EVERGREEN ECONOMICS

Needs Assessment for the Energy Savings Assistance and the California Alternate Rates for Energy Programs

Volume 2: Detailed Findings

Final Report

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Table of Contents

This document is Volume 2 (Detailed Findings Report) of the Needs Assessment study that Evergreen Economics conducted for the Energy Savings Assistance (ESA) and the California Alternate Rates for Energy (CARE) programs for the joint California investor-owned utilities (IOUs).

This volume contains the following sections:

- Section 4: Low-Income Population and Program Characterization
- Section 5: Low-Income Population Needs and Program Assessment

The study report contains three volumes. Volume 1 is the Summary Report and Volume 3 is the Technical Appendix.

4 Low-Income Population and Program Characterization

This section characterizes the state of California's low-income (LI) population, and measures and savings potential for the ESA program. First, we estimate the eligible population for the CARE and ESA programs in Section 4.1. Next, we characterize cumulative CARE and ESA participation and estimate 2012 program penetration in Section 4.2. In Section 4.3, we present an updated characterization of the LI population including demographics and home and equipment characteristics. In Section 4.4, we discuss the ESA program measure eligibility and provide current energy savings estimates by measure category. Finally, in Section 4.5 we discuss how much of the data in this section could be used to inform questions about the remaining ESA program energy savings potential, identify caveats to using the available data and recommend research that could be conducted to fill critical data gaps.

4.1 Eligible Population for CARE and ESA

We used Athens Research data, introduced in Section 3.4 above, to generate the eligible population for both the 2012 CARE and ESA programs. Athens Research produced estimates for the California IOUs based on analysis of Census and other data sources. As shown in Table 1 and Table 2, Athens Research produced estimates of the total number of households that are technically eligible for each program, followed by the number and percent of households that meet certain thresholds of federal poverty levels. Currently, both CARE and ESA are using 200 percent of the federal poverty level (the fourth columns in the tables below) to be income-eligible for the programs. Statewide, 32 percent (4.1 million households) are technically and income-eligible for the CARE and ESA programs.

Table 1: CARE Eligible Population Estimates for IOUs (2012)

	Total Households Technically Eligible for CARE[1]	CARE Eligible Households				Percent of Total Households Eligible for CARE			
		175% of Poverty	200% of Poverty	225% of Poverty	250% of Poverty	175% of Poverty	200% of Poverty	225% of Poverty	250% of Poverty
Statewide[2]	12,811,083	3,597,993	4,148,934	4,668,707	5,163,877	28%	32%	36%	40%
PG&E (total)	5,246,113	1,361,181	1,574,844	1,782,675	1,978,906	26%	30%	34%	38%
PG&E (electric and gas)	3,269,167	809,149	934,939	1,058,830	1,174,837	25%	29%	32%	36%
PG&E (electric only)	1,183,408	328,958	380,410	430,133	476,620	28%	32%	36%	40%
PG&E (gas only)	793,538	223,073	259,495	293,713	327,448	28%	33%	37%	41%
SCE	4,379,538	1,214,701	1,413,367	1,599,507	1,777,677	28%	32%	37%	41%
SCG	5,393,233	1,545,847	1,787,455	2,009,173	2,224,406	29%	33%	37%	41%
SDG&E (total)[3]	1,246,898	303,793	351,607	397,987	442,194	24%	28%	32%	36%
SDG&E (electric accounts)	1,246,898	303,793	351,607	397,987	442,194	24%	28%	32%	36%
SDG&E (gas accounts)	838,523	202,514	234,813	266,275	296,395	24%	28%	32%	35%

[1] Technical eligibility refers to household eligibility based on the home metering arrangement, irrespective of other eligibility requirements. The CARE and ESA programs have different technical eligibility requirements for sub-metered and master metered households. Master metered, sub-metered and individually metered households are technically eligible for the ESA program. Only sub-metered and individually metered households are eligible for the CARE program. Athens Research cannot distinguish differences in technically eligible households at the statewide level but do provide this distinction for each utility.

[2] The statewide estimates of eligible households for CARE (Table 17) and ESA (Table 18) are equal. The Athens Research statewide estimates are developed by aggregating third party vendor data for all regions of California including areas served by non IOU utilities. Unlike the utility specific estimates, this data does not make the distinction between households technically eligible for ESA and the smaller number technically eligible for CARE. This results in the same number of households technically eligible for both programs in the statewide results.

[3] The SDG&E total is based on electric tariff counts.

Source: 2012 data developed by John Peterson of Athens Research under subcontract to the IOUs.

Table 2: ESA Eligible Population Estimates for IOUs (2012)

	Total Households Technically Eligible for ESA[1]	ESA Eligible Households				Percent of Total Households Eligible for ESA			
		175% of Poverty	200% of Poverty	225% of Poverty	250% of Poverty	175% of Poverty	200% of Poverty	225% of Poverty	250% of Poverty
Statewide[2]	12,811,083	3,597,993	4,148,934	4,668,707	5,163,877	28%	32%	36%	40%
PG&E (total)	5,767,701	1,523,992	1,758,164	1,986,244	2,200,969	26%	30%	34%	38%
PG&E (electric and gas)	3,533,851	885,098	1,020,618	1,154,003	1,278,602	25%	29%	33%	36%
PG&E (electric only)	1,010,746	285,079	330,480	374,234	415,183	28%	33%	37%	41%
PG&E (gas only)	1,223,104	353,815	407,066	458,006	507,184	29%	33%	37%	42%
SCE	4,408,691	1,225,731	1,425,901	1,613,339	1,792,693	28%	32%	37%	41%
SCG	5,970,138	1,759,003	2,027,605	2,273,100	2,511,005	30%	34%	38%	42%
SDG&E (total)[3]	1,261,216	308,534	356,943	403,916	448,645	25%	28%	32%	36%
SDG&E (electric accounts)	1,261,216	308,534	356,943	403,916	448,645	25%	28%	32%	36%
SDG&E (gas accounts)	904,151	224,208	259,173	293,234	325,642	25%	29%	32%	36%

[1] Technical eligibility refers to household eligibility based on the home metering arrangement, irrespective of other eligibility requirements. The CARE and ESA programs have different technical eligibility requirements for sub-metered and master metered households. Master metered, sub-metered and individually metered households are technically eligible for the ESA program. Only sub-metered and individually metered households are eligible for the CARE program. Athens Research cannot distinguish differences in technically eligible households at the statewide level but do provide this distinction for each utility.

[2] The statewide estimates of eligible households for CARE (Table 17) and ESA (Table 18) are equal. The Athens Research statewide estimates are developed by aggregating third party vendor data for all regions of California including areas served by non IOU utilities. Unlike the utility specific estimates, this data does not make the distinction between households technically eligible for ESA and the smaller number technically eligible for CARE. This results in the same number of households technically eligible for both programs in the statewide results.

[3] The SDG&E total is based on electric tariff counts.

Source: 2012 data developed by John Peterson of Athens Research under subcontract to the IOUs.

4.2 CARE Enrollment and ESA Participation

We used IOU reports combined with the previous LINA study to generate annual CARE enrollment and ESA participation estimates from 1993 to 2012. The IOUs have ramped up enrollment in the CARE program over time, as shown in Table 3 below, reaching a peak during the last two to three years. As discussed previously in Section 2.1.1, the CPUC set a 90 percent penetration goal for the CARE program in Decision 08-11-031. The IOUs achieved that goal in 2011 and 2012 across the IOU service territories.

Table 3: Summary of Annual CARE Program Participation by IOU (1993-2012)

Year	PG&E	SCE	SCG	SDG&E
1993	328,491	326,526	441,831	111,510
1994	350,605	414,828	610,170	103,672
1995	344,149	455,188	737,410	111,218
1996	317,998	466,296	673,553	129,831
1997	282,701	491,045	614,942	119,508
1998	257,945	507,188	533,362	120,548
1999	284,276	496,271	519,511	123,137
2000	350,194	542,175	549,158	145,764
2001	545,175	729,367	655,446	151,121
2002	731,107	817,637	790,592	170,815
2003	812,204	899,148	957,602	181,028
2004	900,264	977,760	1,049,767	193,524
2005	1,037,618	972,188	1,148,334	203,292
2006	1,133,663	1,055,710	1,264,264	220,010
2007	1,107,733	1,024,148	1,332,614	229,759
2008	1,136,237	1,104,556	1,435,938	241,196
2009	1,351,415	1,235,123	1,560,543	269,517
2010	1,499,942	1,381,109	1,720,017	296,430
2011	1,532,692	1,437,537	1,716,495	308,596
2012	1,491,413	1,402,052	1,649,360	309,605

Sources: LINA Study (KEMA 2007) for data through 2006, IOU ESA and CARE Annual Reports for data from 2007-2011, and IOU ESA and CARE Monthly Reports for 2012 data.

Table 4 below presents CARE annual program participation by small multi-jurisdictional utilities (SMJUs). Program participation increased over the last few years for the SMJUs, in conjunction with similar increases achieved by the IOUs.

Table 4: Summary of Annual CARE Program Participation by SMJU (2003-2011)

	Alpine Natural Gas	Bear Valley Electric	PacifiCorp	Sierra Pacific	Southwest Gas	West Coast Gas
2003	23	1,569	3,336	1,108	22,576	40
2004	26	1,559	4,445	1,277	25,487	45
2005	31	1,302	5,346	1,507	32,200	38
2006	38*	1,059	7,576	1,604	38,939	34
2007	??	1,062	8,917	2,364	37,266	41
2008	??	1,477	10,500*	2,496*	??	46*
2009	68	2,181	9,149	3,147*	??	50*
2010	??	2,405	10,224	3,023	50,888	54*
2011	??	2,599	10,442	2,889*	53,804	58*

*Estimates.
Sources: LINA Study (KEMA 2007) for data through 2006, 2007 – 2011 data from the Low Income Oversight Board website (www.liob.org/documents).

Table 5 below presents annual IOU ESA program participation from 1994 through 2012. The IOUs ramped up participation for ESA during the same timeframe that the CARE program experienced increased enrollment. As described previously in Section 2.1.2, the IOUs were responding to the long-term vision of the ESA program outlined in the state's Strategic Plan: to have 100 percent of all eligible and willing LI customers receive all cost-effective ESA program measures by 2020. CPUC Decision 12-08-044, which approved the 2009-2011 program cycle, set ESA participation goals equal to one-third of the remaining untreated homes (1,093,442 homes). The expectation was that the IOUs would treat the remaining two-thirds of untreated homes in the next two program cycles. The IOUs treated 303,396 homes in 2012, 83 percent of the 364,481 projected for that year by the CPUC.

Table 5 shows annual average and cumulative participation counts during the entire period and also for the period 2002-2012. The year 2002 is being used as a baseline from which to measure cumulative ESA participation and penetration towards the state's Strategic Plan goal. During the period 2002-2012, the IOUs treated 2,444,679 homes.

Table 5: Summary of Annual ESA Program Participation by IOU (1994-2012)

Year	PG&E	SCE	SCG	SDG&E
1994	42,189	95,896	16,075	9,453
1995	41,837	42,977	16,327	7,395
1996	45,015	69,236	20,664	9,824
1997	45,033	69,569	21,073	9,931
1998	30,391	68,056	21,686	10,838
1999	40,604	74,694	25,390	10,993
2000	42,038	81,401	22,429	13,660
2001	32,740	85,509	28,457	19,315
2002	56,698	29,685	42,667	14,089
2003	38,631	33,348	46,900	15,706
2004	42,380	37,341	54,221	17,431
2005	52,648	36,419	40,477	11,266
2006	58,250	53,004	36,852	13,965
2007	63,319	44,323	44,048	13,074
2008	61,034	54,635	58,773	20,804
2009	81,308	61,834	83,493	20,927
2010	133,329	121,016	120,358	21,593
2011	128,071	93,771	161,020	22,575
2012	115,229	68,859*	96,893	22,415
Annual Average (1994 – 2012)	60,565	64,293	50,411	15,013
Cumulative Total (1994 – 2012)	1,150,744	1,221,573	957,803	285,254
Annual Average (2002 – 2012)	75,536	57,658	71,427	17,622
Cumulative Total (2002 – 2012)	830,897	634,235	785,702	193,845

*49,026 customers were treated; 68,859 customers were enrolled.
Sources: LINA Study (KEMA 2007) for data through 2006, 2007 – 2011 data from the Low Income Oversight Board website (www.liob.org/documents).

Table 6 below presents annual ESA program participation for the SMJUs, where the data were available. Participation levels are fairly low, but increasing, for most SMJUs.

Table 6: Summary of Annual ESA Program Participation by SMJU (2003-2011)

	Alpine Natural Gas	Bear Valley Electric	PacifiCorp	Sierra Pacific	Southwest Gas	West Coast Gas
2003	n/a	n/a	92	160	843	n/a
2004	14	65	15	119	913	n/a
2005	16	85	70	119	738	n/a
2006	Not available	6	29	84	798	n/a
2007	45*	70	81	150	Not available	n/a
2008	54*	105*	90*	115*	Not available	n/a
2009	Not available	163*	110*	125*	Not available	n/a
2010	Not available	163*	115*	140*	Not available	n/a
2011	Not available	163*	120*	150*	Not available	n/a

* Participation projections from program applications.
n/a=The ESA programs for Alpine Natural Gas and Bear Valley Electric were not in effect until 2004. West Coast Gas does not offer the ESA program.
Sources: LINA Study (KEMA 2007) for data through 2006, 2007 – 2011 data from the Low Income Oversight Board website (www.liob.org/documents).

Table 7 below presents CARE and ESA program penetration rates for 2012, based on a combination of participation and eligibility data presented earlier in this section. These data compare to the 2006 penetration data reported in the previous KEMA LINA study (below in Table 8) for the LIEE program (as the ESA program was formerly known). As shown, both programs have experienced a major increase in penetration rates (doubling for ESA/LIEE and increasing by 22 percent for CARE).

Table 7: Estimates of Annual CARE and ESA Program Penetration (2012)

	CARE Eligible Households (200%)	CARE Participants	Annual CARE Penetration	LIEE Eligible Households (200%)	LIEE Participants	Annual LIEE Penetration
PG&E	1,574,844	1,491,413	95%	1,758,164	115,229	7%
SCE	1,413,367	1,402,052	99%	1,425,901	68,859	5%
SoCalGas	1,787,455	1,649,360	92%	2,027,605	96,893	5%
SDG&E	351,607	309,605	88%	356,943	22,415	6%
Total	5,127,273	4,852,430	95%	5,568,613	303,396	5%

Sources: Participant data from CARE Programs 2012 Annual and Monthly Reports and eligibility data from 2012 data developed by John Peterson of Athens Research under subcontract to the IOUs.

Table 8: Estimates of Annual CARE and LIEE Program Penetration (2006)

	CARE Eligible Households (200%)	CARE Participants	Annual CARE Penetration	LIEE Eligible Households (200%)	LIEE Participants	Annual LIEE Penetration
PG&E	1,601,238	1,133,663	71%	1,868,594	58,250	3%
SCE	1,351,845	1,055,710	78%	1,365,633	53,004	4%
SCG	1,762,569	1,264,264	72%	2,005,118	36,852	2%
SDG&E	335,015	220,010	66%	394,242	13,965	4%
Total	5,050,667	3,673,647	73%	5,633,587	162,071	3%

Source: LINA Study (KEMA 2007).

4.3 Low Income Population Characteristics

This section presents characteristics of the state's LI population[1] as compared to the total population, and by IOU service territory. We also compared characteristics across LI population segments such as by home type and ownership, depending on data availability.

We used a number of sources[2] to develop the estimates in this subsection, which were introduced in Section 3.4:

- 2004 and 2011 ACS/PUMS data, and
- 2013 CLASS data.

Section 7 in this report's appendix presents more detail on these results, including results on weather-sensitive energy-using equipment by climate zone from the 2010 California RASS.

Section 4.3.1 presents the demographic results from the ACS/PUMS data. Section 4.3.2 presents the home and equipment characteristics results from the CLASS data. In each subsection, for each result, we present up to two exhibits. First, we present a table that shows the result for the California population, the overall California LI population and by IOU (for the LI population). For only the demographic data, we provide time series data from 2004 for the

[1] 2004 and 2011 ACS/PUM, CLASS and RASS data households are considered low income if their household income below 200% of Federal Poverty Guidelines. We provide more detail on how this was determined for each data source in section Section 7.1.

[2] As described in more detail in Section 7.1.2, we compared the demographic characteristics of each source's LI sample. We assumed that the ACS/PUMS data were the most reliable, including the most robust sample sizes. We found that the RASS and CLASS LI sub-samples have more homeowners than the PUMS LI sub-sample, with nearly half the sample owning their home compared to 33 percent in PUMS. The CLASS also over-represents households whose primary language is English (this variable was not available for RASS). We did not adjust the RASS and CLASS samples, but we do provide all the home and equipment characteristic results by homeowner versus renter and for households whose members speak Spanish or another non-English language in Section 7.3.

overall state and LI population. Next, we include a chart that highlights any substantial differences that we noted across additional segments of the LI population, including home type and ownership, language and urban versus rural.[3] If we did not find any substantial differences across any segments, we do not include a follow-up chart.

Any differences across segments that we describe in the text are statistically significant[4] unless indicated otherwise.

4.3.1 Demographic Characteristics

We used 2004 and 2011 ACS/PUMS data to describe the California total and California LI population's demographic characteristics. We included 2004 data to allow for comparisons over time.[5] The columns of the first table of each result, and the PUMS sample size, are:

- Percent of California population – 2011 (n=146,280);
- Percent of California population – 2004 (n=43,413);
- Percent of California LI population – 2011 (n=38,293);
- Percent of California LI population – 2004 (n=11,046);
- All remaining columns are for 2011:
    - Percent of PG&E's California LI population (n=16,786);
    - Percent of SCE's California LI population (n=26,033);
    - Percent of SDG&E's California LI population (n=8,052); and
    - Percent of SoCalGas's California LI population (n=26,382).

The segments that we selected within the PUMS 2011 LI sub-sample are home type, home ownership, language and rural versus urban. The specific segments we reviewed, and the PUMS sample size for each segment, are:

- Single-family home occupied by homeowners (n=13,696);
- Single-family home occupied by renters (n=7,850);
- Multi-family homes[6] (n=14,683);
- Mobile homes (n=1,000);
- English-only (n=17,973);

[3] The rural versus urban distinction was available only for the ACS/PUMS data.
[4] We referred to the approximate sampling error estimates for each source (shown in Section 7.1) for PUMS. For the CLASS data, we calculated confidence bounds or referred to standard errors for means for each result noted in the text.
[5] The prior needs assessment study conducted the majority of its primary research with 2004. In Section 5, we make some comparisons to the prior study, so we chose 2004 for the time series data in this section for consistency.
[6] Multi-family homes are defined as any housing structure with two or more units. This differs from the 2007 KEMA study were multi-family homes are defined as housing structures with five or more units. This also differs from the concurrent Cadmus multi-family LI study which also defines multi-family homes as housing structures with five or more units.

- Spanish[7] (n=14,087);
- Other language (n=6,233);
- Urban[8] (n=35,269); and
- Rural (n=3,024).

In selected exhibits, we also include results for the linguistically isolated segment of the population. The ACS defines a linguistically isolated household as a household in which no one in the household of age 14 and over speaks English only or English very well.

For most results, we present a follow-up chart that compares results across one or more of these segments of the LI population, where we identified substantial differences. Sampling error information is provided in Section 7.1.1 and standard errors for means is included in the detailed results in Section 7.2.

Table 9 below shows the distribution of home types for the state as a whole, for the state's LI population, and for the LI population by IOU service territory. About half of LI homes are single-family, a smaller proportion than the total population. PG&E has a larger fraction of single-family LI homes than the other IOUs.

Figure 1 presents the distribution of LI home types within the primary language segments of the population, households that speak primarily English, primarily Spanish or primarily some other non-English language, and the rural and urban segments of the population. There is a slightly higher proportion of LI single-family homes in rural areas and among homes whose primary language is Spanish or English, while there is a lower proportion (39%) of LI single-family homes among linguistically isolated households.

[7] The ACS asks respondents if they speak a language other than English, and if so, what language (allowing one response per household member). The PUMS data includes a household language variable that has rolled up the individual household member data into the household level (allowing one response per household).
[8] The definition of urban and rural is based on county, since that was the lowest geographic area available in the ACS/PUMS that could be associated with a rural or urban designation.. If a home was in a county that was in a metropolitan area with population of 250,000 or greater, the home was considered to be in an urban area. Otherwise it was considered rural. This approach may lead to an under statement of rural residents.

