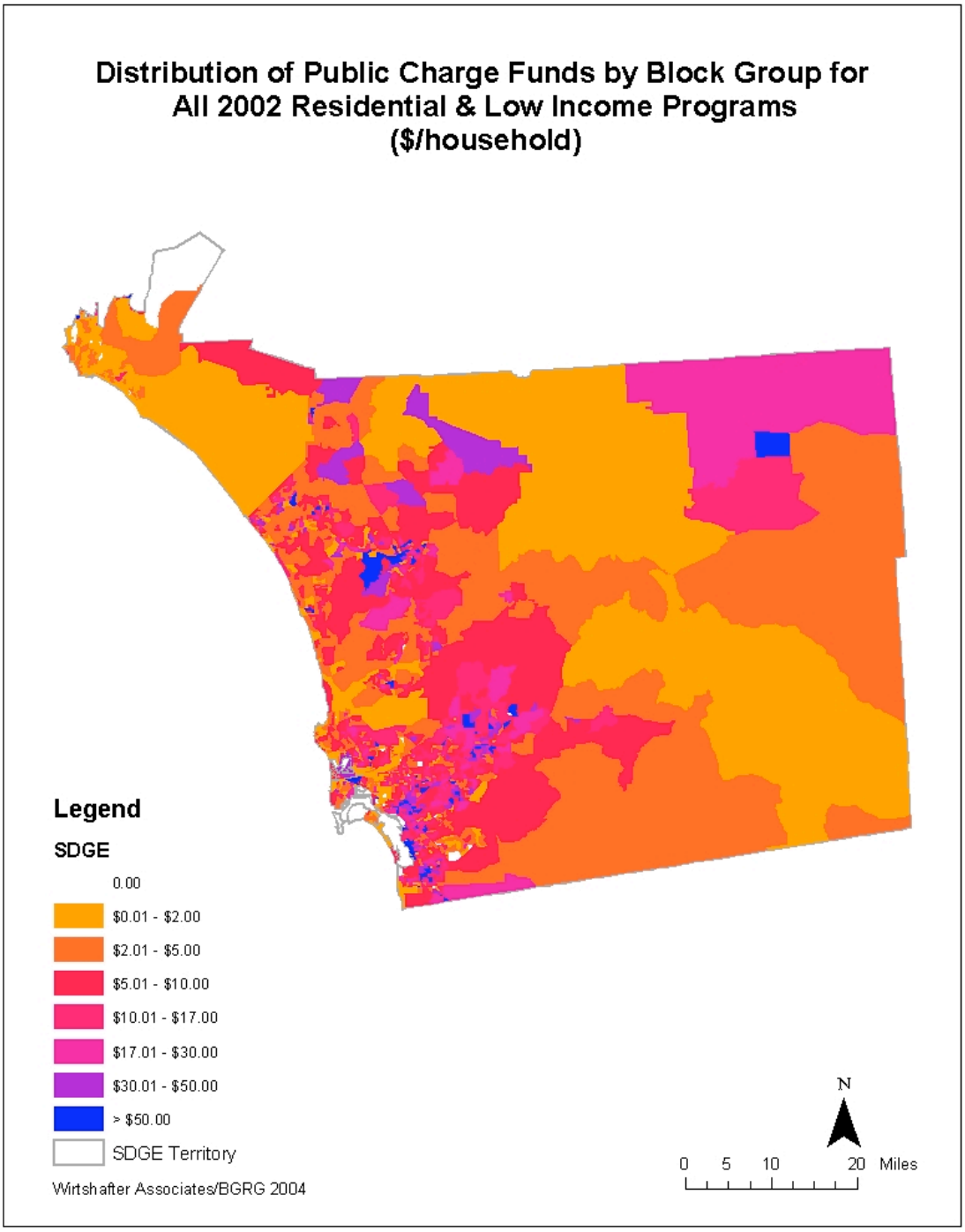
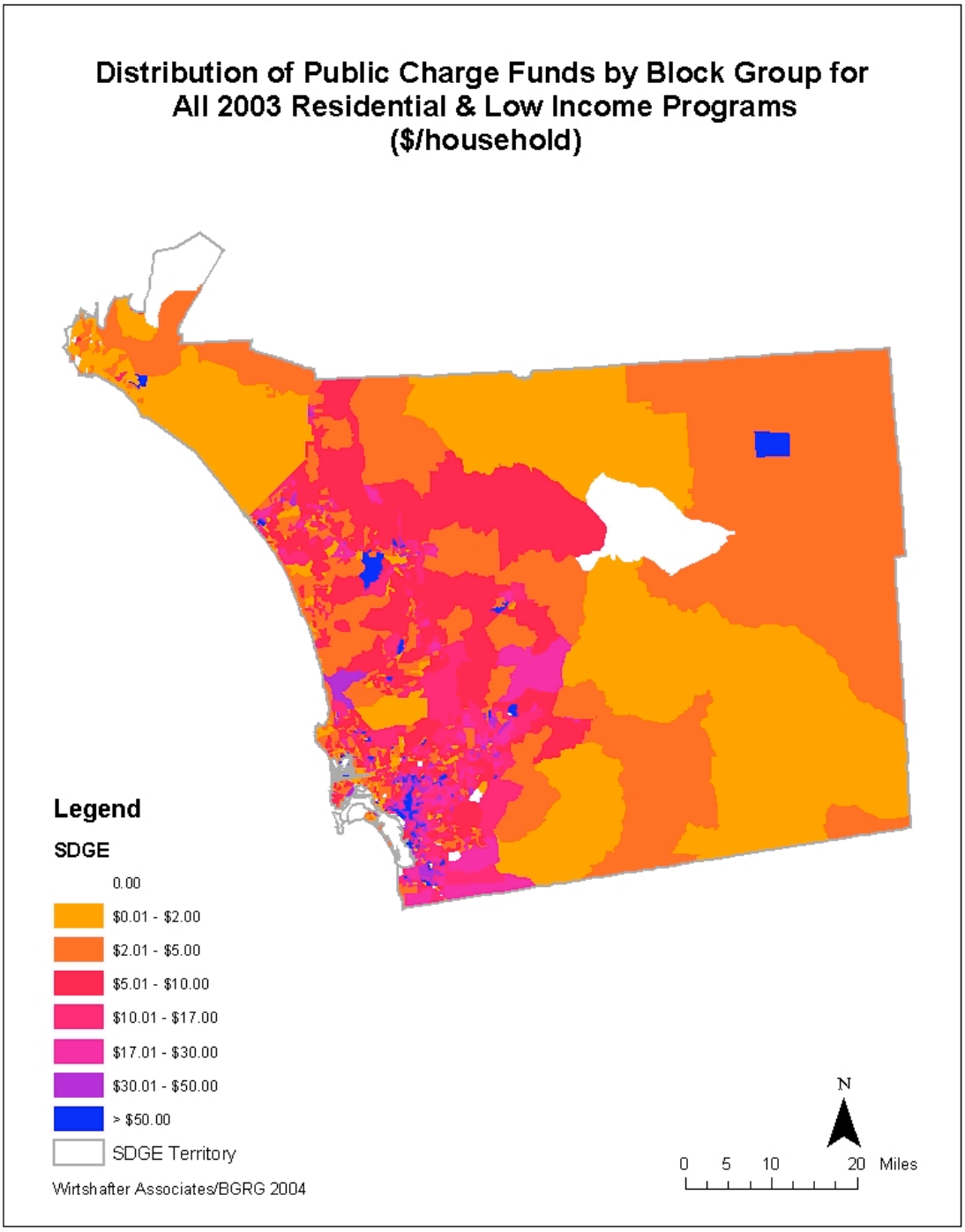


Figure 7-6: Distribution of Rebates for SDG&E in PY2003 including LIEE Program Benefits