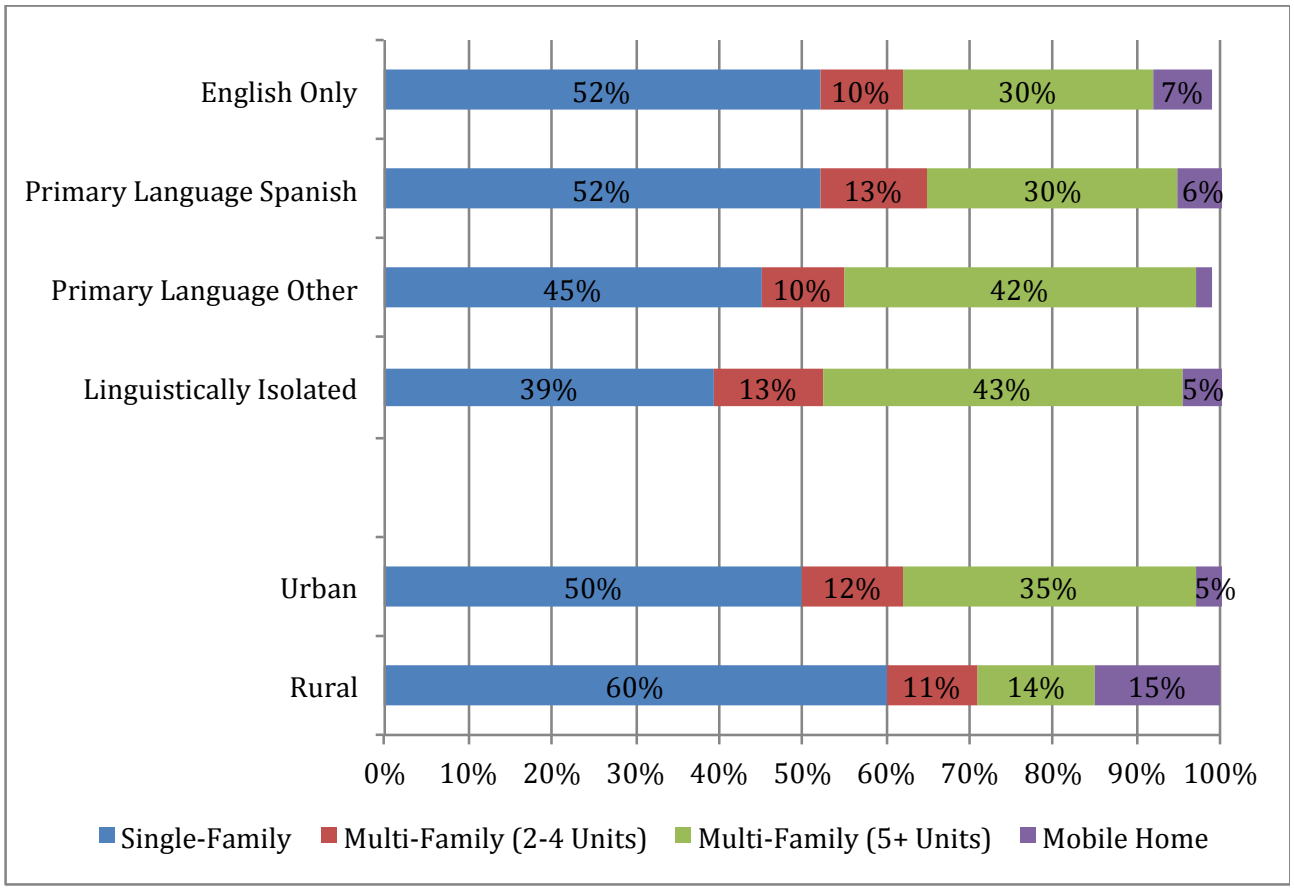
Table 9: Housing Type - By Population and IOU[9]

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Single-Family	66%	66%	51%	49%	55%	51%	45%	50%
Multi-Family (2-4 Units)	8%	8%	11%	12%	13%	11%	10%	11%
Multi-Family (5+ Units)	23%	22%	32%	32%	26%	32%	40%	33%
Multi-Family (Total)*	31%	30%	43%	44%	39%	43%	50%	44%
Mobile Home	4%	4%	6%	6%	7%	6%	5%	6%

* The definition of multi-family homes in this study is a housing structure with 2 or more units. In this table, we provide a sub-total for housing structures with 5 or more units to allow for comparison with the 2007 KEMA Low Income Needs Assessment and the concurrent Cadmus LI multifamily study.
Sources: 2004 and 2011 PUMS.

[9] We compared our estimates to the Multifamily LI Study being concurrently conducted by Cadmus, and found that our statewide estimate of the percent of LI households that are in multi-family homes with 5+ Units is within 1 percent. The IOU estimates are within 2 percent for all IOUs but SCE, where we are within 5 percent. We used ACS/PUMS as did Cadmus, however they used both the 3-year and 5-year data, while we used only 3-year data. Each team used a slightly different approach to access the data for LI households by geographic segments such as IOU service territories. Our results are estimates with associated error, and we believe that the two sets of results are consistent and differences are within expected error bounds.

Figure 1: Housing Type - By Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

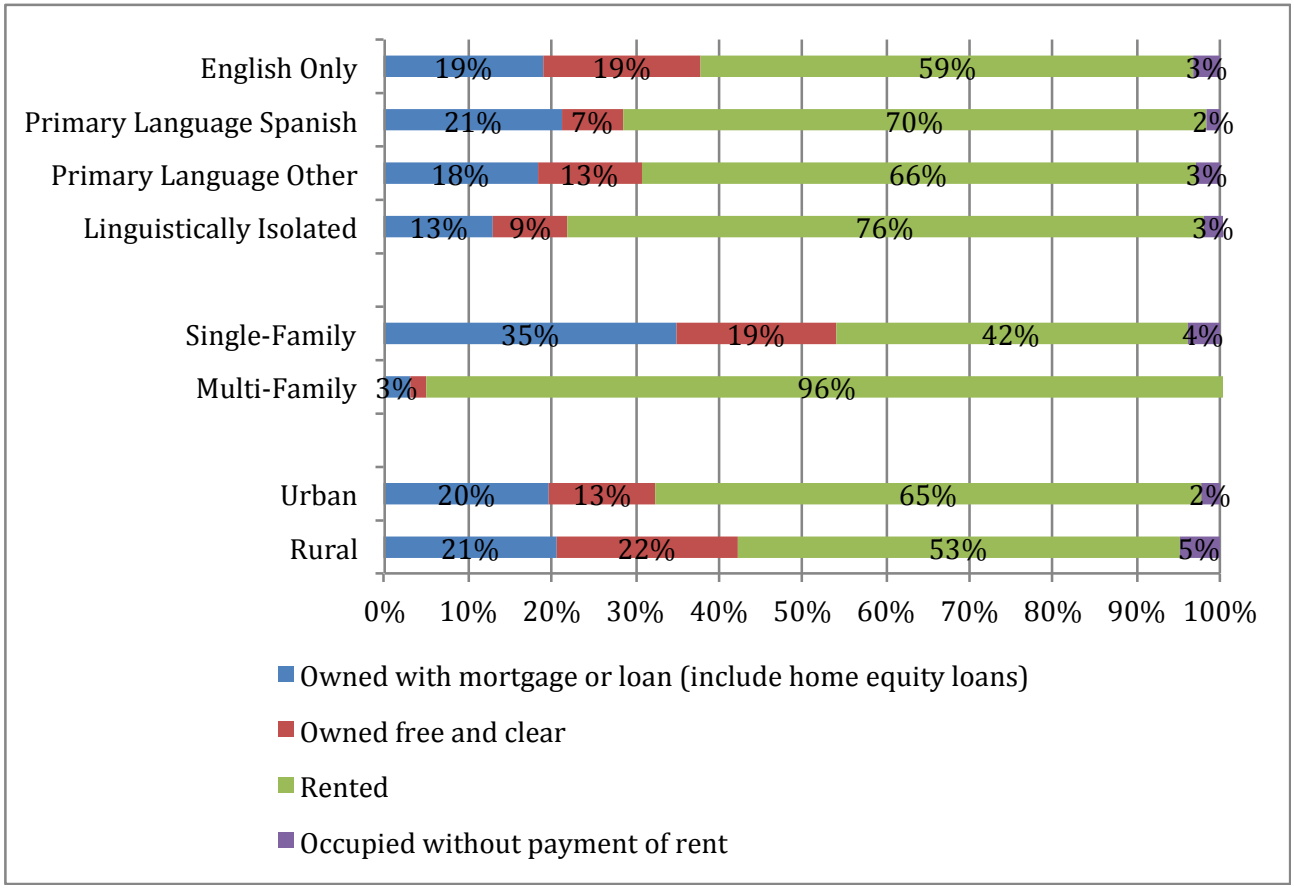
Table 10 below shows the distribution of home ownership for the state and its LI population. Only 33 percent of LI homes are owned as compared to 55 percent of all homes. There is little difference across IOUs in the rate of LI home ownership. Figure 2 shows the same distribution by LI primary language and urban versus rural segment, with English-only and rural LI homes being more likely to be owned and linguistically isolated homes more likely to be rented.

Table 10: Home Ownership - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Owned with mortgage or loan (include home equity loans)	41%	44%	20%	20%	20%	22%	19%	21%
Owned free and clear	14%	15%	13%	14%	16%	13%	13%	12%
Rented	44%	40%	64%	63%	62%	63%	65%	65%
Occupied without payment of rent	2%	1%	3%	2%	3%	2%	2%	2%

Sources: 2004 and 2011 PUMS.

Figure 2: Home Ownership - By Language, Home Type and Urban/Rural For California LI Population



Sources: 2011 PUMS.

Table 11 shows the distribution of urban and rural homes, with 93 percent of LI homes located in urban areas, similar to the 94 percent of total homes. As described above in the introduction to this section, the definition of urban and rural is based on county, since that is geographic information provided for the PUMS data. If a home was in a county that was in a metropolitan area with a population of 250,000 or greater, the home was considered to be in an urban area. Otherwise, it was considered rural.

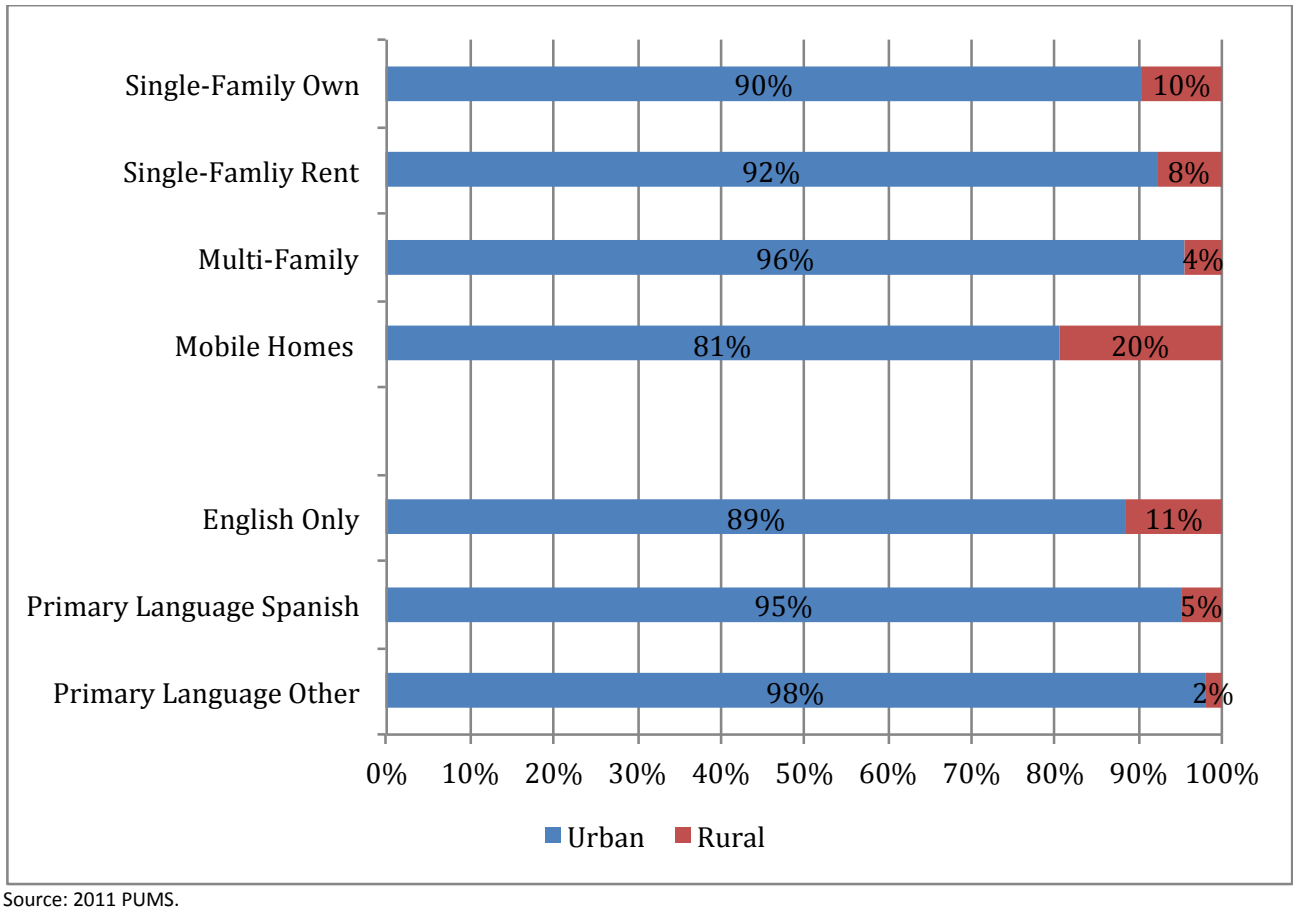
PG&E has a greater proportion of rural LI homes (15%). Figure 3 shows the distribution by home type, ownership and primary language segment. As shown, there are greater proportions of mobile homes and English-only homes in rural areas.

Table 11: Urban/Rural Status – By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Urban	94%	N/A	93%	N/A	85%	97%	97%	99%
Rural	6%	N/A	7%	N/A	15%	3%	3%	2%

Sources: 2004 and 2011 PUMS.

Figure 3: Urban/Rural Status – By Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

Table 12 shows the language spoken in homes, either English-only, or if a non- English language is spoken, the primary non-English language. As mentioned above in the introduction to this section, the ACS asks respondents if they speak a language other than English, and if so, what language (allowing only one). The PUMS data includes a household language variable that assigns a single language to each household. Where one or more people in a household reported speaking a language other than English at home, the non-English language spoken by the first person in a preassigned ranking system was assigned to the household as the household language. The ranking scheme listed household members in the following order: householder, spouse, parent, sibling, child, grandchild, other relative, stepchild, unmarried partner, housemate or roommate, and other non-relatives[10].

There is a lower proportion of LI English-only speaking homes (46%) as compared to all homes (58%). PG&E has fewer Spanish-speaking LI homes than the other IOUs. There has been a slight increase in homes speaking other languages besides English since 2004, among LI and all homes.

Figure 4 below shows the same distribution by LI home type and rural versus urban segment, with more LI urban, single-family, renter-occupied and multi-family homes speaking a primary language other than English.

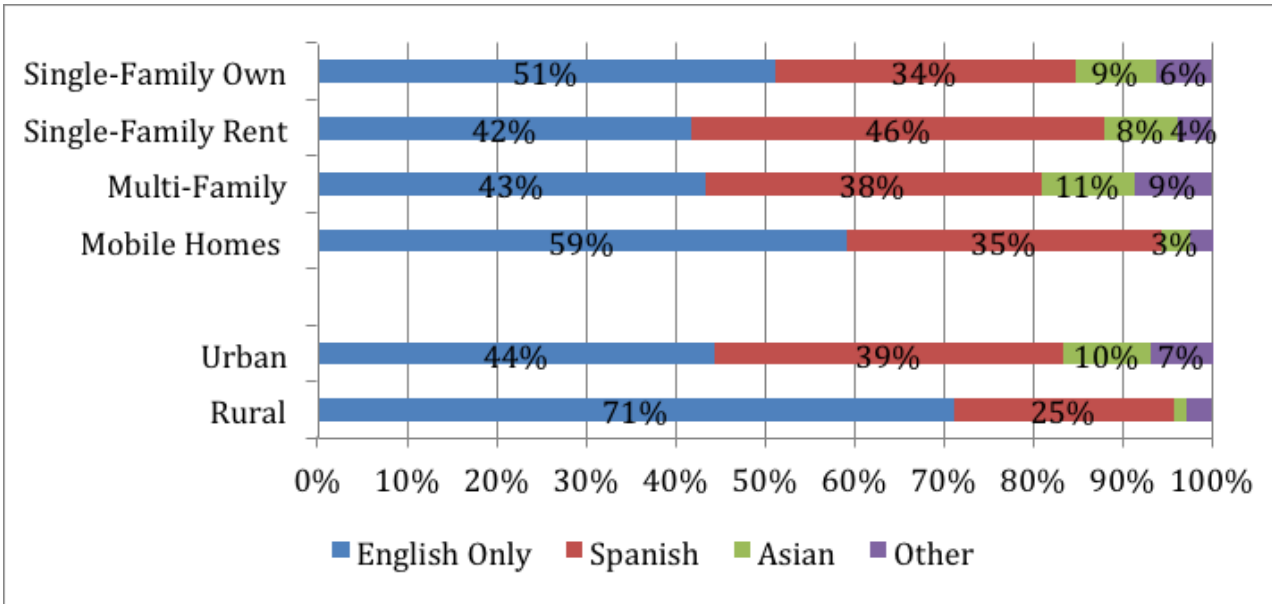
Table 12: Language Spoken in Household - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
English-only	58%	61%	46%	48%	55%	41%	52%	40%
Spanish	25%	24%	38%	37%	30%	45%	32%	46%
Asian	10%	9%	9%	9%	10%	8%	7%	8%
Other	7%	6%	7%	6%	6%	6%	9%	6%

Sources: 2004 and 2011 PUMS.

10 Social Explorer; U.S. Census Bureau; American Community Survey 2011 Summary File: Technical Documentation.
http://www.socialexplorer.com/data/ACS2011/documentation/49d2e728-46a6-430c-aef7-2b4282b76327#88f99dfa-a802-4151-a52e-3334e65af9b4

Figure 4: Language Spoken in Household – By Housing Type and Urban/Rural For California LI Population



Source: 2011 PUMS.

Table 13 below presents the proportion of households that report being linguistically isolated. As described above, a linguistically isolated household is a household in which no one in the household aged 14 and over speaks English only or English very well. Double the proportion of LI to total households are linguistically isolated (20% compared to 10%). This percentage has dropped slightly since 2004, from 23 percent for LI and from 11 percent for the total population, even though as reported above there are more non-English speakers. This result suggests that the additional households that speak a language other than English are more likely to also speak English. Slightly more SCE and SoCalGas LI households are linguistically isolated compared to the other IOUs.

Table 13: Linguistic Isolation - By Population and IOU

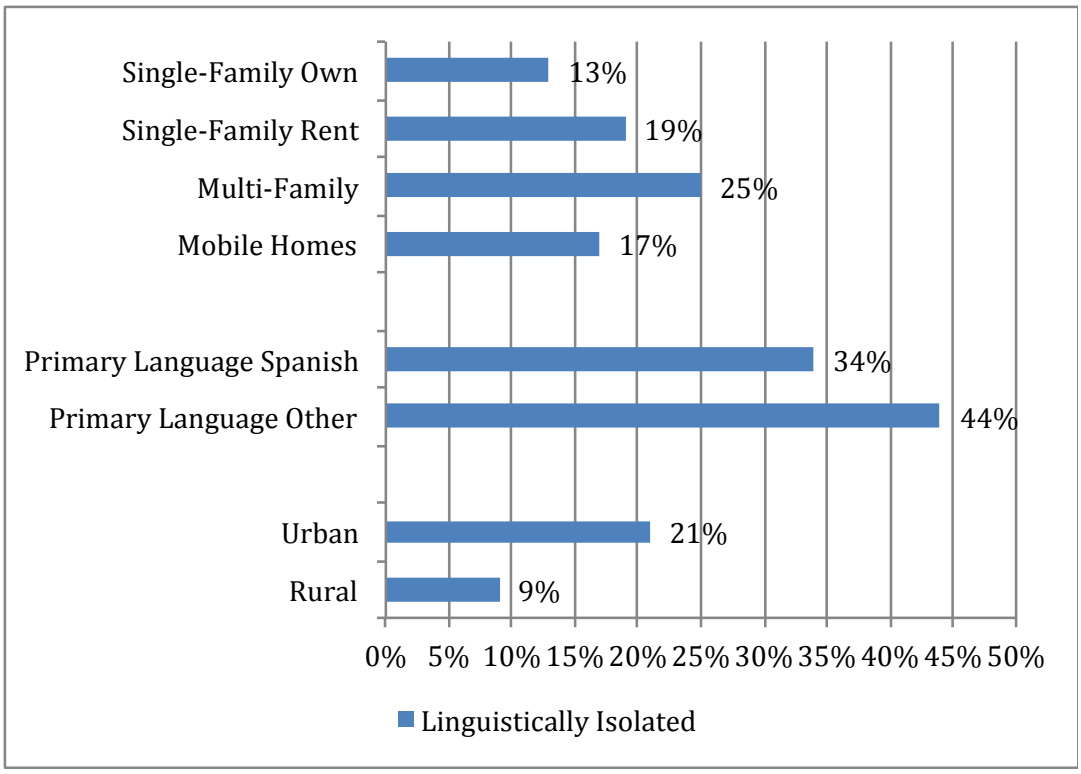
	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Linguistically Isolated	10%	11%	20%	23%	17%	21%	18%	22%

Sources: 2004 and 2011 PUMS.

Figure 5 below shows linguistic isolation by LI home type, primary language and rural versus urban segments, with a greater proportion of multi-family and urban homes reportedly isolated. The language segments represent the portion of the population of households whose

primary language is Spanish or another non-English language. These segments are correlated with linguistic isolation. 34 percent of households with Spanish as the primary language are linguistically isolated. 44 percent of households with another non-English language are linguistically isolated.

Figure 5: Linguistic Isolation - By Housing Type, Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

Table 14 below presents the distribution of ethnicities of the head of household, with 20 percent of LI homes in the state lead by a White householder, compared to 40 percent of all homes. 42 percent of LI homes are led by a Hispanic householder, compared to 28 percent of all homes. The ethnicities of California households have shifted since 2004, with more homes led by Hispanic householders. PG&E and SDG&E have greater proportions of White LI households compared to the other IOUs. Both SCE and SoCalGas have approximately 50 percent (49% SCE, 50% SoCalGas) of LI households headed by a Hispanic.

Table 14: Race/Ethnicity of Householder - By Population and IOU

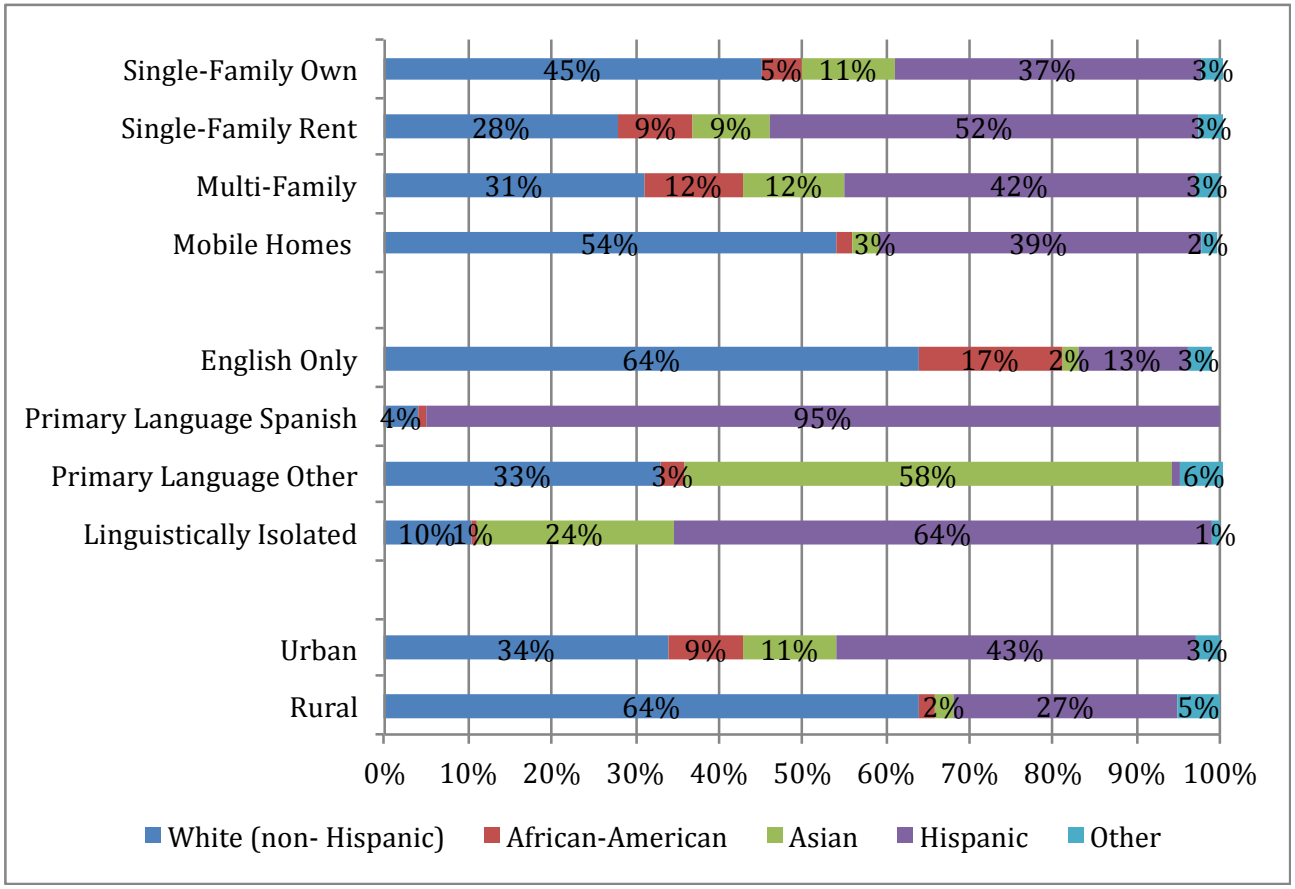
	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
White (non- Hispanic)	51%	62%	36%	46%	44%	31%	48%	30%
African-American	6%	5%	9%	7%	8%	9%	6%	9%
Asian	12%	11%	10%	10%	11%	9%	8%	9%
Hispanic	28%	20%	42%	33%	34%	49%	36%	50%
Other	3%	2%	3%	4%	3%	3%	3%	3%

Sources: 2004 and 2011 PUMS.

Figure 6 presents ethnicity by LI home type, primary language and rural versus urban segment, showing pronounced differences by home type, ownership, language and urban versus rural.

- The majority of single-family rental households are Hispanic (52%), with 28 percent White.
- Of LI homes speaking a primary language other than Spanish or English, 58 percent are Asian.
- 61 percent of rural LI homes are White, compared to only 18 percent of urban LI homes.

Figure 6: Race/Ethnicity of Householder - By Housing Type, Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

Table 15 shows the distribution of household size, with 30 percent of LI homes having a single resident compared to 25 percent for the state. LI homes have slightly more occupants on average than all homes. PG&E and SDG&E LI homes have slightly fewer occupants on average than the other IOUs. Household size has remained stable over time.

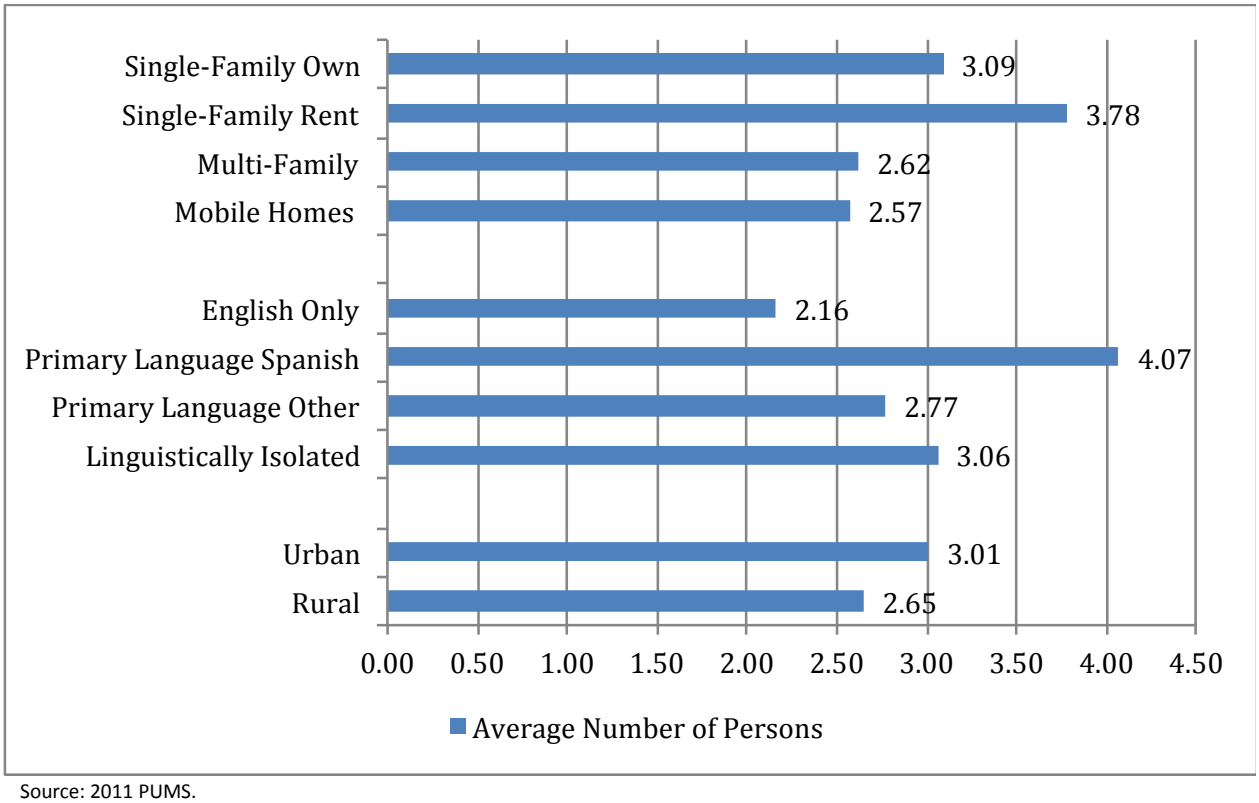
Table 15: Number of Persons per Home - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
1 person	25%	25%	30%	29%	32%	27%	32%	27%
2 persons	30%	30%	21%	21%	22%	20%	24%	20%
3 or more persons	46%	45%	50%	49%	46%	53%	44%	53%
Average Persons	2.77	2.75	2.98	2.98	2.85	3.15	2.73	3.15

Source: 2004 and 2011 PUMS.

Figure 7 shows the same distribution by LI home type, primary language and rural versus urban segment, with single-family renters, urban and Spanish speakers having the largest number of occupants.

Figure 7: Number of Persons per Home – By Home Type, Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

Table 16 shows the household composition, with a greater proportion of LI households having children in the home (46% compared to 37% of all households). There has been a small increase (2%) in the proportion of homes with children since 2004 across LI and all households.

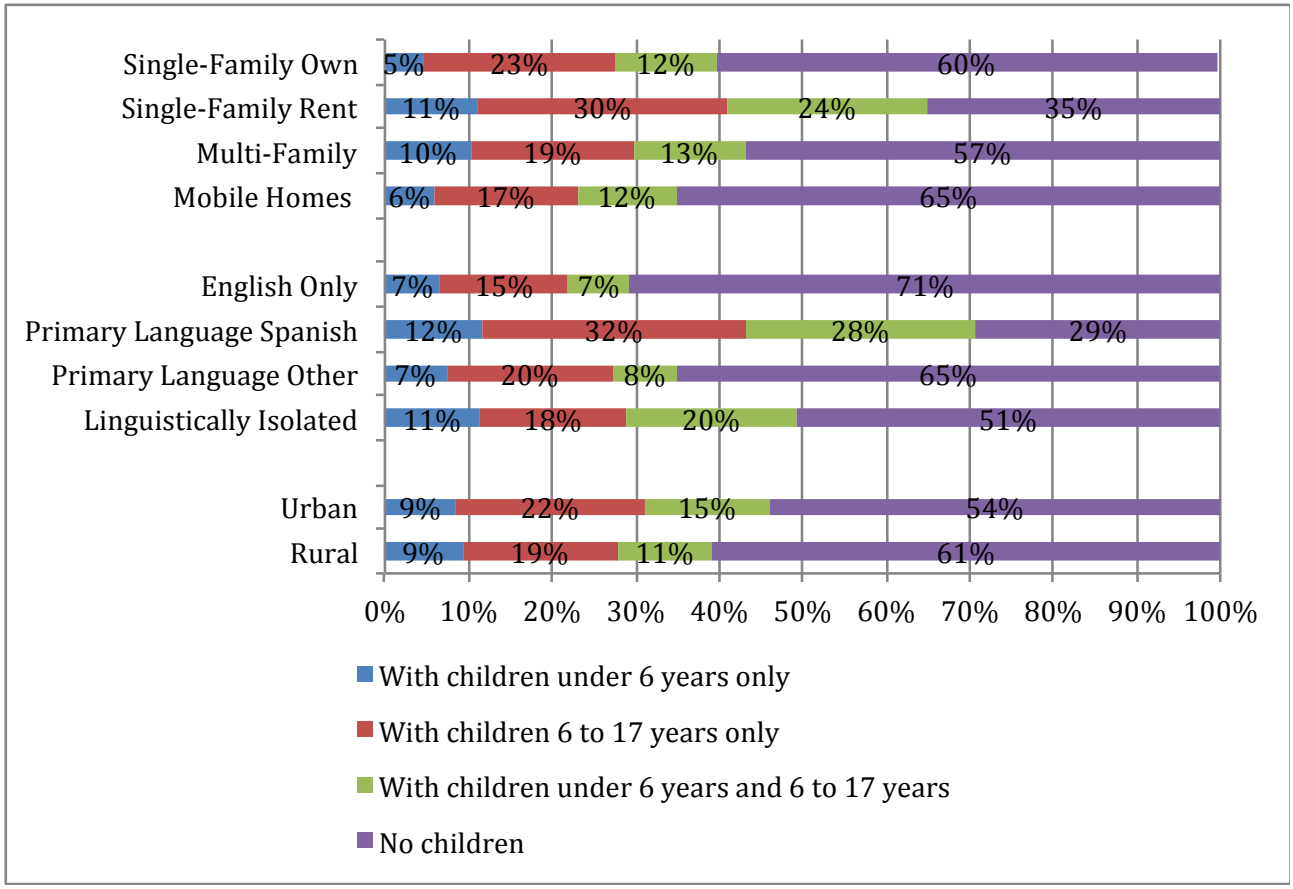
Table 16: Presence of Children in Home - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCal Gas 2011
With children under 6 years only	8%	8%	9%	10%	9%	9%	8%	9%
With children 6 to 17 years only	20%	21%	22%	22%	20%	24%	22%	24%
With children under 6 years and 6 to 17 years	9%	9%	15%	16%	14%	16%	12%	16%
No children	63%	61%	54%	52%	56%	51%	59%	51%

Sources: 2004 and 2011 PUMS.

Figure 8 below presents household composition by LI home type, primary language and rural versus urban segment, with major differences based on home ownership and primary household language. 65 percent of single-family renter-occupied homes have children, compared to only 40 percent of single-family owner-occupied homes. Households that speak Spanish primarily are much more likely than other households to have children (71%). There is a small but significant difference in household composition between urban and rural households, with urban households more likely to have children (46% compared to 39%).

Figure 8: Presence of Children in Home - By Housing Type, Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

Table 17 below presents the proportion of homes with either an elderly or disabled[11] household member, with a similar proportion of elderly household members across LI and all homes, but more LI homes (22% compared to 31%) with disabled members. As shown in Figure 9, these proportions vary substantially and consistently by LI segment, with some exceptions:

- Single-family owner-occupied LI homes are much more likely to have elderly members.
- LI households living in mobile homes are more likely to have disabled members, but are not as likely to have elderly members.
- Other primary language speaking LI households are the most likely to have an elderly member.
- There are only small differences between the proportions of elderly household members but there are more disabled household members across rural LI homes than in urban LI homes.

Table 17: Elderly or Disabled Household Member - By Population and IOU

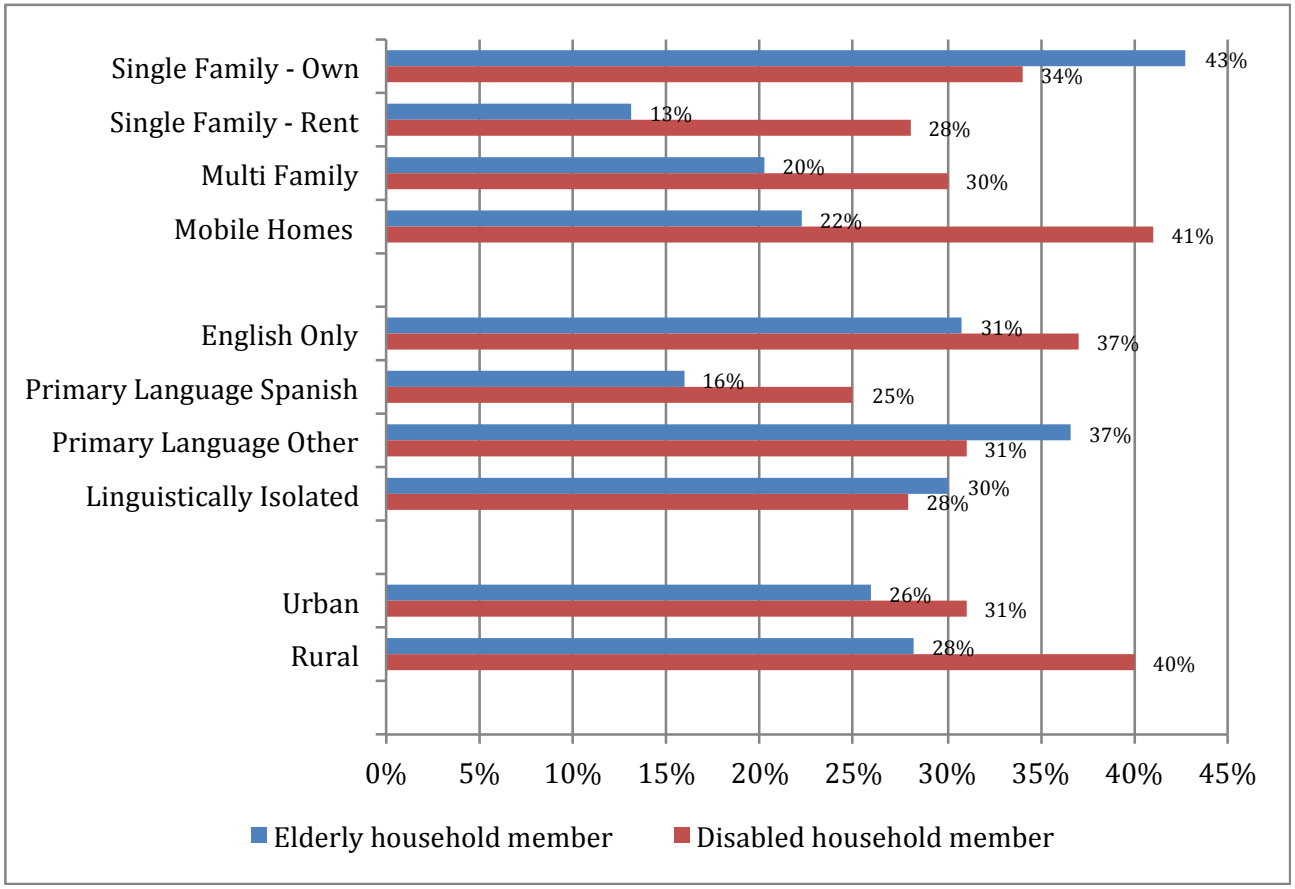
	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Elderly household member	25%	22%	26%	24%	26%	26%	25%	26%
Disabled household member	22%	25%	31%	34%	33%	31%	27%	30%

Sources: 2004 and 2011 PUMS.

[11] The ACS/PUMS classifies a household as having (a) disabled member(s) if anyone in the household said yes to any of the following questions:

Is this person deaf or does he/she have serious difficulty hearing?
Is this person blind or does he/she have serious difficulty seeing even when wearing glasses?
Because of a physical, mental, or emotional condition, does this person have serious difficulty concentrating, remembering, or making decisions? (5 years of age or over)
Does this person have serious difficulty walking or climbing stairs?
Does this person have difficulty dressing or bathing? (15 or over).

Figure 9: Elderly or Disabled Household Member – By Housing Type, Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

Table 18 below presents the average household income for LI and all California homes. We defined LI homes based on 200 percent of the federal poverty level, which varies based on the size of the household (see Section 1.1.1.). The average income of homes that are at or below 200 percent of the federal poverty level is $20,621, almost equal to the 2004 average. In contrast, the average household income for the state has increased from $69,596 to $80,684.