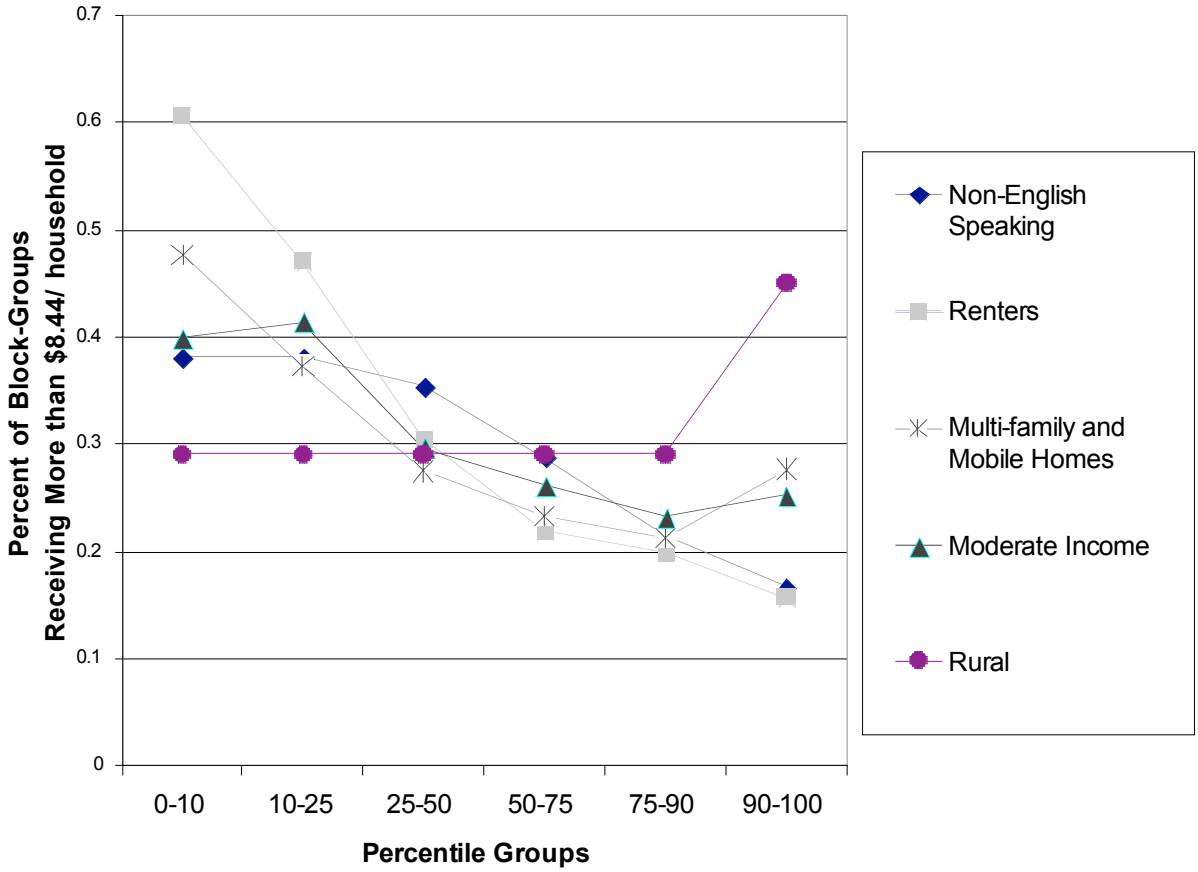
7.2 Examination of SDG&E Block-Groups Receiving Large Fund Amounts

We examined the ends of the distribution to see why some block-groups have so much activity and others have no or little activity. Because SDG&E only has data for two

programs, there were only seven block-groups in SDG&E that received more than $100, and 27 block-groups received more than $50/household. There were 31 block-groups, approximately 0.6 % of the total number of block-groups in SDG&E's territory, at or above $45.26, which is plus two standard deviations above the mean. The list is principally composed of block-groups that received MFRP funds. Only three of the 31 block-groups had large SFEER activity. When the LIEE program data are added to the totals, 241 block-groups push above the $50/household level.

We looked at the composition of the set of block-groups that received more than the mean amount of benefits to see if any characteristics describe this group. Figure 7-7 shows some of the key results for the MFRP and the SFEER, only. This group of 579 block-groups receiving $8.44 or more represents 30% of the total block-groups in SDG&E, yet they receive 92% of the MFRP funds and 55% of the SFEER funds.

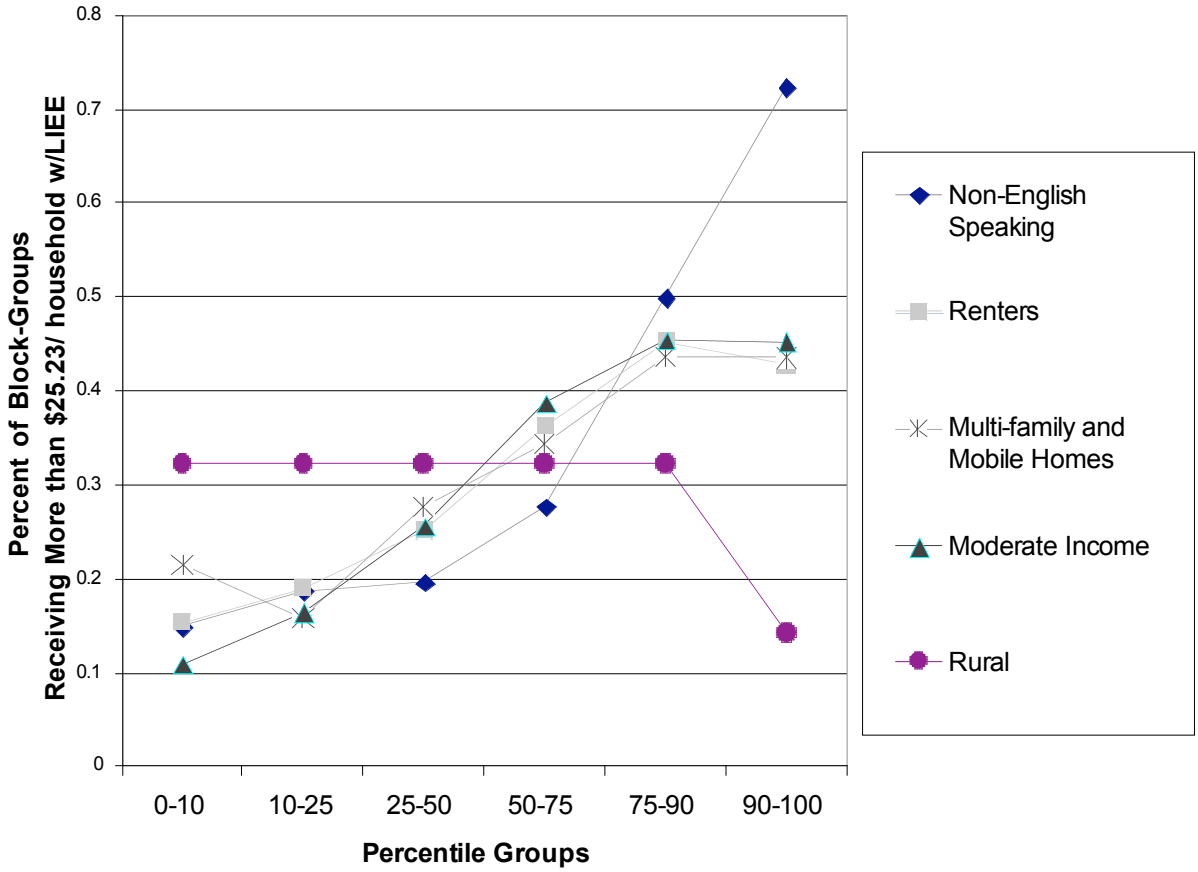
Figure 7-7: The Distribution of Block-groups Receiving More Than $8.44 from 2002-03 at SDGE.