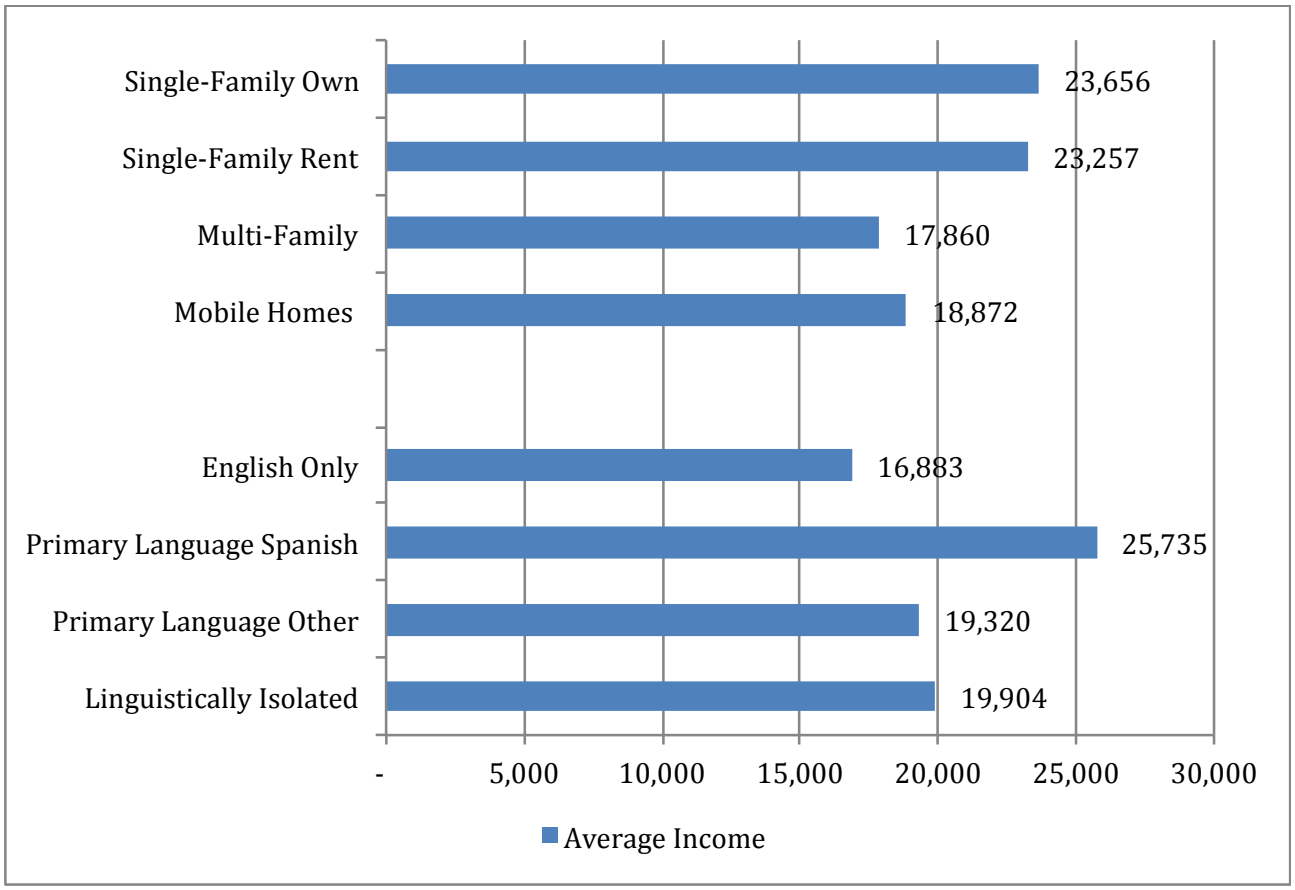
Table 18: Average Household Income - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Average Household Income	$80,684	$69,596	$20,621	$20,427	$20,075	$21,446	$18,607	$21,432

Sources: 2004 and 2011 PUMS.

Figure 10 shows the average household income by LI home type, primary language and rural versus urban segment. Much of the differences observed are due to differences in the number of occupants by segments (as shown in Figure 7 above), with single-family and Spanish-speaking homes having the highest average income. As reported elsewhere in this section, Spanish-speaking households have relatively more occupants, on which the income requirements are based.

Figure 10: Average Household Income ($) - By Housing Type and Language For California LI Population



Source: 2011 PUMS.

Table 19 presents employment status of the head of household, with a much higher proportion of LI householders being unemployed as compared to the overall population. The rate of employment has dropped since 2004 as a result of the recession, impacting LI households slightly more than the population as a whole.

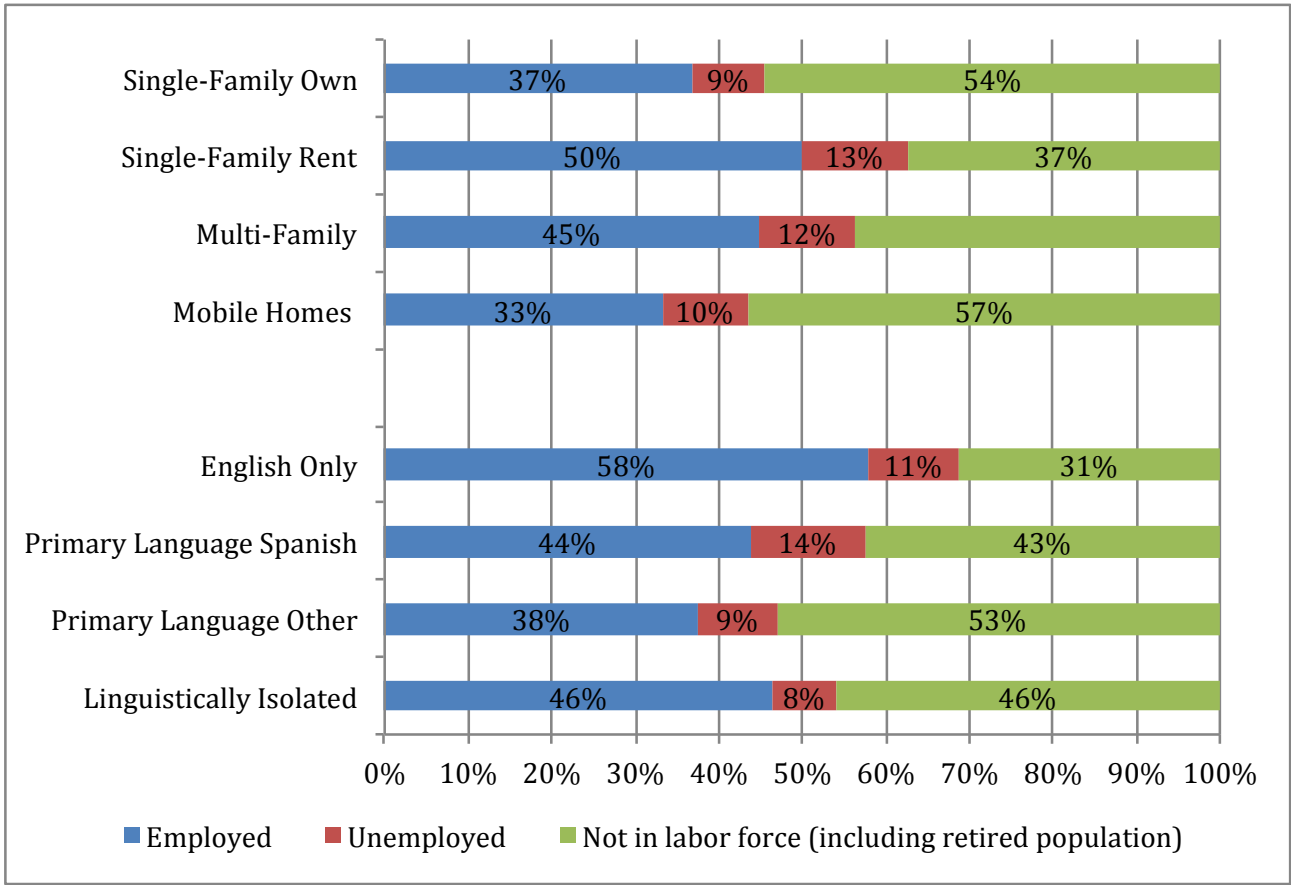
Table 19: Employment Status of Head of Household - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Employed	63%	65%	43%	46%	41%	40%	42%	45%
Unemployed	6%	4%	11%	7%	12%	11%	10%	11%
Not in labor force (including retired population)	30%	31%	46%	47%	47%	46%	50%	45%

Sources: 2004 and 2011 PUMS.

Figure 11 shows employment status by LI home type and primary language segments, with single-family renters and multi-family households more likely to be employed, likely because single-family homeowners (and mobile home dwellers) are more likely to be retired. Households speaking languages other than English have lower employment rates than English-only households, and households speaking another language besides Spanish have the largest proportion of heads of household out of the labor force.

Figure 11: Employment Status of Head of Household - By Housing Type and Language For California LI Population



Source: 2011 PUMS.

Table 20 presents the distribution of education reported by the head of household, with a substantial difference in the highest level achieved for LI versus all heads of household. While one-third of California heads of household have a bachelor's degree or higher, only 14 percent do of LI households. There has been a slight increase in education since 2004, with a greater increase occurring among non-LI households.

SCE and SoCalGas LI households on average have the lowest educational attainment across the IOUs, where 35 percent of householders have not graduated from high school, compared to 31 percent for the average LI householder.

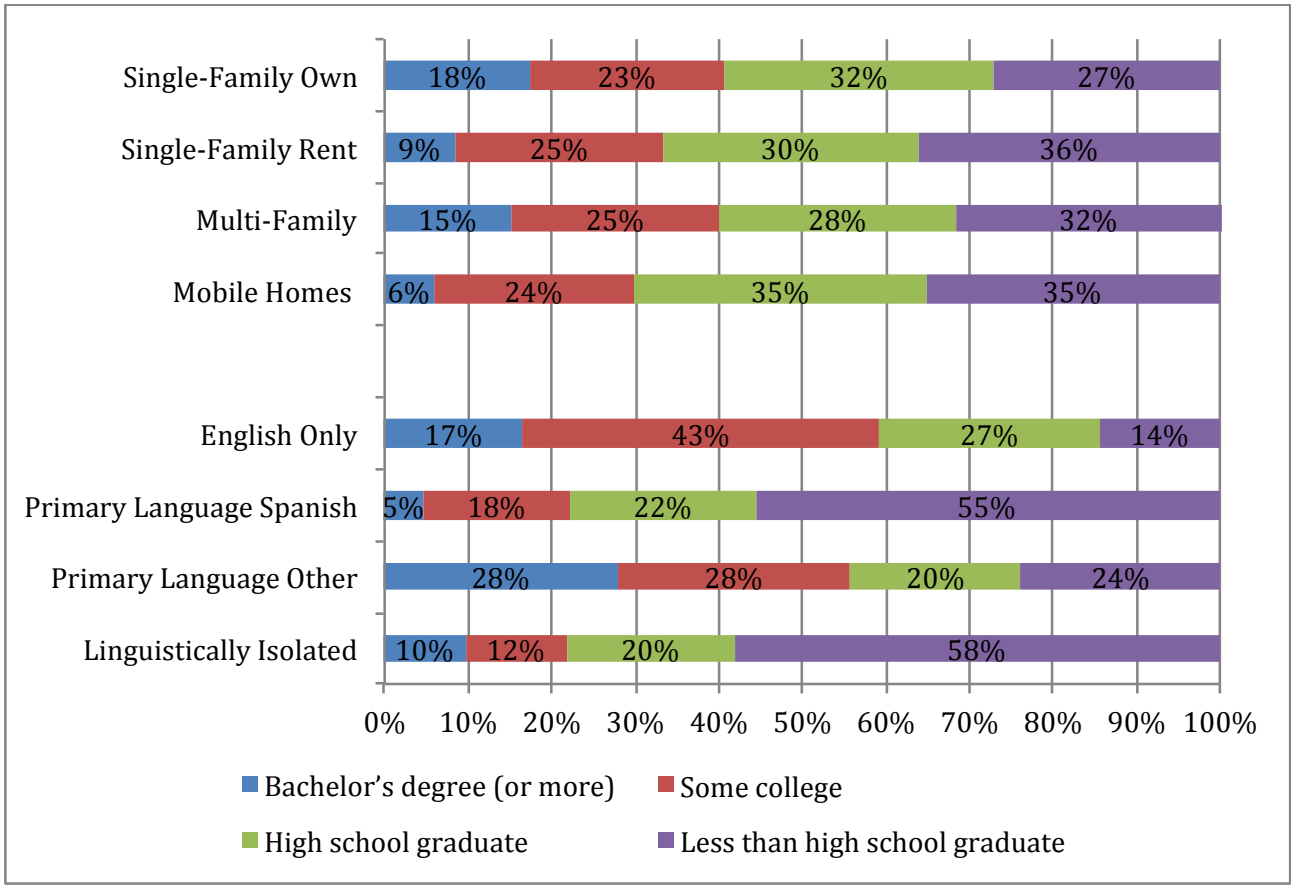
Table 20: Education of Head of Household - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Bachelor's degree (or more)	34%	31%	14%	13%	14%	13%	20%	13%
Some college	32%	32%	31%	28%	33%	29%	35%	29%
High school graduate	18%	20%	24%	25%	25%	24%	22%	23%
Less than high school graduate	15%	16%	31%	34%	28%	35%	23%	35%

Sources: 2004 and 2011 PUMS.

Figure 12 below shows education by LI home type and primary language segment, with some pronounced differences. The LI segments with the highest proportion of heads of households that have a bachelor's degree are single-family owner-occupied, multi-family and other language (besides Spanish) speakers. The primary language Spanish and linguistically isolated segments are more likely to be headed by someone with less than a high school graduate education.

Figure 12: Education of Head of Household - By Housing Type and Language For California LI Population



Source: 2011 PUMS.

Table 21 below shows the average annual household self-reported energy costs as reported by ACS respondents. Since 2004, self-reported energy costs have risen 19 percent since 2004, to an average of $1,782 for all households and $1,425 for LI households. PG&E LI households report the highest energy costs, and SDG&E the lowest. Section 5.5.2 reports on the energy burden (the ratio of energy costs to income) for the LI population compared to the total population, based on actual IOU billing data, self-reported income for our telephone survey respondents and self-reported income at the Census block group level for the population.

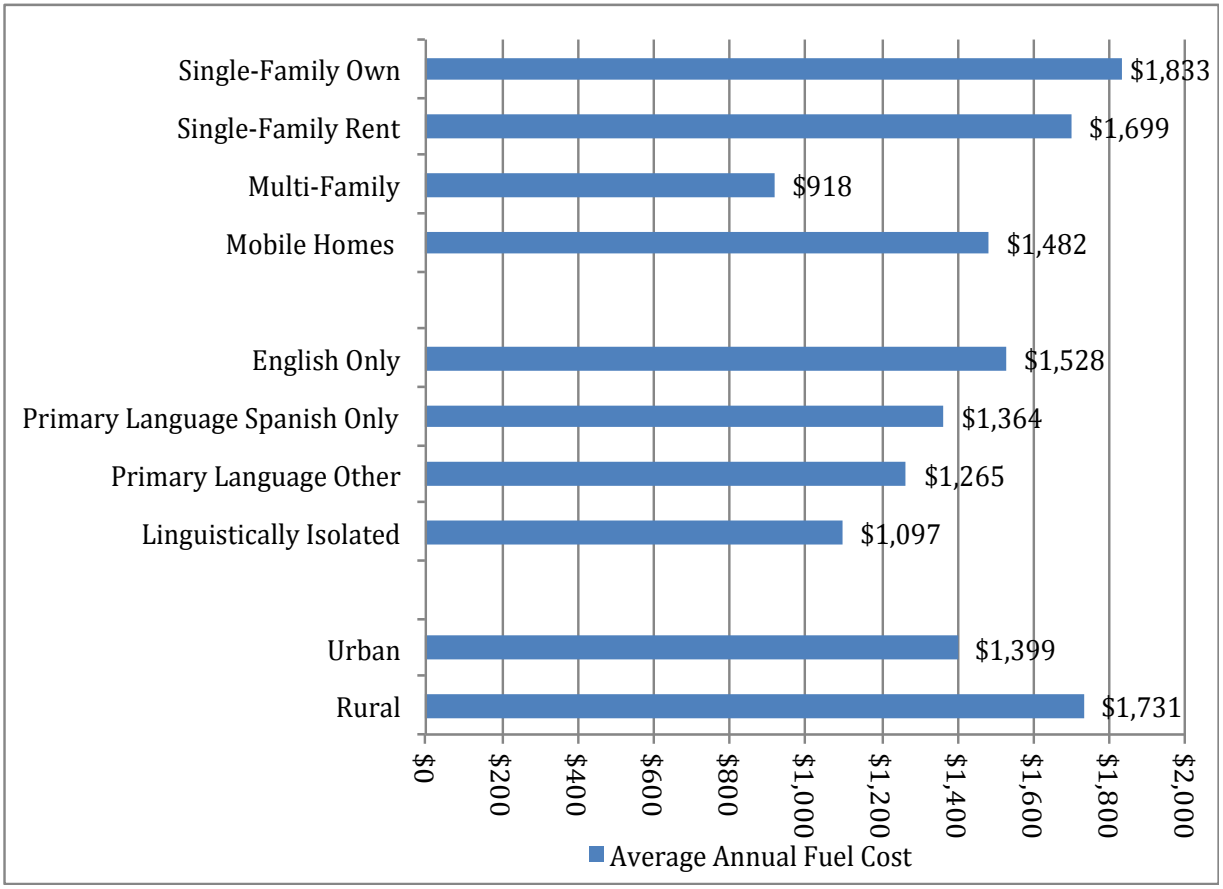
Table 21: Annual Household Energy Costs - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
$1 – $249	2%	2%	4%	5%	5%	3%	7%	3%
$250 – $499	9%	9%	13%	15%	12%	11%	21%	11%
$500 – $749	12%	14%	16%	18%	14%	16%	20%	16%
$750 – $999	12%	14%	14%	15%	13%	16%	14%	15%
$1,000 – $1,249	11%	12%	12%	12%	12%	12%	10%	12%
$1,250 – $1,499	9%	9%	8%	8%	8%	9%	6%	9%
$1,500 – $1,999	14%	14%	12%	11%	13%	13%	7%	13%
$2,000 or greater	32%	25%	21%	16%	24%	21%	14%	21%
Average Annual Energy Cost	$1,782	$1,502	$1,425	$1,200	$1,483	$1,437	$1,110	$1,446

Source: 2004 and 2011 PUMS.

Figure 13 shows the variation in self-reported energy costs by LI home type, primary language and rural versus urban segment, with higher costs for single-family homes (which are generally larger and do not use shared systems), rural homes and English-only speaking households. Linguistically isolated homes tend to have lower energy costs, which we would expect, given the high proportion of linguistically isolated households that live in multi-family structures (Figure 2) and who are renters (Figure 3).

Figure 13: Annual Household Fuel Costs – By Housing Type, Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

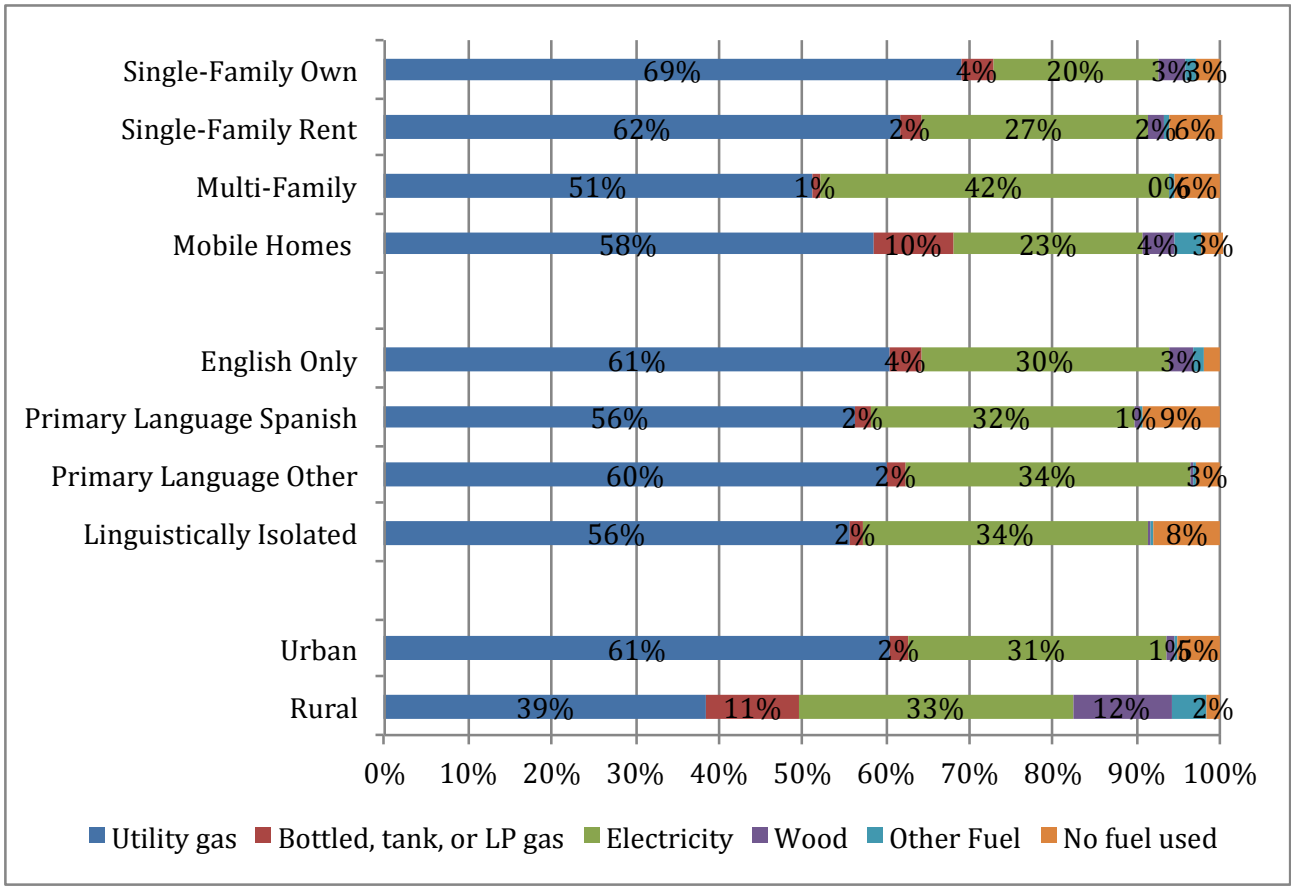
Table 22 shows the fuel that is used most for heating homes, with some differences in the use of heating fuels between the LI and total population and for the LI population, across IOUs. The majority of homes use natural gas (or utility gas, per the ACS survey) to heat their homes—66 percent of all homes and 59 percent of LI homes. This proportion has dropped by 7 percent for all homes since 2004 (and by 5% for LI homes). As shown in Figure 14, rural homes are much less likely to use natural gas to heat their homes, likely because natural gas service is not offered as often in remote and/or mountain locations.