In Figure 7-8, we look at the composition of the set of block-groups that received more than the mean amount of benefits when the LIEE program is included. This group of 594 block-groups that received more than $25.23 represents 31% of the total block-groups in SDG&E, yet they receive 79% of the LIEE funds, 83% of the MFRP funds and 25% of the SFEER

funds. Figure 7-8 shows the effects of adding the LIEE money into the equation. Doing so flips the shape of the distribution from one that favored block-groups with the lowest percentages of homes with HTR household characteristics, to favoring block groups with the most households with HTR household characteristics. Including the LIEE gives a fuller picture of the distribution of PGC funds across the whole residential population.

Figure 7-8: The Distribution of Block-groups Receiving More Than $25.23 from 2002-03 at SDGE with LIEE Included.



7.3 Examination of Block-Groups in SDG&E with Little Program Activity

At the other end of the distribution, 24% of block-groups received average benefits of less than $2.10 per household. There are only 65 block-groups (3%) with no program activity in PY2002 or PY2003. When the LIEE program is included, only 38 block-groups have no activity in either of the two years. Table 7-2 shows the characteristics of these block-groups. For multi-family, renters, and non-English speaking characteristics, the mean percentage for block-groups with no activity is much higher than the mean percentage for all SDG&E block-groups.

Table 7-2: Characteristics of SDG&E Block-groups with No Activity

		Values for Block-groups with No Program Activity					
	All Block-group Mean	Mean	Minimum	Maximum	Percentiles		
					25	50	75
Is in Designated HTR Zip Code	25%	22%	0%	100%	0%	0%	0%
Percent Moderate Income	35%	34%	18%	100%	29%	33%	37%
Percent Multi-family	23%	36%	0%	100%	0%	26%	76%
Percent Non-English Speaking	33%	44%	0%	100%	20%	34%	71%
Percent Renters	41%	66%	0%	100%	32%	81%	98%
Percent Rural	4%	11%	0%	100%	0%	0%	0%
Percent Hispanic*	21%	34%	0%	97%	10%	20%	55%
Percent Low-Income*	20%	26%	8%	45%	16%	27%	37%
Percent Non-White*	28%	37%	0%	86%	21%	32%	58%

*This is not an HTR criterion

For this study, we have selected the value of $2.10/household as benchmark for low activity in SDG&E, representing the 25% of block-groups with the least amount of activity. Figure 7-9 shows the characteristics of the block-groups with less than $2.10 per household in PY2002-03 activity. For the entire SDG&E area, 25% of the block-groups are in the below $2.10 category, while only 15% of the rural households are in the low-activity category.

Figure 7-9: The Distribution of Block-groups Receiving Less Than $2.10 from 2002-03 at SDGE.

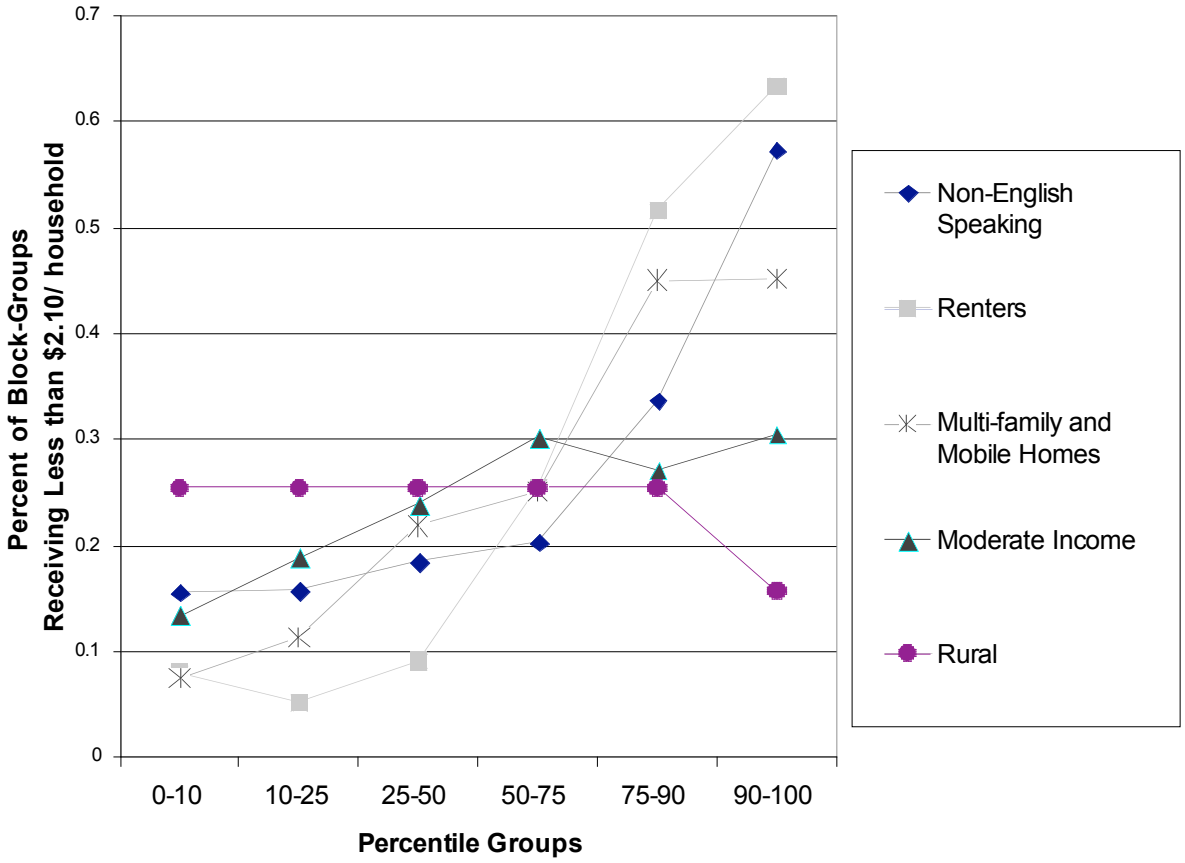
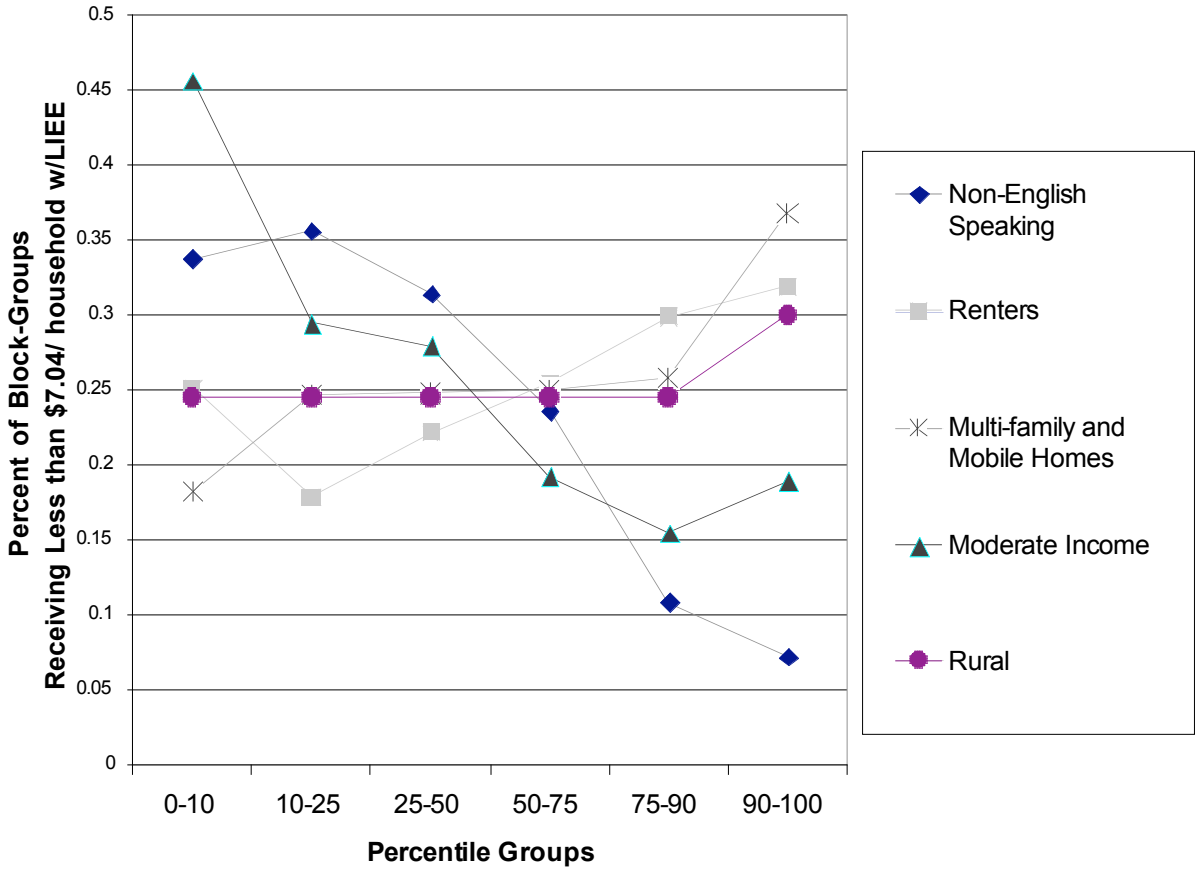


Figure 7-10 shows the distribution of block-groups receiving less than $7.04 when the LIEE funds are added to the amounts from SFEER and MFRP. Almost none (<7%) of the block-groups that are predominantly non-English speaking are receiving less than $7.04 from the three programs. Block-groups with the highest concentration of renters and/or multi-family households are more likely to be below the $7.04 per household cutoff than the average block-group in SDG&E.

Figure 7-10: The Distribution of Block-groups Receiving Less Than $7.04 from 2002-03 at SDGE with LIEE Included.



7.4 Characteristics Associated With Program Activity in the SDG&E Territory

The last step in the process is to determine what factors are associated with block-groups activity. Table 7-3 shows the correlation between Total Funds Received in PY2002-03 versus a number of characteristics that could possibly explain the reason these block-groups are not active. For the entire model with all 1917 block-groups in SDG&E, all of the HTR factors are essentially uncorrelated with the amount of rebate dollars per household.

The first two columns in Table 7-3 include the MFRP and SFEER programs only. In the last two columns, we show the correlations including the LIEE funds. Table 7-3 shows the difference when the LIEE funds are included. Without LIEE funds, it appears as though participation in the residential programs is uncorrelated with most HTR household characteristics. When LIEE funds are included, a weak correlation appears between the penetration of the non-English-speaking households and the amount PGC funds received. The finding that similar correlations exist between the variables of race and income level (both of which are not HTR household characteristics) is not surprising since they are both collinear with the variable of non-English-speaking, The weak correlation between low

income and PGC funds distributed (including both LIEE and residential programs), merely reflects that part of the correlation is due to the fact that the LIEE program funds are being successfully distributed to low income households.

Table 7-3: Correlation of Total Funds Received with Possibly Associated Variables for Block-Group Activity in SDG&E in PY 2002-03

	Pearson Correlation to Funds (without LIEE) per Household in PY 2002-03	Significance	Pearson Correlation to Total Funds (with LIEE) per household in PY 2002-03	Significance
Is in Designated HTR Zip Code	0.078	.001	-0.072	.002
Percent Moderate Income	-0.047	.038	0.134	.000
Percent Multi-family	0.019	.395	0.123	.000
Percent Multi-family and Mobile Home	0.012	.606	0.197	.000
Percent Non-English Speaking	-0.034	.137	0.311	.000
Percent Renter	-0.070	.002	0.167	.000
Percent Rural	-0.016	.493	-0.053	.020
Percent Below 175% of Poverty Level*	-0.106	.000	0.380	.000
Percent Hispanic*	-0.071	.002	0.352	.000
Percent Non-White*	-0.079	.001	0.328	.000

*This is not an HTR criterion.

8. How Accurate Are the Currently-used HTR Designated Zip Codes

Having addressed the broad question of the HTR household characteristics, we now address whether the method used by the utilities to identify which participants are HTR is valid and worth continuing in operation. We address the following issue: ease of use versus its accuracy in determining if a participant is HTR.

By all accounts, the zip code based HTR-designation is easy to use. Each program manager need only look up the zip code in a chart of HTR-designated zip codes to determine if the participant qualifies as HTR. The question is what level of accuracy is achieved by developing such an easy mechanism to use?

Throughout this report, we have seen indications that the HTR-designation is not a very good predictor of whether a block-group receives funds. Table 8.1 summarizes that finding. Table 8-1 shows the distribution of program funds between areas with HTR zip code designation and areas not designated as HTR. For PG&E, the average funding for HTR areas is almost the same as the funding for non-HTR areas. For SCE there are fewer funds provided to HTR-designated areas, while for SCG and SDGE there are more funds provided to HTR-designated areas.

Table 8-1: The Distribution of Program Funds by HTR Designation

UTILITY	HTR Designation	Average $/household for block-groups		
		2002	2003	2002-03
PG&E	Yes	$3.01	$1.38	$4.39
PG&E	No	$3.12	$1.72	$4.84
SCE	Yes	$1.49	$1.06	$2.55
SCE	No	$2.92	$1.55	$4.46
SCG	Yes	$0.40	$0.58	$0.97
SCG	No	$0.34	$0.43	$0.77
SDGE	Yes	$6.17	$4.72	$10.89
SDGE	No	$3.38	$4.23	$7.60
SDGE w/LIEE	Yes	$8.77	$12.39	$21.16
SDGE w/LIEE	No	$14.75	$11.86	$26.60

We test the accuracy of the HTR zip code designation by comparing areas with Census specified high concentrations of HTR characteristics against the IOUs zip code HTR-designation. If the HTR designation is valid, we will see the majority of the block-groups with the highest concentrations of the characteristic as being among those block-groups HTR-designated. Table 8-2 shows this cross-tabulation using the 75% and 90% percentile

cut-offs as the definition for areas with high concentrations of households with an HTR characteristic.

For example, at the 90% cut-off, only those block-groups with more than 40% of households in the moderate-income category are included. This represents the 10% with the highest percentages of households in the moderate-income category. As the figures show, more block-groups with this high concentration of moderate income are not classified as HTR-designated, than there are block-groups in this concentration that are classified as HTR-designated.

In fact, for every criterion except rural, the HTR designation excludes more block-groups with high concentrations of the HTR household characteristics than it includes. Even in the rural case at the 90% cut-off, the HTR-designation process fails to classify 44% of the block-groups that have more than 6.8% of the households living in rural areas.

Table 8-2: Cross-tabulation of HTR-Designation with Block-groups with Highest Concentration of HTR Household characteristics

	75 Percentile Cut-off	Is Block Group in HTR Designated Zip Code			90 Percentile Cut-off	Is Block Group in HTR Designated Zip Code	
		No	Yes			No	Yes
Percent Moderate Income	>37%	4669	4262		>40%	1873	1702
Percent Renters	>69%	5136	3556		>80%	2032	1429
Percent Multi-Family and Mobile Homes	>36%	5318	3448		>61%	2207	1311
Percent Non-English Speaking	>56%	4518	4105		>77%	1717	1763
Percent Rural BG	>1%	1875	2206		>6.8%	1566	1992

*These tables indicate there are more than 35,000 block-groups in the analysis even though California has only 22,000 block-groups. Some block-groups are serviced by more than one of the four IOUs, particularly in the SCE/SCG areas, and are included more than once.