Table 22: Heating Fuel Type - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
Utility gas	66%	69%	59%	64%	56%	62%	52%	63%
Bottled, tank, or LP gas	3%	4%	3%	3%	4%	3%	2%	2%
Electricity	25%	22%	31%	25%	33%	27%	40%	27%
Wood	2%	2%	2%	2%	3%	1%	1%	1%
Other Fuel	1%	1%	1%	1%	1%	1%	1%	1%
No fuel used	3%	2%	5%	5%	2%	7%	4%	7%

Source: 2004 and 2011 PUMS.

Figure 14: Heating Fuel Type - By Housing Type, Language and Urban/Rural For California LI Population



Source: 2011 PUMS.

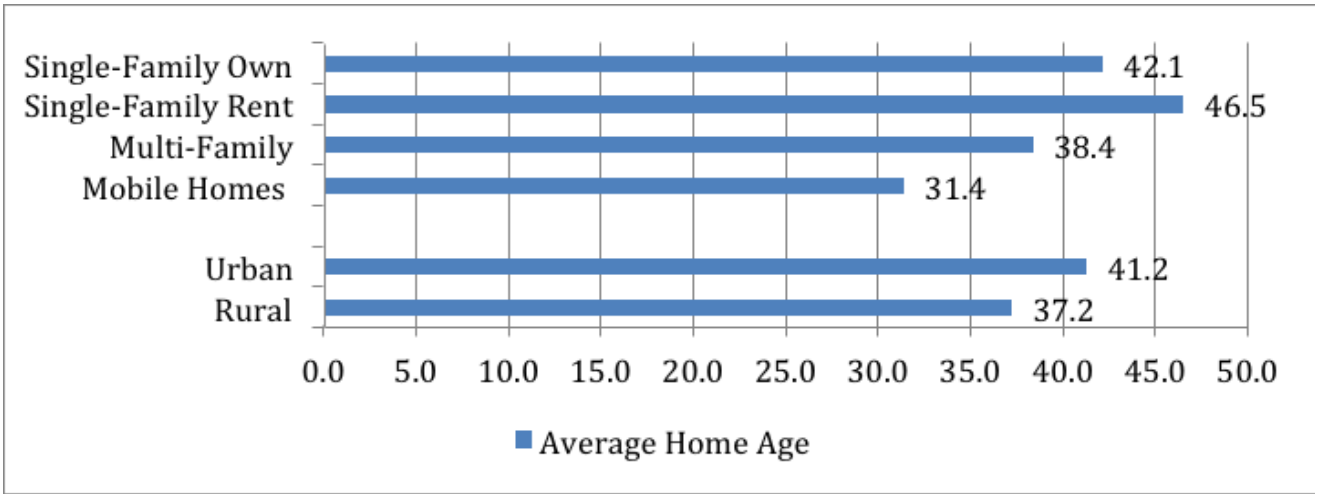
Table 23 shows the distribution and average age of homes, with only small differences between home vintage for LI versus all homes (LI homes are on average 42 years old compared to all homes, which are on average 40 years old). SDG&E's LI housing stock is the youngest, with an average age of 36 years. There are some differences in vintage across LI segments as shown in Figure 15, with renter-occupied single-family homes an average of five years older than owner-occupied single-family homes, and urban homes an average of four years older than rural homes.

Table 23: Age of Home - By Population and IOU

	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
1949 or earlier	16%	17%	17%	20%	16%	18%	8%	18%
1950 to 1969	28%	30%	29%	32%	26%	31%	26%	31%
1970 to 1989	33%	37%	34%	36%	35%	33%	45%	32%
1990 to 1999	11%	11%	9%	9%	10%	9%	11%	9%
2000 to 2011*	12%	5%	10%	3%	12%	9%	10%	9%
Average Home Age	39.9	N/A	41.7	N/A	40.1	42.5	35.9	42.6

Sources: 2004 and 2011 PUMS.

Figure 15: Age of Home – By Home Type and Urban/Rural For California LI Population



Source: 2011 PUMS.

Table 24 below shows the length of time households have resided at their current residence (tenure), with LI households reporting tenure 2 years shorter than the overall average (9 versus 11 years). Tenure has changed over time, but in a different direction for LI versus non-LI homes. LI homes have a shorter average tenure (by one year) compared to 2004, while the average for all homes is longer (by one year).

Table 24: Length of Time Residing at Present Address - By Population and IOU

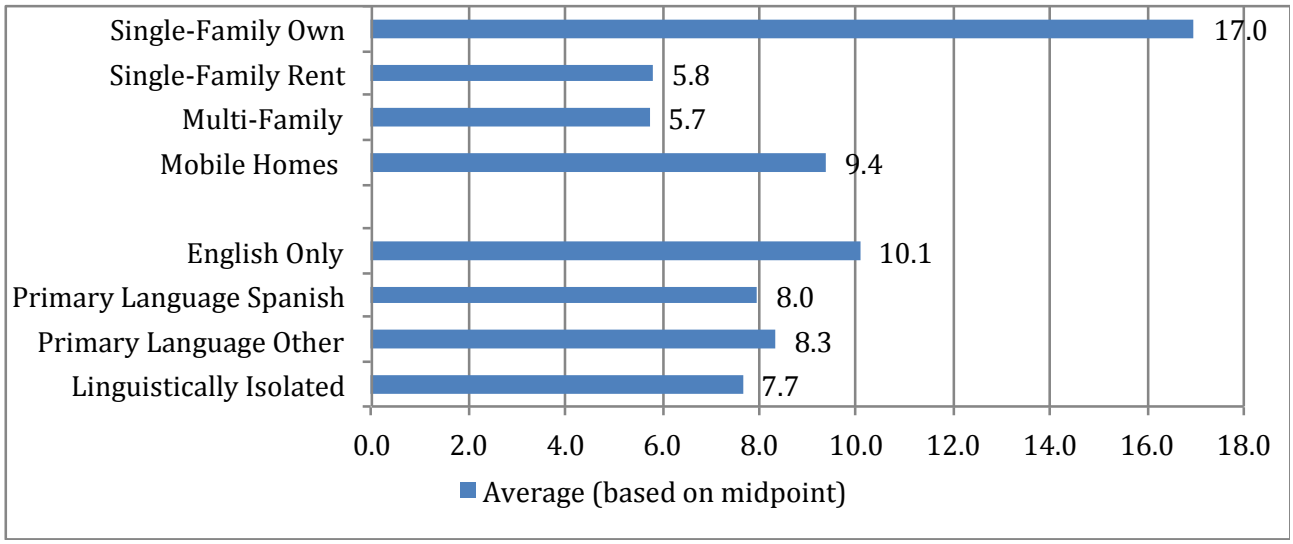
	Percent of California Population		Percent of California Low Income Population		Percent of California Low Income Population			
Year	Total 2011	Total 2004	Total 2011	Total 2004	PG&E 2011	SCE 2011	SDG&E 2011	SoCalGas 2011
23 months or less	23%	25%	28%	25%	30%	26%	29%	26%
2 to 4 years	19%	22%	22%	22%	22%	21%	25%	21%
5 to 9 years	19%	19%	18%	19%	17%	19%	19%	19%
10 to 19 years	20%	18%	17%	18%	16%	19%	15%	19%
20 to 29 years	9%	8%	7%	8%	7%	7%	6%	7%
30 years or more	9%	8%	8%	8%	9%	8%	7%	8%
Average (based on midpoint)	10.6	9.5	9.2	9.5	9.3	9.5	8.5	9.5

Source: 2004 and 2011 PUMS data.

Figure 16 shows tenure by LI segment, with single-family homeowners having a much longer average tenure than single-family renters and multi-family dwellers. Households speaking a

primary language other than English have a shorter average tenure than English-speaking households.

Figure 16: Length of Time Residing at Present Address - By Housing Type and Language For California LI Population



Source: 2011 PUMS.

4.3.2 Home and Equipment Characteristics

We used the 2013 CLASS data to describe the California total and California LI population's home and equipment characteristics. (In Section 7.3.2, we also present RASS equipment characteristic data by climate zone categories.) The columns of the first table of each result are:

- Percent of California population (including the LI population);
- Percent of California LI population;
- Percent of PG&E's California LI population;
- Percent of SCE's California LI population;
- Percent of SDG&E's California LI population; and
- Percent of SoCalGas's California LI population.

The segments that were relevant to this study, and were available and had sufficient sample sizes within the 2013 CLASS LI sub-sample are home type, home ownership and language. The specific segments we reviewed are:

- Single-family home occupied by homeowners;
- Single-family home occupied by renters;

- Multi-family homes;[12]
- Spanish is the primary language; and
- English-only.[13]

For most results, we present a follow-up chart that compares results across one or more of these segments of the LI population, where we identified substantial differences. The sample size (n) for the LI population segment is indicated in the caption of each exhibit. The sample size for each LI segment is indicated in the label for each segment within each chart.[14] More detailed sample size information (including standard errors for means) is provided in Section 7.3.

Table 25 below presents the average home size, with LI homes being an average of 332 square feet smaller than the average California home. Figure 17 compares the average LI home size by home type and ownership, with single-family homes occupied by owners being the largest, and multi-family homes being the smallest.

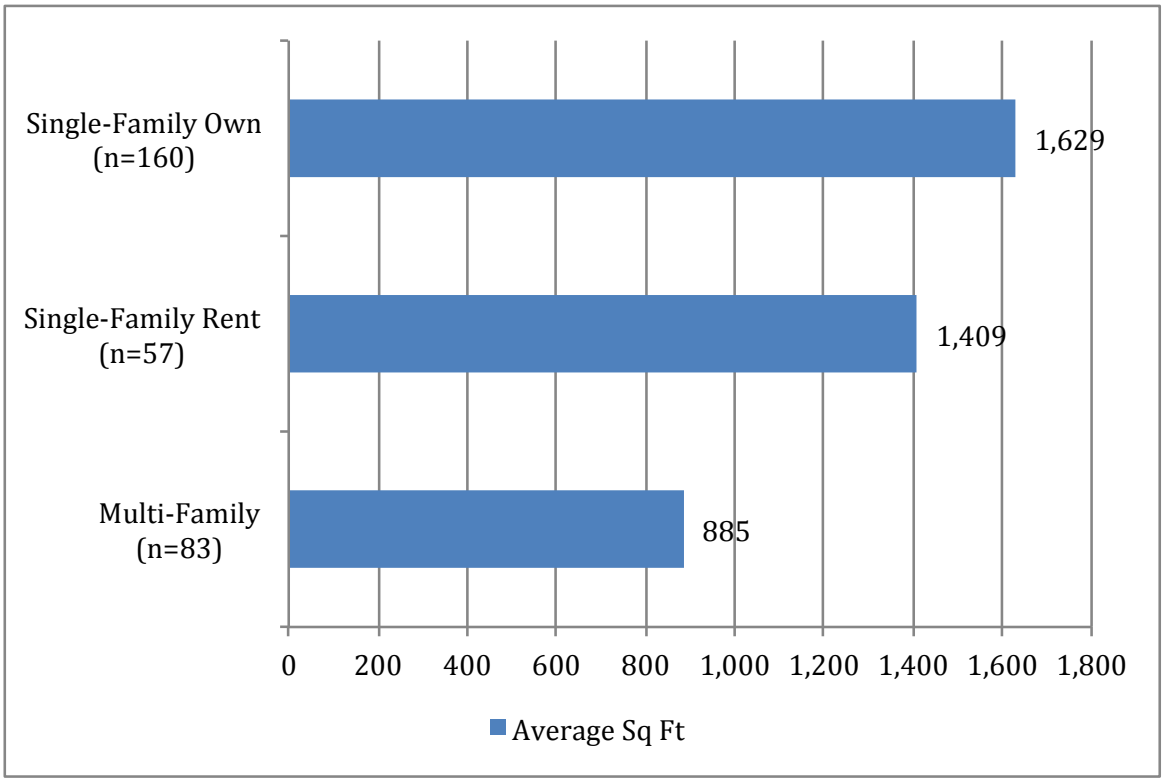
Table 25: Average Square Footage of Home – By Population Segment and IOU (LI Population n=311)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalGas
Average Sq Ft	1,643	1,311	1,332	1,298	1,292	1,330

Source: 2013 CLASS.

[12] Multi-family homes are defined as any housing structure with two or more units. This differs from the 2007 KEMA study were multi-family homes are defined as housing structures with five or more units. This also differs from the concurrent Cadmus multi-family LI study which also defines multi-family homes as housing structures with five or more units. We excluded mobile homes as a segment category due to the small sample size in CLASS.
[13] The non-English/non-Spanish sample was too small to include as a segment for the CLASS data.
[14] Please note, in some cases the sum of the sample sizes of the LI segments do not match the total LI sample size as some categories in each segment were excluded, for example, mobile homes or other languages.

Figure 17: Average Square Footage of Home – By LI Home Type (LI Population n=311) For California LI Population



Source: 2013 CLASS.

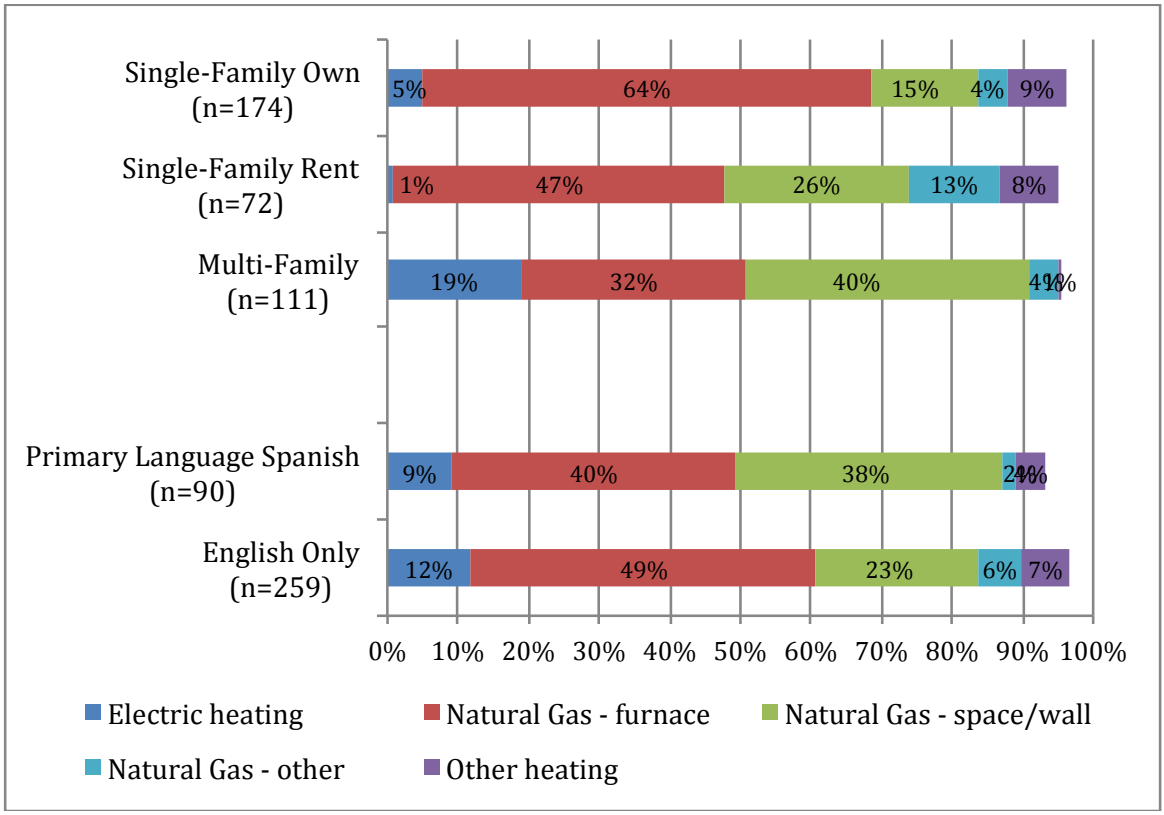
Table 26 shows the type of heating equipment and fuel used by California homes. The majority of equipment uses natural gas, with furnaces being the most common equipment type. As shown, LI homes are more likely to use wall or space heaters as compared to all California homes. SDG&E LI homes are less likely to use central heating and more likely to use portable or wall/baseboard heating, likely due to relatively milder winters. Figure 18 compares heating equipment by home type and ownership, with multi-family homes more likely to have electric heat.

Table 26: Heating Equipment and Fuel Type – By Population Segment and IOU (LI Population n=388)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalGas
Electric Portable Heaters	2%	2%	1%	1%	3%	1%
Electric Resistance/Baseboard	2%	3%	4%	1%	9%	0%
Other Electric	7%	6%	4%	6%	13%	2%
Natural Gas Hot Air Furnace	61%	47%	48%	48%	46%	55%
Natural Gas Space Heaters/Wall Units	14%	27%	27%	30%	8%	31%
Other Gas	8%	5%	2%	7%	12%	7%
Propane	4%	2%	3%	2%	1%	0%
Wood or Coal	1%	4%	7%	1%	2%	0%
No Heating Equipment	2%	4%	4%	4%	7%	4%

Source: 2013 CLASS.

Figure 18: Heating Equipment and Fuel Type – By LI Home Type and Primary Language (LI Population n=388) For California LI Population



Source: 2013 CLASS.

Table 27 below shows cooling equipment type and age. As shown, LI homes are less likely to have central air conditioning as compared to the overall population. However, cooling equipment in LI homes is newer compared to the overall population's cooling equipment. As shown later in this section, multi-family homes are younger than single-family homes.

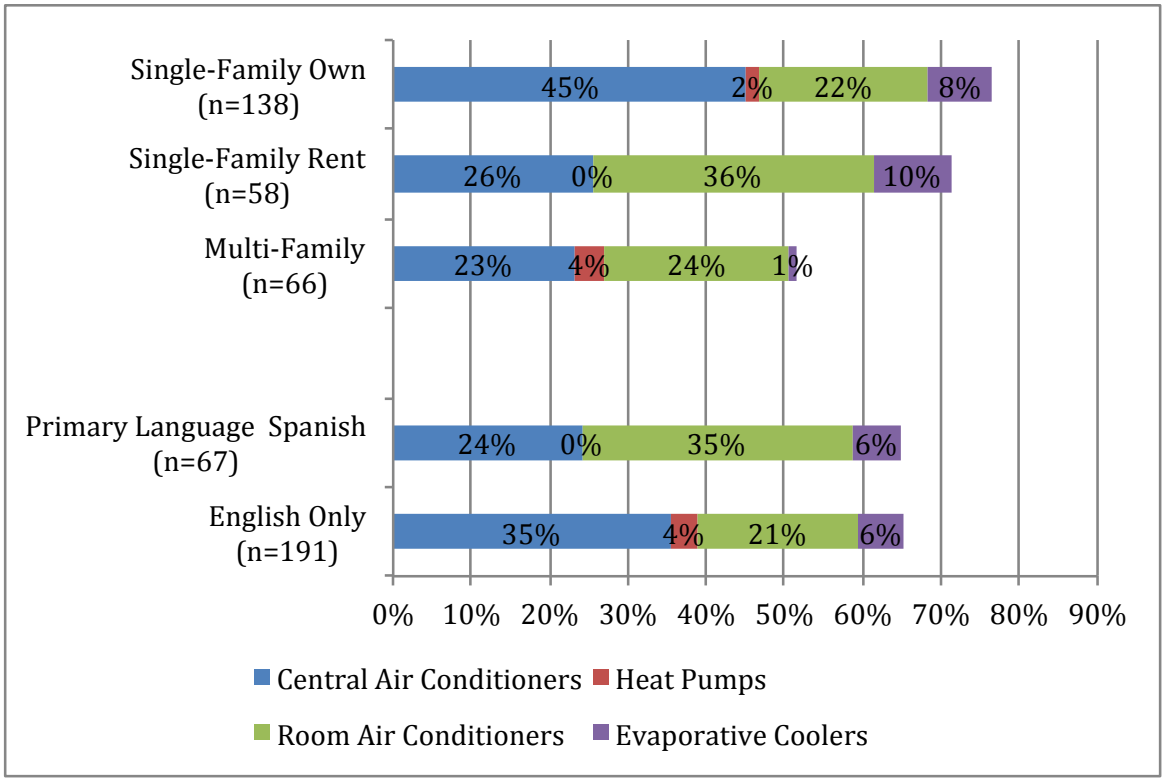
Figure 19 below shows cooling equipment by home type and language spoken, with single-family homeowners and English-only homes being the most likely to have central air conditioning. The difference between English-only and Spanish-speaking homes is not statistically significant.

Table 27: Cooling Equipment Type and Age – By Population Segment and IOU (LI Population n=388 for equipment; n=53* for age)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalGas
Type of Cooling Equipment/Systems						
Central Air Conditioners	47%	32%	29%	38%	24%	41%
Heat Pumps	2%	2%	3%	3%	0%	1%
Room Air Conditioners	15%	25%	16%	36%	17%	32%
Evaporative Coolers	2%	6%	5%	7%	0%	6%
No Cooling Equipment	34%	35%	48%	17%	59%	20%
Age of Cooling Equipment						
<10 years	40%	53%	47%	62%	46%	57%
10-19 years	34%	27%	39%	23%	36%	27%
20-29 years	25%	20%	14%	16%	18%	15%
30 or more years	1%	0%	0%	0%	0%	0%
Average Age	12.7	10.0	10.1	9.5	12.1	9.8

* The sample size n=53 for cooling equipment age reflects the number of cooling equipment units with valid age data.
Source: 2013 CLASS.

Figure 19: Cooling Equipment – By LI Home Type and Primary Language (LI Population n=388) For California LI Population



Source: 2013 CLASS.

There is very little difference between the total population and LI total water heating equipment fuel type and age, as shown in Table 28 below. Most homes use natural gas for their water heating.

Table 28: Water Heating Equipment Type and Age – By Population Segment and IOU (LI Population n=388 for equipment; n=135* for age)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalGas
Water Heating Fuel						
Electricity	6%	8%	10%	7%	3%	2%
Natural Gas	84%	81%	74%	90%	74%	96%
Propane	4%	3%	5%	1%	2%	0%
Solar	1%	1%	1%	1%	0%	1%
Unknown	5%	8%	11%	2%	21%	2%
Age of Water Heating Equipment						
1-5 years	35%	33%	27%	37%	42%	37%
6-10 years	48%	45%	55%	37%	48%	37%
11-15 years	7%	9%	10%	9%	4%	8%
16-20 years	5%	8%	4%	12%	6%	12%
More than 20 years	4%	5%	4%	6%	0%	6%
Average Age	7.8	8.2	8.2	8.5	6.9	8.5

* The sample size n=53 for water heating equipment age reflects the number of water heating equipment units with valid age data.
Source: 2013 CLASS.

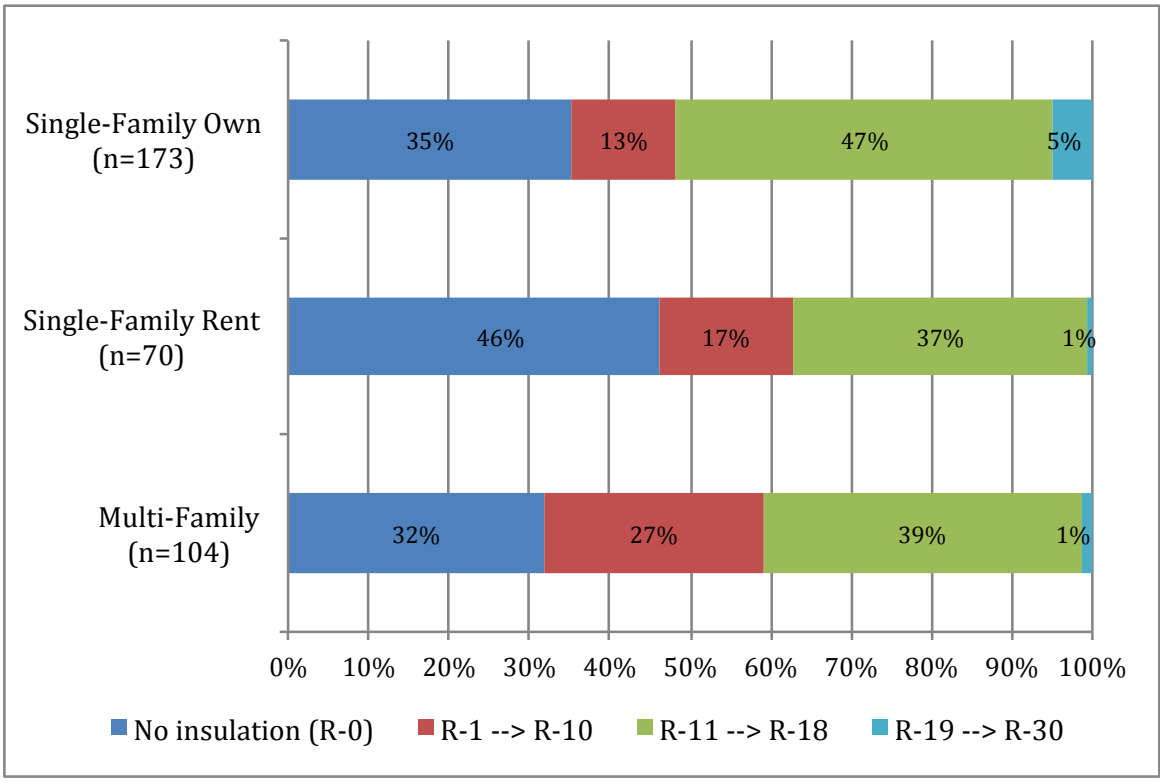
Table 29 shows the type of wall insulation that is present in California and LI homes, with the most common type between R-11 and R-18. LI homes typically have less wall insulation, with 35 percent having no insulation compared to 26 percent for the overall population. Figure 20 shows the same information by home type and ownership for the LI population, with single-family renters being the most likely (46%) to have no wall insulation—though this result is not statistically significant.

Table 29: Existing Wall Insulation R-Value – By Population Segment and IOU (LI Population n=358)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalGas
No insulation (R-0)	26%	35%	36%	33%	49%	32%
R-1 -> R-10	15%	20%	23%	20%	9%	20%
R-11 -> R-18	54%	44%	37%	45%	41%	47%
R-19 -> R-30	5%	0%	5%	1%	1%	1%

Source: 2013 CLASS.

Figure 20: Existing Wall Insulation R-Value – By LI Home Type (LI Population n=358) For California LI Population



Source: 2013 CLASS.

Table 30 shows the foundation type of California homes, with just over half having a slab foundation. Figure 21 shows foundation type for LI homes by home type and ownership, with multi-family homes most likely (62%) to have a slab foundation, though this result is not statistically significant. A high proportion of slab foundations could be an area of potential energy savings if slab edge insulation is lacking. The US Department of Energy's Office of Building Technology indicates that exterior edge slab insulation can reduce winter heating bills by 10 – 20 percent.[15]

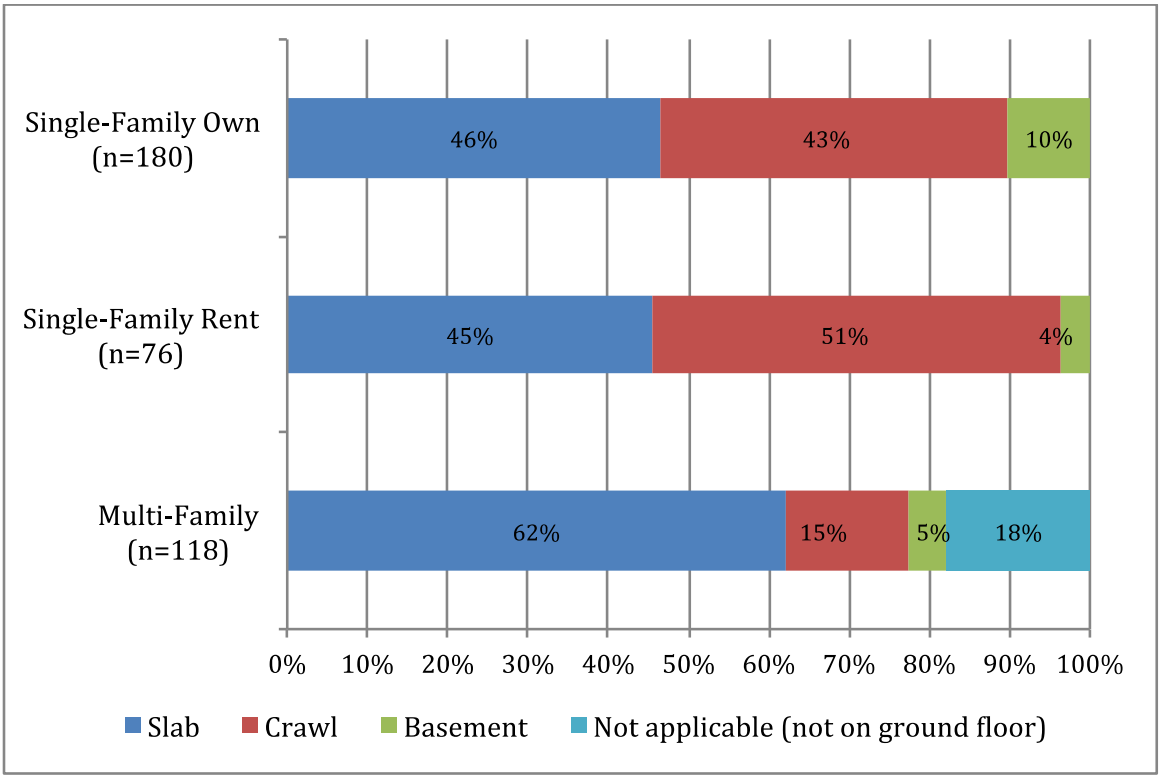
[15] Office of Building Technology. Technology Fact Sheet Slab Insulation. http://web.ornl.gov/sci/roofs%2Bwalls/insulation/fact%20sheets/slab%20insulation%20technology.pdf

Table 30: Foundation Type – By Population Segment and IOU (LI Population n=387)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalG
Slab	55%	52%	42%	59%	70%	60%
Crawl	31%	34%	39%	32%	15%	33%
Basement	7%	7%	10%	3%	7%	3%
Mobile home skirting	<1%	<1%	1%	0%	0%	0%
Not applicable (not on ground floor)	7%	9%	9%	6%	8%	4%

Source: 2013 CLASS.

Figure 21: Foundation Type – By LI Home Type (LI Population n=387) For California LI Population



Source: 2013 CLASS.

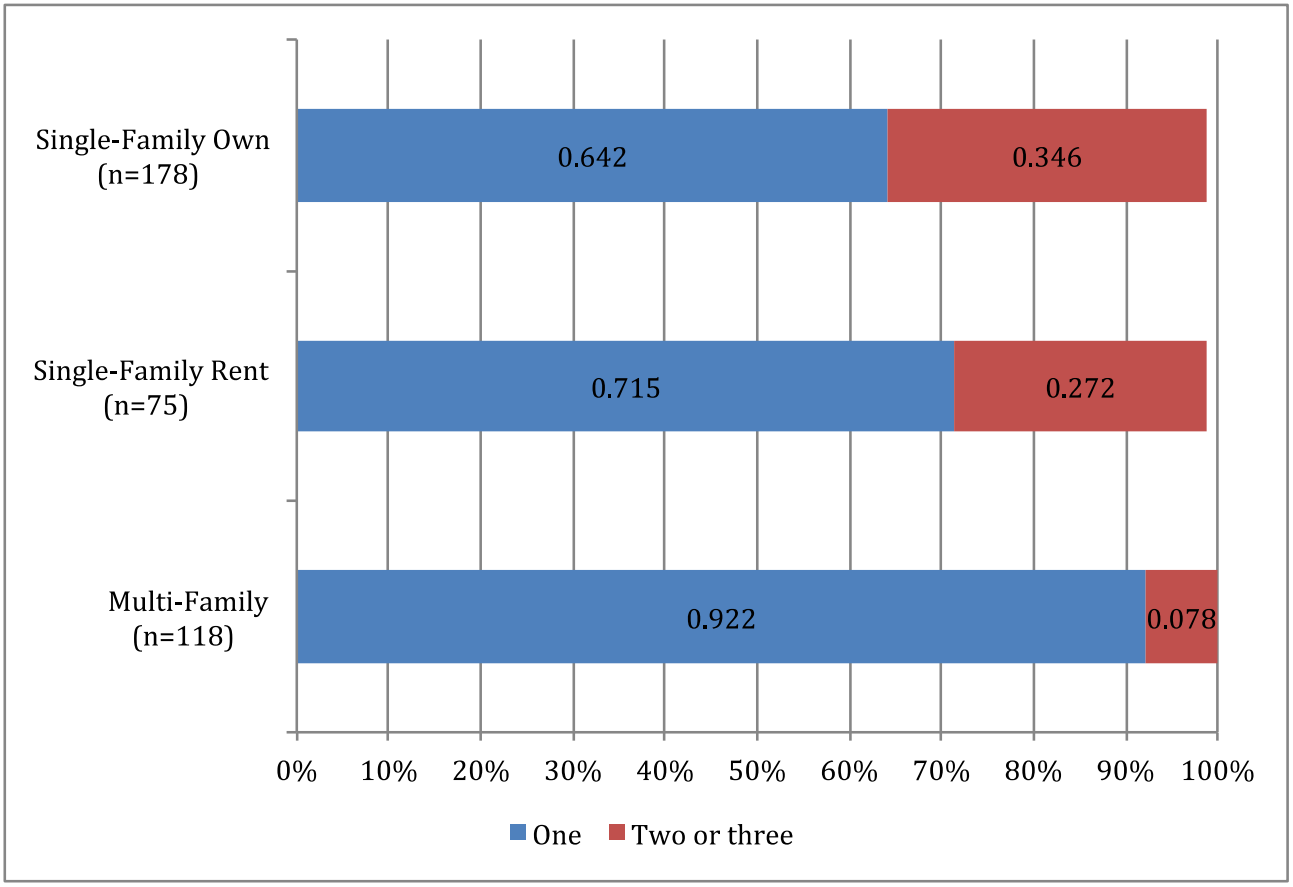
Table 31 below shows the number of refrigerators and their age. LI homes are more likely to have only one refrigerator, and their refrigerators are on average one year newer as compared to the overall population. Figure 22 shows the same information for the LI population by home type and ownership, with single-family homes much more likely to have a second or third refrigerator.

Table 31: Refrigerator Characteristics – By Population Segment and IOU (LI Population n=388 for equipment; n=268* for age)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalGas
Number of Refrigerators						
One	70%	77%	82%	73%	74%	73%
Two or three	29%	22%	18%	26%	26%	24%
Age						
<6 years	24%	28%	27%	28%	43%	28%
6-10 years	37%	42%	42%	41%	37%	40%
11-15 years	24%	18%	20%	17%	8%	21%
16+ years	16%	13%	10%	15%	12%	12%
Average Age	9.8	8.8	8.8	9.0	7.3	8.5

* The sample size n=53 for refrigerator age reflects the number of refrigerator units with valid age data.
Source: 2013 CLASS.

Figure 22: Refrigerator Quantity – By LI Home Type (LI Population n=371) For California LI Population



Source: 2013 CLASS.

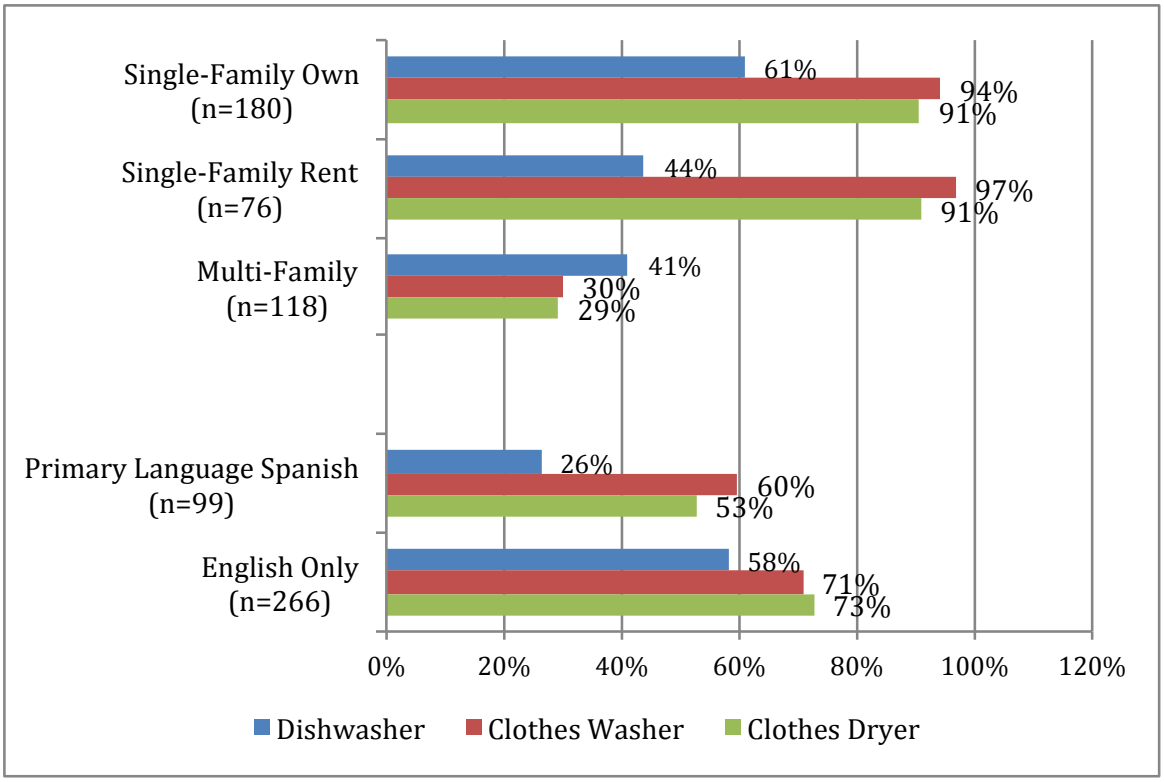
Table 32 shows the presence of appliances and for clothes dryer, fuel type. LI homes are less likely to have clothes washers, dryers and dishwashers than the total population. As shown in Figure 23, single-family homes are more likely to have clothes washers and dryers, and single-family homeowners and English-only homes are more likely to have dishwashers.

Table 32: Home Appliance Types – By Population Segment and IOU (LI Population n=388)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalGas
Dishwasher	74%	50%	45%	54%	56%	52%
No Dishwasher	26%	50%	55%	46%	44%	48%
Clothes Washer	81%	68%	68%	70%	63%	74%
No Clothes Washer	19%	32%	32%	30%	37%	26%
Clothes Dryer	79%	66%	65%	68%	60%	72%
Electric	28%	24%	42%	8%	17%	7%
Gas	49%	40%	21%	59%	43%	65%
Propane	2%	2%	2%	1%	1%	0%
No Clothes Dryer	21%	35%	35%	32%	40%	28%

Source: 2013 CLASS.

Figure 23: Home Appliance Presence – By LI Home Type and Language (LI Population n=388) For California LI Population



Source: 2013 CLASS.

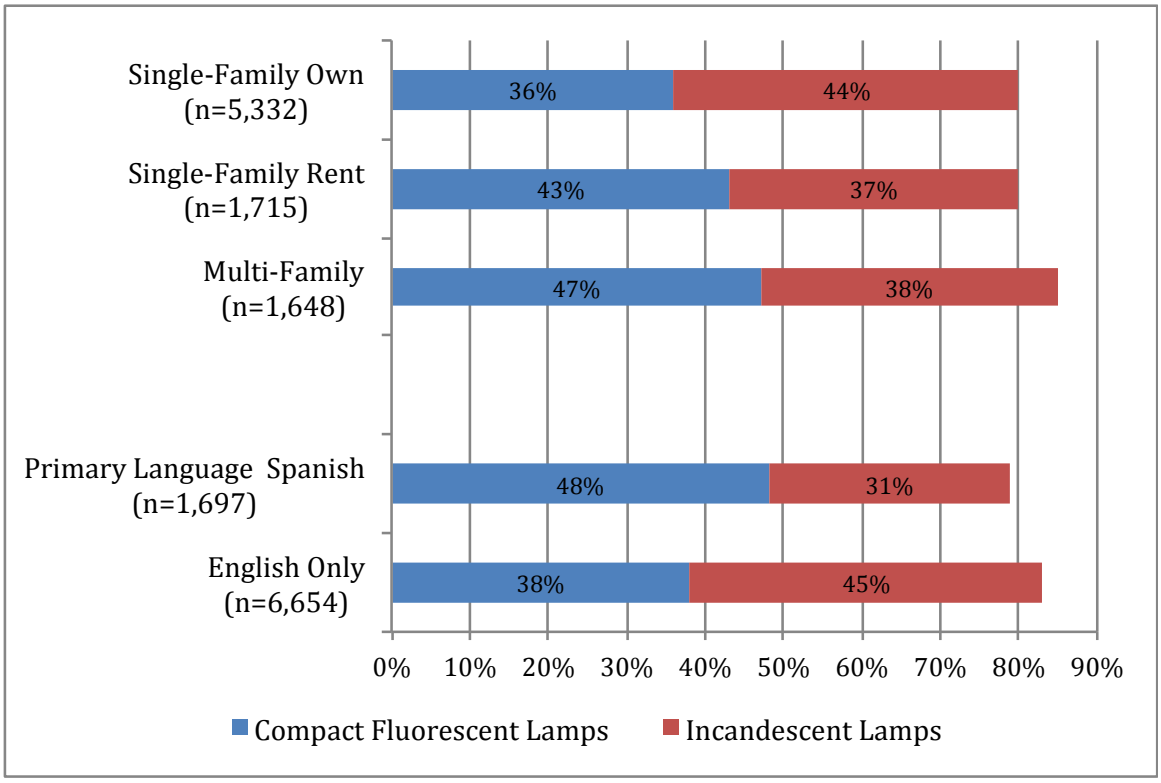
Table 33 shows the distribution of lamp types installed in homes, with only small, but statistically significant, differences in the fraction of CFLs and incandescent lamps in use in LI and all homes (34% for California homes and 41% for California LI homes). Only a small fraction of homes use lighting controls (18% of total and 14% of LI homes.) Spanish-speaking and multi-family LI homes have more CFLs on average than single-family and English-only LI homes, as shown in Figure 24. This may be a reflection of the many LI programs, including ESA, that have been in operation since the early 2000s that have provided CFLs at low or no cost to hard-to-reach communities.