The problem with the zip code level HTR-designation process is not only that it misses areas that have strong HTR household characteristics, but also that it classifies areas with no strong HTR household characteristics as being HTR-designated. In Table 8-3, we create a new variable, "Strong Presence of any HTR Household Characteristic," which determines if a block-group has one or more of the HTR household characteristics. This variable is set to "Yes" if the percentage level of any one of the five HTR household characteristics is above the 75% percentile mark. Block-groups in the "No" Category do not have a single HTR criterion that reaches into the top quarter of all values for that criterion. Yet as Table 8-3 shows, the HTR designation includes 4800 block-groups with no strong presence of a single HTR household characteristic. These 4800 block-groups represent more than 30% of the total block-groups designated as HTR.

Table 8-3: Cross-tabulation of HTR-designation Versus Strong Presence of Any HTR Household Characteristics

		Is Block Group in HTR Designated Zip Code		
		No	Yes	Total
Is there a strong presence of any HTR household characteristic	No	7692	4800	12492
	Yes	12744	10460	23204
	Total	20436	15260	35696

The real strength of the GIS system created for this study is its ability to produce targeted marketing lists for the programs. When coupled with the utility customer data, the GIS can create targeted lists with specific customer addresses. A challenge for this study and GIS technology is to make applications of this type of targeted marketing query as simple as the selection of the customer zip code. The authors suspect that improvements in the GIS software and broader utility billing and marketing applications will drive the development of this type of capability in the very near term.

Figure 8-1: PY2002-03 Program Activity in PG&E HTR Designated Areas

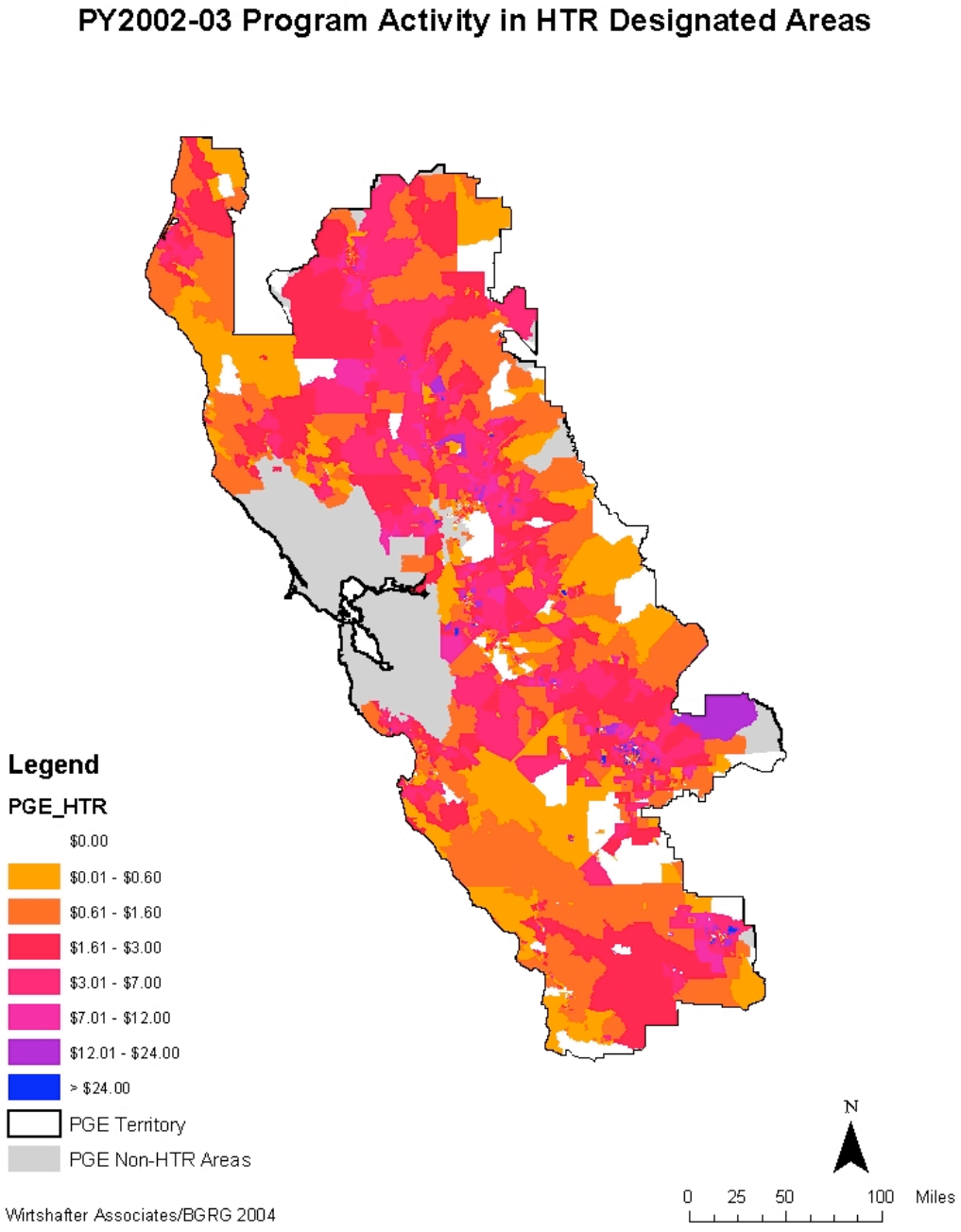
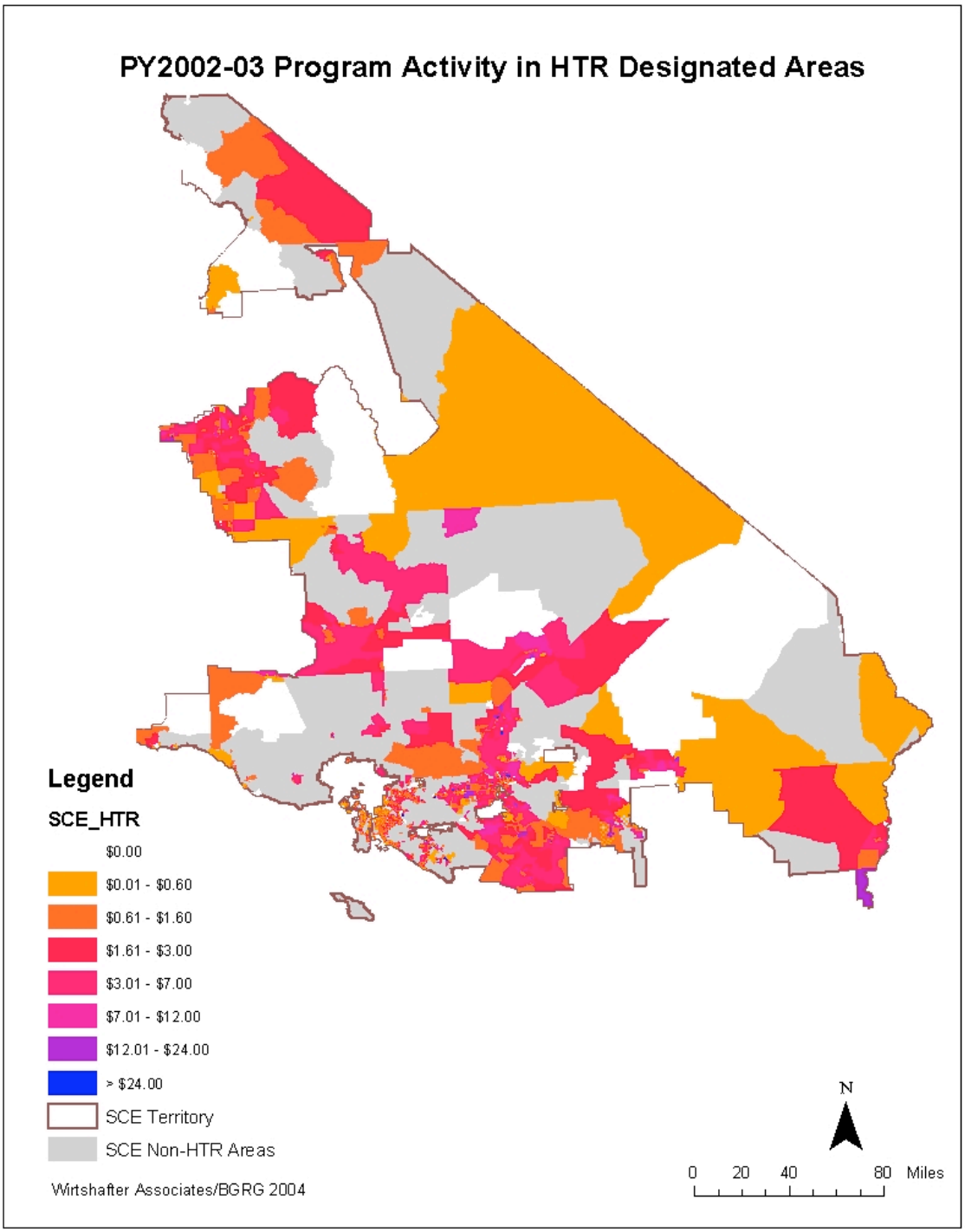


Figure 8-2: PY2002-03 Program Activity in SCE HTR Designated Areas



It is clear that there are areas that are not designated as HTR areas that are not participating in the programs.

Figure 8-3: PY2002-03 Program Activity in PG&E Non-HTR Designated Areas

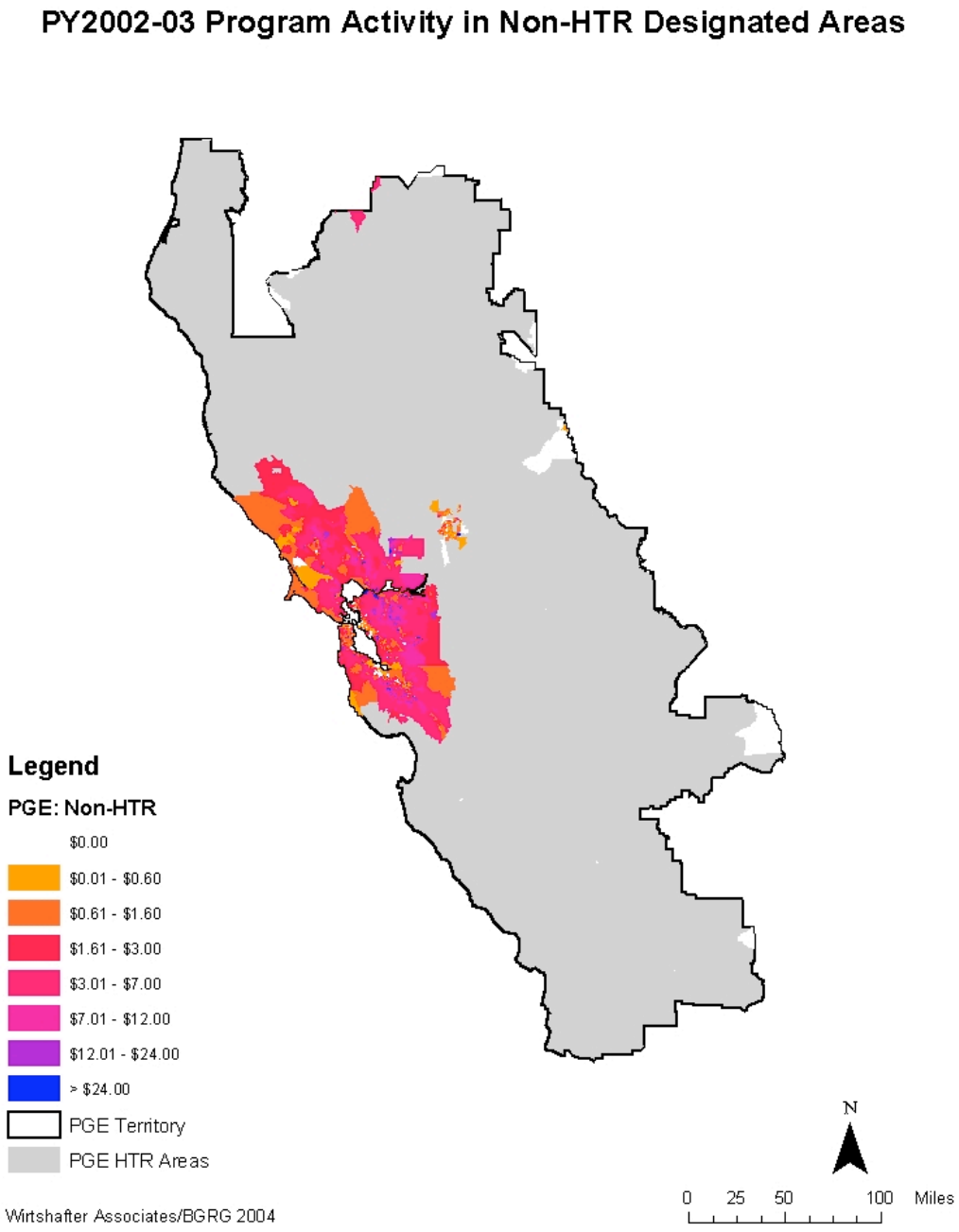
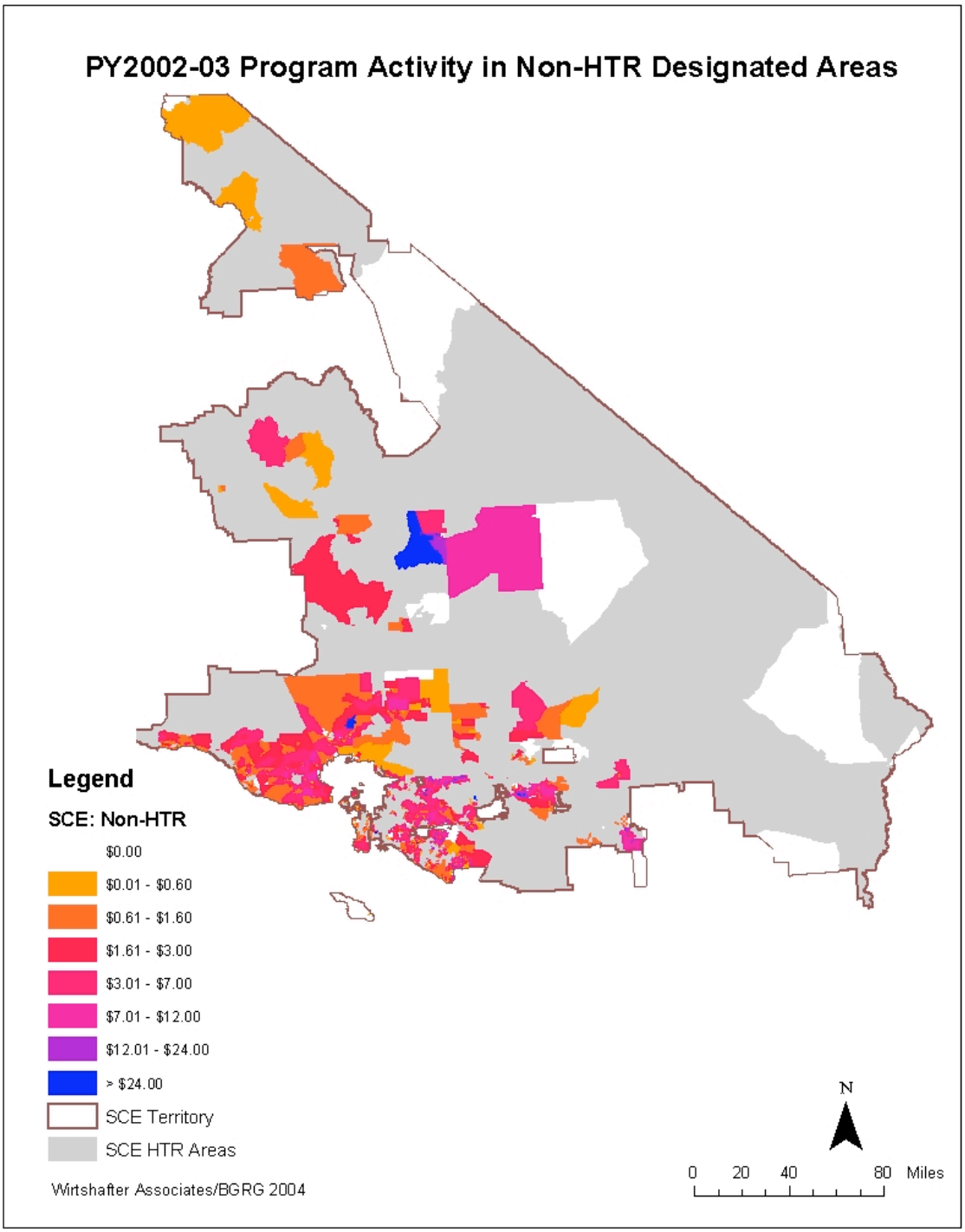