Table 33: Lighting Types – By Population Segment and IOU (LI Population n=8,982)

	Percent of California Population	Percent of California Low Income Population	Percent of California Low Income Population			
	Total	Total	PG&E	SCE	SDG&E	SoCalGas
Lighting Type						
Incandescent Lamps	47%	41%	40%	41%	41%	42%
CFLs	34%	41%	42%	39%	40%	39%
Fluorescent Fixtures	7%	8%	7%	9%	11%	9%
Halogen Lamps	7%	4%	3%	4%	3%	4%
Other	4%	7%	7%	7%	5%	6%
Lighting Controls Installed	18%	14%	15%	14%	12%	14%
No Lighting Controls	82%	86%	85%	86%	88%	86%

* The sample size n=8,982 represents the total quantity of lighting fixtures in LI households.
Source: 2013 CLASS.

Figure 24: Lighting Types – By LI Home Type and Language (LI Population n=8,982*) For California LI Population



* The sample size n=8,982 represents the total quantity of lighting fixtures in LI households.
Source: 2013 CLASS

4.4 ESA Program Measures

Table 34 below indicates the measures available to customers participating in ESA. The CEC Climate Zone eligibility is shown in the second column and the final column indicates additional eligibility requirements based on IOU, home ownership and home type.

Table 34: ESA Program Measure Eligibility

Measure	CEC Climate Zone Eligibility	Other Eligibility
HVAC		
Gas Furnace Repair/Replace[1]	All	Homeowners only; safety measure only
Forced Air Unit Standing Pilot Light Conversion	All	SDG&E and SoCalGas only
Furnace Clean & Tune	5, 6, 7, 8, 9, 10, 13, 14, 15, 16	SDG&E and SoCalGas only
Room A/C Replacement	10, 13, 14, 16	For PG&E – single-family homeowners only
Central A/C Replacement	13 (PG&E only), 14, 15	For PG&E – single-family homeowners only
Central A/C Tune-up	2, 4, 6, 10, 11, 12, 13, 14, 15, 16	
Heat Pump	14, 15	SCE only
Evaporative Coolers	1-4, 10, 11, 12, 13, 14, 15, 16	PG&E and SCE only; no multi-family
Evaporative Cooler Tune-up	All	
Infiltration and Space Conditioning		
Envelope and Air Sealing Measures	All	
Duct Sealing	All	No multi-family
Attic Insulation	All	No mobile homes
Water Heating Measures		
Water Heater Conservation Measures	All	
Water Heater Replacement - Gas	All	Homeowners only
High Efficiency Clothes Washer	All	SDG&E and SoCalGas only
Thermostatic Shower Valve	All	No SCE
Lighting Measures		
CFL Lighting	All	
Interior Hard-wired	All	No SCE

Measure	CEC Climate Zone Eligibility	Other Eligibility
CFL fixtures		
Exterior Hard-wired CFL fixtures	All	SCE and SDG&E – no multi-family or mobile homes
Torchiere	All	
Occupancy Sensors	All	PG&E only
LED Night Light	All	SDG&E only
Other		
Refrigerators	All	
Pool Pumps	All	SCE single-family homes only
Microwave Ovens	All	PG&E and SDG&E only
Minor Home Repairs	All	
AC Time Delay	Varies based on home type	PG&E only
Smart power strips	All	SDG&E and SCE only

[1]Some exclusions for climate zones 6 and 8 for gas-heated homes.

[2]This measure is only for furnaces that are unsafe (e.g., fail a natural gas safety check), it is not intended as an energy efficiency measure.

Source: ESA measure eligibility table (approved on July 15, 2013) provided via email by the CPUC on August 12, 2013.

Table 35, Table 36, Table 37 and Table 38 below show the number of participating households that received each ESA measure (electric and gas measures, respectively) and the total electricity and gas savings by measure for 2011, based on the recent ESA impact evaluation. We used this information to understand the distribution of measure installations and savings contributions across IOUs.

Table 35: Electric ESA Measures Installed in 2011

Measure	Number of Households that Received the Measure			
	PG&E	SCE	SDG&E	Total
HVAC				
Room AC	3,202	931	305	4,438
Central AC	79	4,877	30	4,986
Central AC Tune-Up	12,123	32	59	12,214
Evaporative Cooler	5,841	15,970	0	21,811
Evaporative Cooler Tune-Up	0	9	0	9
Infiltration and Space Conditioning				
Weatherization	64,751	531	16,756	82,038
Duct Test Seal	3,007	4,499	937	8,443
Insulation	6,290	0	789	7,079
Water Heating Measures				
Faucet Aerator	0	397	1,271	1,668
Low Flow Showerhead	0	420	449	869
Thermostatic Shower Valve	0	0	272	272
Water Heater Blanket	0	63	52	115
Water Heater Pipe Insulation	0	64	87	151
Water Heater Repair/Replace	0	0	6	6
Water Heater Conservation Measures	8,450	0	0	8,450
High Efficiency Clothes Washer	0	0	1,668	1,668
Lighting Measures				
CFL	99,402	68,053	16,488	183,943
Hard-wired Lights	87,276	0	6,641	93,917
LED Night Lights	0	0	20,452	20,452
Torchiere	0	2,582	6,612	9,194
Lighting	26,414	835	0	27,249
Other				
Microwaves	0	0	1,524	1,524
Refrigerator	16,773	16,758	1,810	35,341
Pool Pump	0	1,912	0	1,912

Source: 2011 ESA Impact Evaluation, Appendix D (Evergreen Economics, August 30, 2013).

Table 36: Gas ESA Measures Installed in 2011

Measure	Number of Households that Received the Measure			
	PG&E	SoCalGas	SDG&E	Total
HVAC				
Furnace Clean & Tune	0	20,199	5,224	25,423
Furnace Repair/Replace	3,415	15,676	3,010	22,101
Pilot Light Conversion	0	109	310	419
Infiltration and Space Conditioning				
Duct Test Seal	3,578	2,616	929	7,123
Weatherization	69,585	109,070	7,011	185,666
Insulation	7,165	8,236	726	16,127
Water Heating Measures				
High Efficiency Clothes Washer	0	4,680	1,585	6,265
Faucet Aerator	0	0	10,370	10,370
Low Flow Showerhead	0	0	10,144	10,144
Thermostatic Shower Valve	0	0	3,816	3,816
Water Heater Blanket	0	0	787	787
Water Heater Pipe Insulation	0	0	503	503
Water Heater Repair/Replace	1,326	1,819	1,236	4,381
Water Heater Conservation Measures	79,662	114,139	0	193,801

Source: 2011 ESA Impact Evaluation, Appendix D (Evergreen Economics, August 30, 2013).

Table 37: 2011 ESA Electricity Savings by Measure

Measure	First-Year Electricity Savings (kWh)			
	PG&E	SCE	SDG&E	Total
HVAC				
Room AC	356,399	52,757	8,323	417,479
Central AC	11,182	782,397	425	794,004
Central AC Tune-Up	2,788,718	5,462	13,519	2,807,699
Evaporative Cooler	1,531,214	7,150,369	0	8,681,583
Evaporative Cooler Tune-Up	0	334	0	334
Infiltration and Space Conditioning				
Weatherization	10,887,753	29,273	830,475	11,747,501
Duct Test Seal	337,597	92,381	52,210	482,188
Insulation	920,493	0	76,691	997,184
Water Heating Measures				
Faucet Aerator	0	64,344	4,199	68,543
Low Flow Showerhead	0	44,184	2,541	46,725
Thermostatic Shower Valve	0	0	20,079	20,079
Water Heater Blanket	0	5,460	173	5,633
Water Heater Pipe Insulation	0	5,460	34	5,494
Water Heater Repair/Replace	0	0	0	0
Water Heater Conservation Measures	2,309,384	0	0	2,309,384
High Efficiency Clothes Washer	0	0	205,255	205,255
Lighting Measures				
CFL	7,484,304	4,848,777	1,848,447	14,181,528
Hard-wired Lights	12,719,484	0	778,420	13,497,904
LED Night Lights	0	0	60,017	60,017
Torchiere	0	247,252	225,195	472,447
Lighting	3,710,458	41,191	0	3,751,649
Other				
Microwaves	0	0	101,370	101,370
Refrigerator	10,992,293	12,970,606	1,159,157	25,122,056
Pool Pump	0	2,080,256	0	2,080,256
Total	**54,049,279**	**28,420,503**	**5,386,530**	**87,856,312**

Source: 2011 ESA Impact Evaluation, Appendix D (Evergreen Economics, August 30, 2013).

Table 38: 2011 ESA Gas Savings by Measure

Measure	First-Year Gas Savings (therms)			
	PG&E	SoCalGas	SDG&E	Total
HVAC				
Furnace Clean & Tune	0	114,174	50,885	165,059
Furnace Repair/Replace	4,030	0	0	4,030
Pilot Light Conversion	0	4,830	4,680	9,510
Infiltration and Space Conditioning				
Duct Test Seal	61,582	40,218	13,500	115,300
Weatherization	658,546	432,161	23,152	1,113,859
Insulation	318,832	218,406	19,313	556,551
Water Heating Measures				
High Efficiency Clothes Washer	0	144,531	25,166	169,697
Faucet Aerator	0	0	7,647	7,647
Low Flow Showerhead	0	0	9,600	9,600
Thermostatic Shower Valve	0	0	15,318	15,318
Water Heater Blanket	0	0	376	376
Water Heater Pipe Insulation	0	0	23	23
Water Heater Repair/Replace	7,355	6,402	8,405	22,162
Water Heater Conservation Measures	1,109,099	377,331	0	1,486,430
Total	**2,159,444**	**1,338,053**	**178,065**	**3,675,562**

Source: 2011 ESA Impact Evaluation, Appendix D (Evergreen Economics, August 30, 2013).

4.5 Remaining ESA Program Energy Savings Potential

This report contains data that could be used in combination with the recent 2011 ESA impact evaluation to inform the development of estimates of the remaining ESA program energy savings potential.

In particular, these study results could be used to inform ESA program energy savings potential:

- In Section 4.1, we report Athens Research estimates of the remaining ESA eligible population;
- In Section 4.2, we report KEMA RASS and CLASS data that indicate the types of energy-using appliances and equipment that LI (i.e., likely ESA eligible) customers have;
- In Section 4.3, we report Evergreen Economics 2011 ESA impact evaluation results by IOU and measure category; and
- In Section 5, we report phone survey and in-home visit results that indicate the types of measures that customers who are enrolled in CARE (who are likely income-eligible for ESA) who have not yet participated in ESA say they need (based on the phone survey) and we observed they need (based on the in-home visit).

The most critical data that could be used to inform energy savings potential for the ESA program is robust current data on the energy equipment characteristics of non-participating homes. The prior KEMA LINA study collected such data and developed estimates of remaining potential, but those estimates are based on data collected in 2004. This current study lacked the resources to include a large representative sample of non-participants, with auditors spending several hours per home collecting detailed (e.g., name plate) data on all the energy-using equipment.

In addition to the critical data gap, there are caveats associated with using past data to inform estimates of future energy savings potential, including:

- The remaining ESA non-participants are different than recent or past ESA participants —as evidenced in this study, which our telephone survey data highlight (see summary in Section 5.4.5). However, there is likely non-response bias in our telephone survey so the ESA non-participants we conducted surveys with do not represent all the remaining ESA non-participants (refer to the discussion in Section 5.1.1.2 below); they represent those remaining ESA non-participants who may be contacted by phone and are willing to talk to a surveyor about LI-related issues. There are additional ESA non-participants who may have different home characteristics and needs and savings potential.
- ESA impact savings estimates are not consistent over time, possibly reinforcing the issue raised in the previous bullet that ESA participants are not the same and the programs have probably reached those with the most savings potential in earlier program cycles, leaving those with less savings potential (and perhaps more barriers to reaching them).

A recent energy efficiency potential study, conducted by Navigant Consulting,[16] used California IOU data combined with estimates from the prior KEMA LINA study to develop estimates of remaining energy efficiency potential in the LI sector. They estimated technical potential[17] per household of 208 kWh and 9 therms. These estimates are close to other available estimates on average per household ESA energy savings, as shown in Table 39 below.

[16] Analysis to Update Energy Efficiency Potential, goals and Targets for 2013 and Beyond – Track 1 Statewide Investor-Owned Utility Energy Efficiency Potential Study. Prepared for the California Public Utilities Commission. Navigant Consulting, Inc. and Heschong Mahone Group, March 19, 2012.

[17] Technical potential is defined as the amount of energy savings that would be possible if all technically applicable and feasible opportunities to improve energy efficiency were taken, including retrofit measures, replace-on-burnout measures, and new construction measures. It does not take into account whether such retrofits are economically feasible (economic potential) or what fraction would be likely to occur given the current market conditions (market potential).

Table 39 – ESA Potential Estimates

Source	Per LI Household Electricity Savings (kWh/year)	Percentage Savings (based on CARE customer consumption)	Per LI Household Gas Savings (therms/year)	Percentage Savings (based on CARE customer consumption)
2012 Navigant Energy Efficiency Potential Study	208	3%	9	2%
2013 Evergreen Economics ESA Impact Evaluation – PG&E	367	6%	22	6%
2013 Evergreen Economics ESA Impact Evaluation – SCE	279	4%	NA	NA
2013 Evergreen Economics ESA Impact Evaluation – SDG&E	279	4%	26	7%
2013 Evergreen Economics ESA Impact Evaluation – SoCalGas	NA	NA	13	3%
2007 KEMA LINA Study	150	2%	22	6%
Average IOU CARE customer annual consumption (based on IOU 2012 CARE/ESA Annual Reports)	6,564	100%	372	100%

We may combine the technical potential estimates with our study's estimates of willingness to participate to yield estimates of market potential, which for LI households is the technical potential combined with the fraction of households that would be willing to participate in the ESA program. As presented in Section 5.4.4.1, we estimate that 52 percent of income-eligible non-participant homes are willing to participate in ESA. Note that this estimate does not include some unwilling non-participants whose barriers could be addressed by the program, such as renters who do not want to ask their landlord for permission.

We may apply the technical potential estimates and the willing to participate estimates to the 2012 estimates of the number of income-eligible non-participant homes from Table 2 in Section 4.1 above by fuel[18] as follows:

[18] Based on Athens Research analysis.

- Total ESA electric savings potential = 208 kWh x 52% (WTP) x 3,133,942 income-eligible electric IOU customers = 339 MWh.
- Total ESA gas savings potential = 9 therms x 52% (WTP) x 3,714,462 income-eligible gas IOU customers = 17.4 million therms.

We provide recommendations for filling data gaps in Section 3 of this report that are intended to guide the development of a future study that could more accurately and robustly determine the remaining energy savings potential for the ESA program.

5 Low-Income Population Needs and Program Assessment

This section describes the needs of the state of California's low-income (LI) population, how the programs are meeting those needs and whether there exist unmet needs.

5.1 Overview of Sources

We used a variety of sources to support the assessment in this report section (see Section 3 for a description of the research methods). We used the following sources to develop a brief overview for each subsection that provides program context:

- **Program staff in-depth interviews** with each of the IOU program staff for CARE and ESA that provided information about how the programs are implemented and feedback on barriers to participation and meeting customers' energy needs;
- **ESA contractor in-depth interviews** with 11 contractors that do ESA outreach and assessments[19] that provided feedback from contractors on customer outreach, enrollment and eligibility screening;
- **CARE contractor in-depth interviews** with interviews with six contractors that conduct outreach for the CARE program (including those that target Chinese, Vietnamese, Pacific Islanders, Hispanic, Korean and vision-impaired customers), typically offering a wide range of service referrals (e.g., on substance abuse, health care, domestic violence) to LI clients, on customer outreach and barriers to participation; and
- **Literature review** of numerous LI studies and information sources to obtain an understanding of the policies governing the programs and program implementation details, with a focus on customer outreach, enrollment and eligibility and meeting customers' energy needs.

We relied on the following primary research and data analysis to develop the assessments:

- **1,028 telephone survey of CARE customers**[20] including ESA participants (from 2002 – 2012) and ESA non-participants, with highlights of the main findings found in this section including comparisons to prior KEMA LINA study where possible, with more detailed findings provided in the Appendix, Section 8;[21]

[19] We did not interview any ESA installation or inspection contractors.
[20] Due to the CARE program's high penetration rate (see Section 2.1.1) and the consistent income and household size eligibility criteria for CARE and ESA (see Section 2.1), CARE customers are a proxy for customers who are income-eligible for both CARE and ESA.
[21] Section 4.3 also leverages the customer telephone survey to present some demographic information about LI customers, based on their ESA participation status.

- We examined differences in the phone survey results by a number of program categories and LI population segments, including but not limited to CARE participants (which is the basis of the sample frame), ESA participants, ESA non-participants (that are enrolled in CARE), home type, home ownership, language, urban versus rural and climate zone categories. We provide highlights of the telephone survey results throughout this section, with more detailed results provided in Section 8.
- We collapsed home type and home ownership when breaking out results by those categories in this section, showing "single-family owners", "single-family renters" and "multi-family". Mobile homes only accounted for 42 respondents (3% of the sample), not a large enough sample to break out results. 95 percent of multi-family homes are occupied by renters.
- Any differences across segments that we describe in the text are statistically significant[22] unless indicated otherwise. We provide the sample size for the total column in the caption of each result in this section, and more detailed sample size information (and standard errors for means) in Section 8.

- A nested sample of **88 in-home visits** within the ESA non-participant telephone survey sample, providing a fuller picture of ESA non-participants' characteristics and energy needs.
- **A review of several LI programs** similar to ESA offered in other states, providing insights from other similar programs; and
- **Modeling and analysis** of IOU, Athens Research and Census data, informing CARE program participation and penetration, ESA participation and ESA willingness to participate.
  - **CARE modeling**: We developed statistical regression models to understand the drivers of and barriers to CARE program participation based on Athens Research data. The models examine variations in participation and penetration ratios across census block groups, and what variables (that we may observe at the Census block group level) might predict higher or lower rates, all else constant.
  - **ESA modeling**: Similar to the CARE modeling, we developed regression models to understand drivers of and barriers to ESA program participation. We used customer level data from the IOUs (stage one) supplemented with telephone survey data (stage two).
  - **Conjoint analysis:** We used a stated preference survey technique that involves having respondents sort through and rank options that reflect different choices. For this analysis, participants responded to an online/onsite survey where they were first asked to rank choices that

[22] We calculated confidence bounds or referred to standard errors for means for each result noted in the text.

reflected different types of ESA program scenarios. For all these scenarios, each choice was defined by several attributes, and respondents were asked to rank the options from most to least preferred based on these attributes, and then to indicate which scenarios they would actually participate in.

5.1.1 Sample Representation

Below we discuss some important implications of our research approach that the reader should consider when reviewing the results contained in this section.

5.1.1.1 Customer Telephone Survey

There are two implications to consider regarding our approach to the customer telephone survey, based on the sampling and survey approach.

The basis of the customer telephone survey sample frame was IOU tracking data on CARE enrollees during the period 2010 – 2012. If a household was on the CARE rate during any month of that period, they were considered a "CARE enrollee" and part of the sample frame. The rationale for this approach was that estimated CARE program penetration is so high (91% for 2012, as reported previously in Section 1.1.1) that CARE enrollees could serve as a proxy for the LI population (based on the CARE program income guidelines.) This approach was also highly practical since the IOU CARE participant records required relatively less resources to obtain and process, compared to the alternative of attempting a general population survey with screening for income-eligibility.

However, there may be customers enrolled in the CARE program that are not actually income-eligible, because to enroll in CARE, customers are required to self-report their income qualification; they do not actually have to prove their eligibility (see Section 1.1.1 for a description of the CARE program). While the IOUs are aware that there are probably some instances where this is occurring (such as due to confusion about eligibility or households that do not remove themselves from CARE when their income increases), there is no current estimate of how many.

The major research implication of this sampling approach is that some of the customers we considered as income-qualified who responded to our survey may actually have higher incomes and not qualify for the programs. We asked respondents to tell us their income at the end of the survey (a response was not required), but that is not a valid way to confirm their eligibility. We lacked the resources to attempt to more definitively confirm customers' incomes, which would have been very costly and created secondary issues related to non-response bias. Our CARE modeling effort, described in Section 5.3.5 below, provides some insights on this issue.