Figure 8-4: PY2002-03 Program Activity in SCE Non-HTR Designated Areas



9. Summary and Conclusion

The focus of this study is to address the following three research issues.

- How well are the Hard-to-Reach (HTR) communities, as they are currently defined by the CPUC, being served?
- Are the HTR, as they are currently defined, still hard to reach?
- Are there other categories of residential customers that should be included in the definition of HTR? How can the research help programs identify those specific areas and demographic types?

The methodology developed to answer these questions uses a GIS system to identify within which Census block-group each participant lives. The methodology then uses the average Census characteristics of the block-group to represent the likely characteristics of each participant. We then aggregate the results for each block group and compare each block-group's performance. With this methodology, we examine the distribution of program activity with respect to each of the five characteristics by which the CPUC has defined HTR customers.

This report is the first attempt to assemble and analyze all of the California Energy Efficiency residential programs as a portfolio. There are a number of caveats we wish to acknowledge regarding the results as they appear in this report.

One limitation of this study results from missing data. We were not able to obtain all of the data that would be ideally used in a study such as this. Ideally, we wanted to track every dollar of PGC funds received by residential customers. Our study is limited to the five statewide programs for which participant data are routinely collected; and even then, we are missing most of the residential new construction program results and a few other data sets from the Residential Appliance Recycling and Home Energy Efficiency Survey programs. In addition, none of the other statewide programs and none of the local programs are represented in this study.

We only examined data from SDG&E's Low-Income Energy Efficiency program. While this is technically separate from the Energy Efficiency initiatives, PGC funds do flow to residential households through the LIEE program because of an overlap between the low-income and the HTR populations.

There is a second limitation to this study that we want all readers to appreciate in interpreting the results. The analysis is done using the composite values for each Census block-group. The Census block-groups are selected by Census to represent as homogeneous a population as possible. In this respect, the Census block-groups are far more homogeneous than the zip codes previously used to define HTR-designated areas. Even so, the values are the composite distribution of each Census-block's characteristics, and not the actual characteristics of the participants. It is possible that all five participants in a block-group with 500 households speak English at home even though the block-group has 50% of the households not speaking English at home. The Census provides aggregate distributions of

characteristics of the block-group and not the detailed responses of each household. For this reason, it is not possible to know how multiple characteristics overlap. For example, the Census might indicate that 20% of a block-group is non-English speaking, and 40% are renters. We do not know what percentage of this block-group are both renters and non-English speaking. Further, the statistics as presented do not explore distinctions between sub-groups of the HTR household characteristics. For example, there is no way to know whether the non-English speaking households being served include Hmong or Swedish families. Examination of some of the larger sub-groups is possible using this methodology; however, it was not the focus of this first study.

Finally, we need to clarify in the reader's mind, the differences we have established between HTR household characteristics and HTR-designated zip codes.

- **HTR household characteristics** refer to households that possess one or more of the five criteria set out by the CPUC as being HTR. These are renters, multi-family and mobile home occupants, non-English speaking households, moderate-income households, and those living in rural areas.
- **HTR designated zip codes** refers\ to the assignment of specific zip codes to be designated as HTR areas. This designation is based on each utility's own approach for determining which areas have the most households with HTR characteristics.

In the previous Chapter, we have demonstrated that at the block-group level there is not always a good match between HTR designated zip codes and block-groups with high concentrations of households with one or more of the five HTR household characteristics.

From the evidence provided above, and the caveats just expressed, we reach the following conclusions.

9.1 How Well Are the Households with Hard-to-Reach Criteria Being Served?

The primary question to be addressed by this study is whether households with one or more of the five HTR household characteristics: multi-family, rural, moderate income, non-English speaking, and renters, are being served by the program.

We conclude that the HTR communities are being served through the energy efficiency programs. If the distribution pattern we found for LIEE in SDG&E applies to the other three utilities, then when the LIEE funds are included, it is clear that a higher proportion of PGC funds are being given to households that are likely to have at least one of the five HTR household characteristics, than are being given to households likely not to have any HTR household characteristics. **We note that while distribution on average is good, there are many communities receiving little or no benefits from these programs**. Communities receiving little or no benefits are slightly more likely to be designated as HTR.

The tables in Chapter Three document that **while some programs are not very good at reaching households with one of the five HTR household characteristics, others, particularly the MFRP are more effective**. Diversity of programs is an important

characteristic of a utility's portfolio if the intent is to reach many different types of customers. Overall, within the efficiency programs, block-groups with higher percentages of the HTR households are receiving fewer funds than the block-groups with low percentages of the HTR households. However, when the LIEE funds are added to the mix in the SDG&E case, significantly higher amounts of funds are being distributed to those block-groups with the most households with HTR characteristics.

9.2 Are HTR Criteria as Defined Still Hard to Reach

In truth, we cannot answer this research question. The specification of the five original HTR characteristics was not based on empirical evidence. Therefore, we have no basis on which to judge past or current status. Because there is no body of evidence documenting the degree to which each of these criteria was HTR, we have no way of knowing if the current conditions are an improvement or slippage from earlier conditions. We are not even in a position to say whether the HTR-designation and individual program efforts to market to these customers have made an appreciable difference in the number of program participants who have at least one of the five HTR household characteristics.

Having said this, it is clear that some areas of the state with large concentrations of households with HTR household characteristics are receiving significant PGC funds. This is particularly the case in SDG&E when LIEE funds are added to the analysis. Yet, just because these groups are being served by the programs does not mean that they are not still hard to reach.

The evidence suggests that a diversity of programs aimed at all segments of the residential sector is needed. The MFRP is responsible for bringing a significant amount of resources and energy-efficiency benefits to the multi-family segment. Yet the MFRP has not been successful in reaching the mobile home sector for which it is also targeted. This might suggest that additional marketing techniques, modified incentive structures, and even a wholly separate program may be needed to recruit interest among the mobile home segment.

9.3 Should Other Categories of Residential Customers Be Classified HTR

While some areas with high concentrations of HTR households have experienced large participation rates, there are other areas of the state with similar concentrations of households with HTR characteristics where little or no PCG funds have been received. Unfortunately, we are not able to explain fully why these differences occur. One reason is the lumpiness of some programs, particularly new construction and multi-family where large chunks of funds are given to one project. Under these circumstances, there is an unavoidable appearance of feast or famine with respect to participation level.

This study has found that some low activity is structural in nature. A multi-family program will not be successful in recruiting rural households, nor will a single-family rebate program geared to homeowners attract renters. No amount of marketing and recruitment support can produce participants in areas where there are few eligible households. This finding suggests

that a diversity of programs geared to specific markets is required. As data such as produced here become available, new targets requiring modified strategies will emerge.

Other low activity may be due to spatial factors. Word of mouth contact, the driving force for many of these programs, is likely to spread in areas already involved in the program, rather than jump to new areas. Some programs, such as MFRP rely on builders or contractors to supply services. The supply of participant contractors is a factor in why some areas participate and others do not. (see Wirtshafter et. al, 2000). Contractors when left to there own devices will choose locations near them. The IOUs may want to alter incentive levels to encourage program participation in underserved areas.

CPUC policy has to date ignored location itself as a factor in deciding hard to reach criteria, reasoning that as long as the program is serving HTR households, the non-activity in some areas is not an issue as over time funding will catch up to the areas missed in this round. There are at two good reasons for not ignoring the fact that some areas are receiving little funding. First, the idea that areas will receive their equitable share over time assumes that, in a reasonable period, the program will cover all of those needing its support. This is truly not the case for the MFRP, which services a few percent of the State's multi-family households each year. More importantly, one of the tenets of California's Energy Efficiency efforts has been to promote market transformation by building a delivery infrastructure. If the intent is to build infrastructure, programs need to establish a priority for encouraging adoption in areas where the program has not yet caught on, rather than continuing to support projects in areas that have a demonstrated capability.

At this point in the analysis, we do not identify any new criteria, other than geographic areas with little activity, that warrant inclusion into the HTR household characteristics. However, this study should be thought of as the initial foray into that question.

9.4 Is the HTR-Designation Process Valid and Worth Continuing?

This study also addressed whether reliance on the zip code level HTR targeting used by the utilities is valid and worth continuing in operation. By all accounts, the zip code based HTR-designation is easy to use. Each program manager need only look up the zip code in a chart of HTR-designated zip codes to determine if the participant qualifies as HTR. What seems most clear from our analysis is using the zip code level designation to identify and track the number of HTR participants is bound to be imperfect. This is particularly true because counting every participant household in HTR zip codes as being an HTR household is a likely over-estimate of the number of HTR households that have participated. Let us say for example that ten households participated in zip code X, which is deemed HTR because 60% of the households are in the moderate-income range. We might ignore ecologically fallacy issues and assume that 60% of these ten participant households are HTR, but the current practice of the utilities is not justified to assume 100% of the households are HTR. This over-counting amplifies when the HTR characteristics is the rural designate. Zip codes can be designated HTR rural even if less than 10% of the households fit the Census or Goldsmith criteria. Yet the current counting treats every household treated in that zip code as an HTR household. The PGE approach treats all areas outside of San Francisco and

Sacramento as rural even though large areas inside this area are not rural. At the same time, the same method never counts any participant household in San Francisco as HTR even if a non-English speaking, moderate-income, renter occupies it.

The use of HTR zip codes for program marketing may be acceptable if the IOUs match the program to the characteristics to which they are marketing. Programs geared to rural households can use the RNA results to identify rural zip codes; those marketing to multi-family can identify areas with large numbers of multi-family households. However, using a single metric that combines all five HTR characteristics is unlikely to point the individual programs to the best set of potential households.

The continued use of the HTR zip codes even for marketing is further brought into question given the low degree of accuracy this study has found between areas designated as HTR by the four IOUs and the new Census characteristics measured at the block-group level. As demonstrated in the tables in Chapter 8, the HTR designation both includes many areas that do not appear to have large numbers of households with HTR characteristics, and excludes many areas that do have large numbers of households with HTR characteristics.

9.5 Recommended Changes to HTR Designation

Each utility has established a list of HTR areas based on zip code to which they target programs and on which they measure their success in reaching HTR customers. While this report cannot assess how effective the marketing efforts have been given these target areas, it can assess how useful the current HTR zip code designation scheme is in targeting to customers that are HTR. The current scheme using zip codes is simple to apply, yet crude in its application. Within a zip code, areas that are not really HTR must be included because they are in the HTR zip code. The current zip code designation excludes other areas that have HTR customers.

This study's results do not support the continued use of the HTR-designation process. The designation is too inaccurate to be useful; excluding areas that do have strong HTR household characteristics. It also wrongly assumes that every participant in a HTR-designated zip code has one of the five HTR household characteristics. We recommend the following three parallel actions to be taken by the CPUC and the utilities, to be detailed in the subsequent sections.

- Continue to study actual participant data as done in this study. Done over time, this type of study can identify if existing HTR household characteristics are still valid, and if new criteria need to be established.
- Implement a better means of identifying and tracking which participants are HTR. We recommend that if the five HTR household characteristics are to be continued to be tracked that they be done so at the more accurate block-group level.
- Continue to require program evaluations to survey a sample of participants to determine if the participants' characteristics match those predicted from this analysis.

9.5.1 Continue to Study Participation Data over Time to Establish a Dynamic Definition of HTR.

This study suffers from a lack of previous information regarding program participation, however, it serves well as the first iteration of what should be an exercise performed at repeated intervals. What this study was able to accomplish is to look at actual participation records in the light of Census geography-based data to help determine HTR achievements for five energy efficiency programs. By repeating this exercise, we can see trends in participation, not just a single snapshot at one point in time.

As we continue to accumulate participation data, we should redefine the designated HTR areas to reflect actual participation records. As such future studies become available, the utilities and CPUC should be prepared to refine further the definition of HTR. For example, it may be appropriate to redefine the HTR household characteristics from non-English speaking to households speaking specific languages. As the refinement continues, we could also expect the unit of analysis to move to the Census block level for the geographical designation of HTR segments.

The issue of whether this HTR zip code designation should be based on just the Energy Efficiency programs or also should include LIEE is a subject for exploration in future studies. In addition, the CPUC may wish for the topic of equity to be defined and explored.

As the energy efficiency efforts continue, the HTR issue should become even more important. This is not only for equity considerations, but also for efficiency as these un-served household have untapped potential no longer found among the previously treated. Inn addition, moving from a static geographical designation of HTR to one based more on actual performance forces the utilities to identify real barriers facing HTR non-participants. We were not able to delve too deeply into the causes for low activity, but if utilities look closely at specific areas they may determine that it may be a specific language barrier or contractor access that is limiting participation. Armed with such information, they will be more able to develop a specific targeted strategy for those geographical areas.

9.5.2 Implement a Better Means of Identifying Which Potential Participants Are in the HTR Target Market

The GIS system set up as part of this study should be used to provide a more accurate means of identifying which areas are HTR. Depending on the level of commitment and funding, this could be presented in a number of forms. As part of this study, we have generated a set of maps that designate areas with low participation where penetration of households with at least one of the five HTR household characteristics is above the 75 percentile for that service territory. The utilities can use these maps in several ways to target program activity, and should the CPUC agree count HTR activity in these identified areas as well.

For very little money, it is also possible to develop a web site where detailed maps can be referenced and printed. Program managers would be able to enter a street address or a zip+4 code and immediate identify whether the household falls into an HTR block-group. They would also be able to create custom maps at the desired scale to view an area for which they wish to create a specialized marketing plan.

9.5.3 Continue to Require Program Evaluations to Survey a Sample of Participants

This Study can identify the probable characteristics of participants. However, the potential for ecological fallacy exists, so that actual participants may not have the same characteristics as the probabilistic distributions suggest. Market barriers could potentially exist that prevent some household types from not participating fully. For this reason, we note that it is still important for program evaluations to be able to identify the characteristics of actual participants. In most cases, this will still require that programs survey a sample of their actual participants.

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