The second implication stems from our telephone survey approach, which is associated with some level of bias, where our respondents represent the customers who are willing

to talk with a surveyor on the phone about energy issues. (Our telephone call center disposition indicated [see Section 12.2] that we had to dial about twice as many customers as the number of completes, suggesting our results represent about half the ESA non-participants, the half that is reachable by phone. The other half is very difficult to reach by phone by a surveyor who is discussing energy issues.) While we used standard industry practices to ensure the most representative sample possible (calling at different times of the day and week, using trained interviewers and well-vetted screening scripts and conducting Spanish-language surveys), there are some customers who are not able or willing to talk to a surveyor by phone. We had the advantage of using updated IOU customer contact information including phone numbers from the CARE applications and/or billing records, but not all customers are willing to provide their phone number to the IOU and those that move around a lot are less represented since for a larger fraction of those customers, the phone numbers will not be updated.

This issue of non-response bias should be considered in the context of the ESA and CARE programs, which also use telephone calls (either automated or with a live representative) as one major approach to program outreach (see Sections 5.2.1 and 5.3.1 for a description of CARE and ESA marketing and outreach approaches). Our telephone survey sample represents customers who are more likely to respond to CARE and ESA program outreach.

We compared the demographic composition of our telephone survey sample to the ACS/PUMS LI-subsample (see Section 8.1), which is a much more robust and less biased sample,[23] to understand the extent of the CARE income-eligibility and survey non-response bias issues on the representativeness of the telephone survey sample. Across the state, we found that our telephone survey sample has a much higher proportion of homeowners, White and English speakers as compared to the ACS/PUMS LI sample. (When examined by IOU, we noted a difference for SDG&E with our sample having a greater proportion of multi-family homes.) We developed adjustment weights by IOU, home type and homeownership to correct for the difference in the rate of homeowners and home type. We did not attempt to adjust our sample to correct for underrepresenting non-English speakers and non-White ethnicities since due to resource constraints we did not talk to non-English/non-Spanish customers. (For similar reasons we also did not attempt to reach households where non-standard forms of telecommunication are used.) The sample of customers who we interviewed who are non-White and/or speak a language other than English or Spanish should not be weighted to reflect a broader segment of the population who do not speak English or Spanish. Note that the telephone survey is one piece of the broader resources we drew

[23] The Census Bureau institutes several measures to control for sampling and non-sampling error, including non-response bias. The ACS uses a combination of mail, CATI and CAPI data collection efforts to maximize response rates to the mandatory survey, including follow up interviews to mail non-respondents. The response rate for 2011 was 97.6%. Specific details on accuracy of ACS data can be found at http://www.census.gov/acs/www/data_documentation/documentation_main .

from to develop the assessments in this section; the LI population characterization in Section 4.3, the CARE modeling in Section 5.3.6 and the ESA modeling in Section 5.4.5 draw from ACS/PUMS and Athens Research data that reflect the total LI population, including non-English/non-Spanish speakers and households that require non-standard forms of telecommunication. In particular, the CARE models and the first stage ESA models provide insight into the characteristics of likely income-eligible customers who have not enrolled in CARE or participated in ESA, based on what we could observe in the available data (for CARE – at the census block group level, and for ESA – at the individual level based on IOU data).

5.1.1.2 ESA Non-Participant In-Home Sample

The ESA non-participant in-home survey sample was recruited from the telephone survey. The sample represents customers who are on CARE (and are likely income-eligible[24]), have not had ESA treatment in their homes since 2002, who are willing to talk to a surveyor by phone about energy issues and who will allow a researcher into their home[25] for an in-person interview and walk-through observation of their energy-using equipment. As such, the in-home sample represents the subset of telephone respondents who were willing to participate in the visits.

Our telephone survey results showed that about half the ESA non-participants were willing to be recruited for an in-home interview, and of those, around one-quarter that we attempted to visit had issues arise that prevented us from doing the visit.

What we learned in reaching out to customers to participate in the in-home visits will also apply to program outreach. Households that answer the telephone regarding ESA and agree to in-person visits are also more likely to be accessible to the program. As such, our discussion of non-participants could be considered to be the next cadre of participants. They do not necessarily represent the full population of non-participants, as some eligible households are more difficult to reach for either a research study or program participation and are underrepresented in our study sample.

5.2 ESA Program Accessibility

This subsection presents study results on ESA program awareness and outreach. First, we provide an overview of program marketing and outreach, followed by customer telephone survey in-home visit results. Feedback provided by program staff and contractors and additional telephone and in-home survey results are included in Section 5.4, where we discuss ESA drivers of and barriers to participation.

[24] We reviewed the self-reported income of ESA non-participant telephone survey respondents and screened out any customers who were likely ineligible based on their response.
[25] Customers were given a $100 Visa gift card.

5.2.1 Overview of ESA Marketing and Outreach

The IOUs use automated phone calls, email campaigns and periodic direct mail combined with data mining to identify likely eligible customers for the ESA program. The IOUs track who has participated in ESA in the past and who has not, CARE enrollment status, and income levels for geographic areas in order to identify likely eligible customers. There is additional data sharing across IOUs and other utilities for other income-qualified programs.

There are a number of other methods that the IOUs have used to identify eligible households:

- Leveraging IOU data on CARE enrollments, since income-eligibility is consistent across the two programs;
- Accessing additional IOU marketing and customer data;
- Accessing the CIS database to identify customer language preference to tailor outreach strategies;
- Purchasing third-party data and combining with IOU data; and
- Tracking ethnicity and language preferences of ESA program participants and using that information to guide marketing efforts to groups with a lower percentage of participation.

The ESA marketing and outreach teams develop and implement a variety of marketing strategies, such as direct mailing, outbound calling, e-mailing and leveraging grass roots through community involvement, developing collateral for the specific events in multiple languages to enroll and educate customers.

In general, all the IOUs are moving toward highly customized messaging targeted to hard-to-reach populations. To support this development, they collect, track, purchase and analyze detailed geographic and demographic characteristics of their service territories' eligible population. Messages may be customized or timed to the appropriate season for specific measures. IOUs develop customized messaging for seniors and disabled populations as well as a variety of multi-cultural/multi-lingual communities.

The ESA program involves a number of in-person visits by assessment and installation contractors, requiring travel. For this reason the implementation teams find it useful to employ tactics that lead to geographic clustering of enrollment/installations. Some IOUs batch potentially eligible customers for contractors in clustered areas to minimize travel costs and time (in some cases, IOUs leave the logistical planning to the contractors). Managing program operations requires substantial logistical planning, looking at where remaining eligible customers are located, contractor service territories and ability to ramp up or down based on the number of leads, and batching the leads for contractors.

The IOUs coordinate automatic voice message (AVM) outbound calling to support geographic clustering of installations. If a customer responds to an AVM, they can be directly connected with contractors, and in some cases, schedule an appointment during the phone call. In other cases, they can indicate their interest and the lead will be passed on to the appropriate contractor. These are targeted campaigns developed geographically in coordination with contractors. Some contractors conduct door-to-door canvassing and direct customer calls, while others rely on leads provided by IOUs.

The IOUs and their contractors attempt to accommodate non-English language speakers using a number of tactics, including providing multiple language options on AVM, matching contractors with language capabilities to geographic areas with those language needs, using in-language direct mail and advertisements in local ethnic media.

Outreach and assessment contractors[26] supplement IOU outreach strategies, but mostly rely on IOU referrals (including direct customer calls in response to IOU AVM campaigns, mostly based on customers enrolled in CARE who have self-reported that they are income-eligible). Some conduct their own advertising and/or conduct door-to-door canvassing. Community organizations, property managers and word-of-mouth also generate customer leads. Contractors also do outreach at community events and senior centers. They typically have a specific customer enrollment goal provided by the IOU for a specific geographic area.

5.2.1.1 High-Usage Customers on CARE

New CPUC direction requires high usage customers on the CARE rate to be subject to income verification processes (i.e., post-enrollment verification or PEV) and take steps to reduce their energy usage. High usage customers—or customers exceeding 400 percent of baseline usage—must provide income documentation and participate in the ESA program in order to stay on the CARE rate. CARE customers exceeding 600 percent of baseline must do these things and also reduce their usage to 400 percent or they will be dropped from the CARE rate.

The IOUs are using communication and notification strategies to high usage customers, giving them an opportunity to opt out of CARE before the requirements are implemented.

[26] ESA outreach and assessment contractors are responsible for identifying and assessing income-eligibility of customers for the ESA program. They also perform a basic measure assessment, which is used to determine initial measure eligibility. Installation contractors (including HVAC, weatherization and plumbers) schedule subsequent appointments to do a more formal measure eligibility assessment before installing measures.

5.2.1.2 Tracking Disabled Customer Participation

The IOUs are required to report the percentage of ESA participants that they observe to be disabled, with a target of 15 percent.[27] The IOUs are no longer allowed to ask the customer for their disabled status (as of the 2009-2011 program cycle). Customers can volunteer the information or the contractor can observe it if it is very obvious. However, there may be other household members that are not present and/or the disability(ies) may not be observable so the actual penetration is probably higher than what is presently reported.

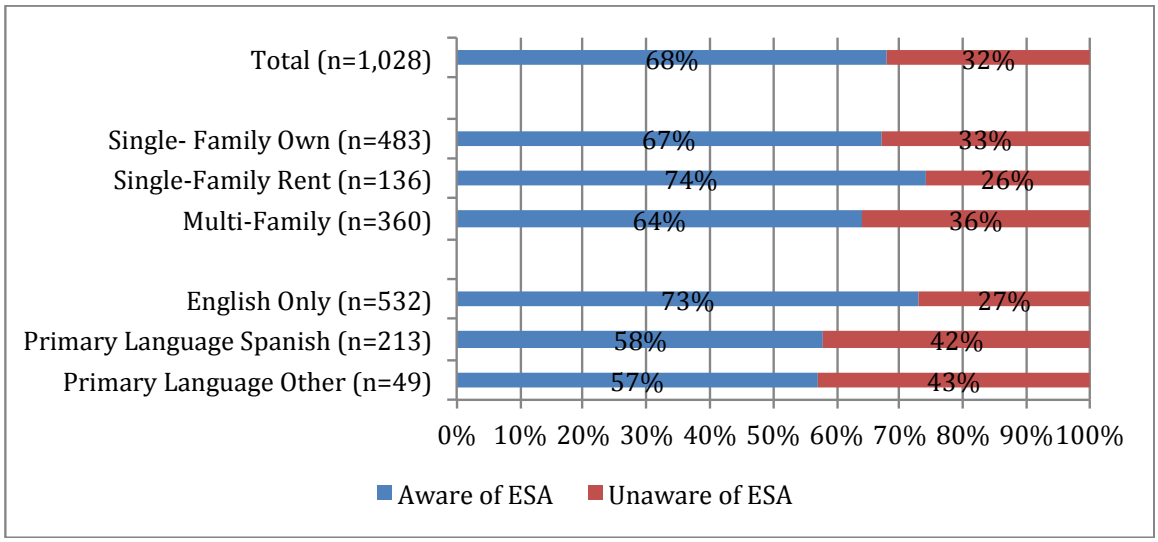
The IOUs typically partner with organizations that outreach to disabled customers, but both IOUs and contractors report that are issues with confidentiality, that the organizations do not always want to share their customer lists. In addition, IOUs partner with agencies that serve senior communities and conduct outreach events that target the visually impaired.

5.2.2 Customer Telephone Survey

We asked telephone survey respondents whether they are aware of ESA, providing them with a general description of the program. Since the program has recently changed its name, we did not expect unprompted awareness of "Energy Savings Assistance Program". As shown in Figure 25 below, two-thirds of respondents are aware of the ESA program. English-only households have a higher level of awareness (73%) than other households. Single-family homeowners have a higher level of awareness than renters or multi-family residents, but this difference is not statistically significant. (As reported in Section 5.1, 95 percent of multi-family homes are occupied by renters, so we do not break out that home type by home ownership.) We did not attempt to distinguish between awareness of the ESA program and other programs such as LIHEAP that provide similar services to the state's LI households.

[27] Note that the prior KEMA LINA study estimated that 14 percent of LI households have disabled members and an additional 13 percent have both elderly and disabled members for a total of 27 percent of households that have disabled members. (Based on the study's on-site survey that looked at physical , emotional and mental disabilities.) We think that these results may have been misinterpreted, such that the 14 percent estimate of LI households that have disabled members but do not have elderly members was used to support the 15 percent target.

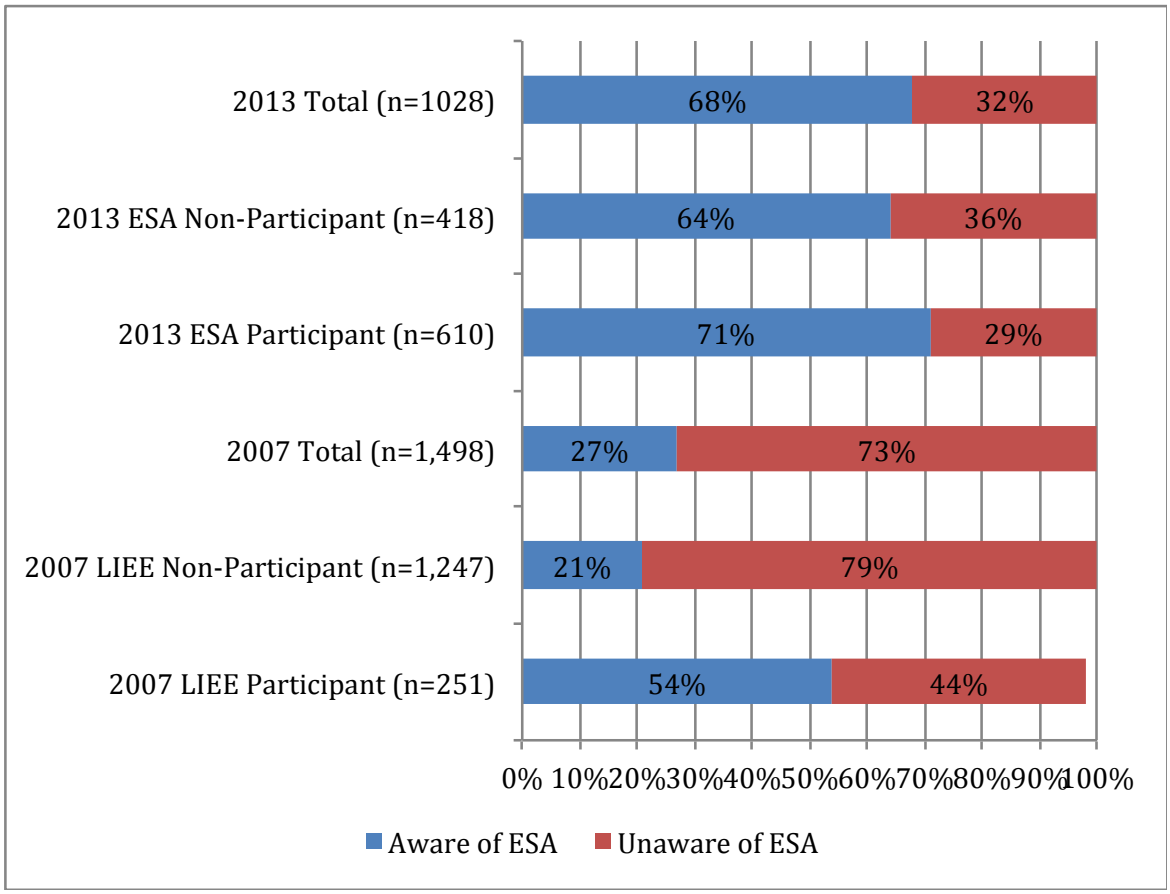
Figure 25: ESA Awareness (Aided) by LI Population Segments (S17) For California LI Population



Source: 2013 CARE Participant Telephone Survey

Figure 26 below compares ESA program awareness over time, using data from the prior KEMA LINA study. Program awareness has increased substantially since the last study, from 27 to 68 percent of the LI population, and also among the program participants and non-participants. Recall that "participants" are households that are living in a home that has been treated by ESA, and they may not be aware that the home has been treated or may not recall that it was treated (if they were living in the home when the program installed measures). There may also be cases where even though we attempted to talk to the head of household, that the person responding to the survey was not the person who participated in the program.

Figure 26: ESA/LIEE Awareness by ESA Participation Over Time (S17) for California LI Population

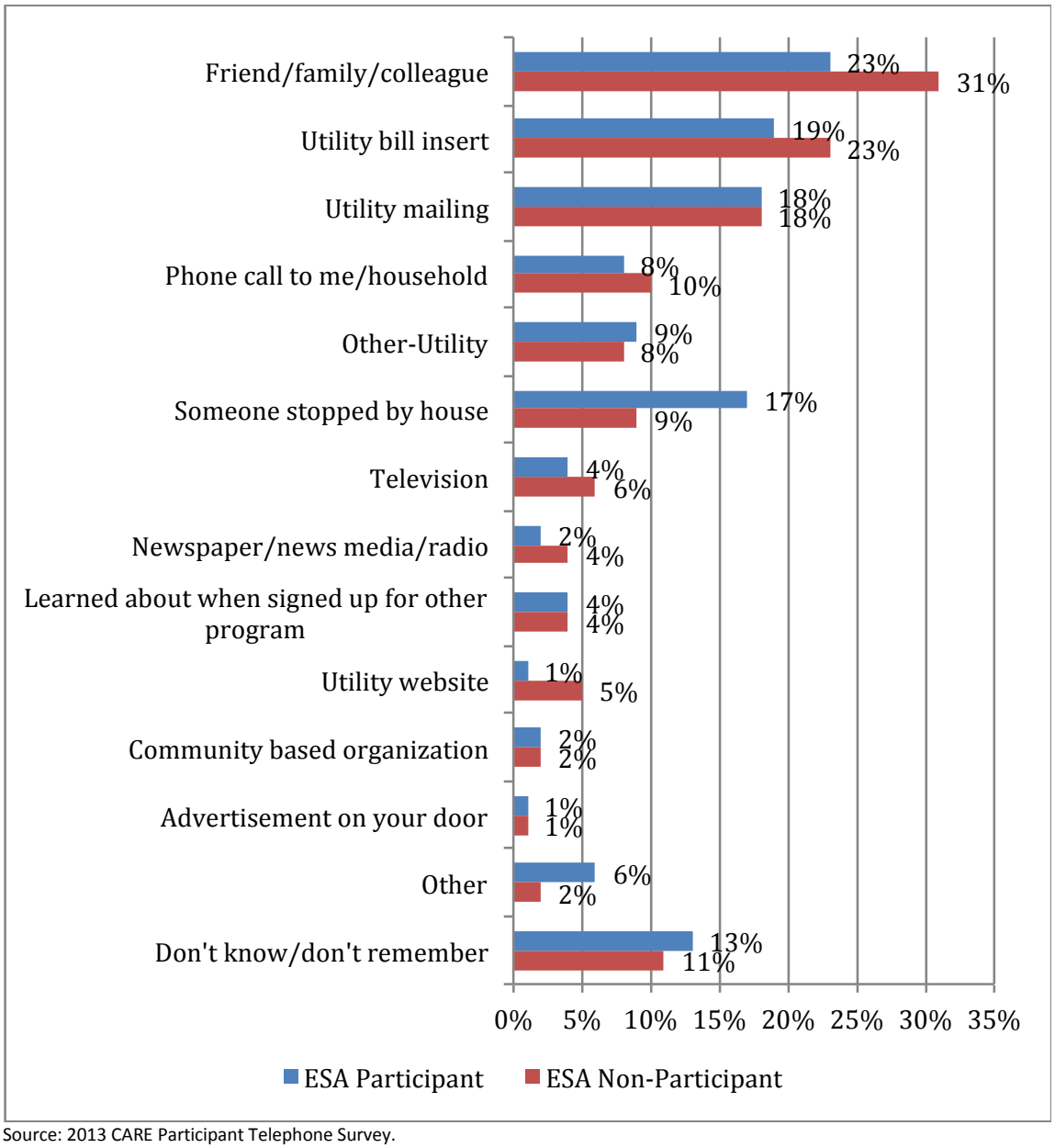


2007 source: p. 5-56 of KEMA report
2013 source: 2013 CARE Participant Telephone Survey

Figure 27 below describes how survey respondents learned about the ESA program (of those that were aware)—with hearing about it from a friend, family member or colleague being the most common method (27% of all aware respondents), closely followed by an IOU bill insert (21%) and mailing (18%). A greater proportion of ESA participants (17%) learned about the program from someone stopping by their home than non-participants (9%). We remind the reader that the sample is biased towards households who are willing to talk to a telephone and in-person surveyor about energy issues and the CARE program. Those that did not respond might have lower awareness and for those who are aware, different source of awareness.

Advertising via television, radio and newspaper or other media was mentioned by few respondents – though they were only able to respond with the primary source of their awareness. The IOUs do not rely on media advertising as a primary marketing delivery channel, and when they do use these channels it is often in conjunction with another targeted campaign such as phone calls or door-to-door canvassing. The advertising serves as a foundation that the more personal outreach leverages to facilitate households' awareness and participation.

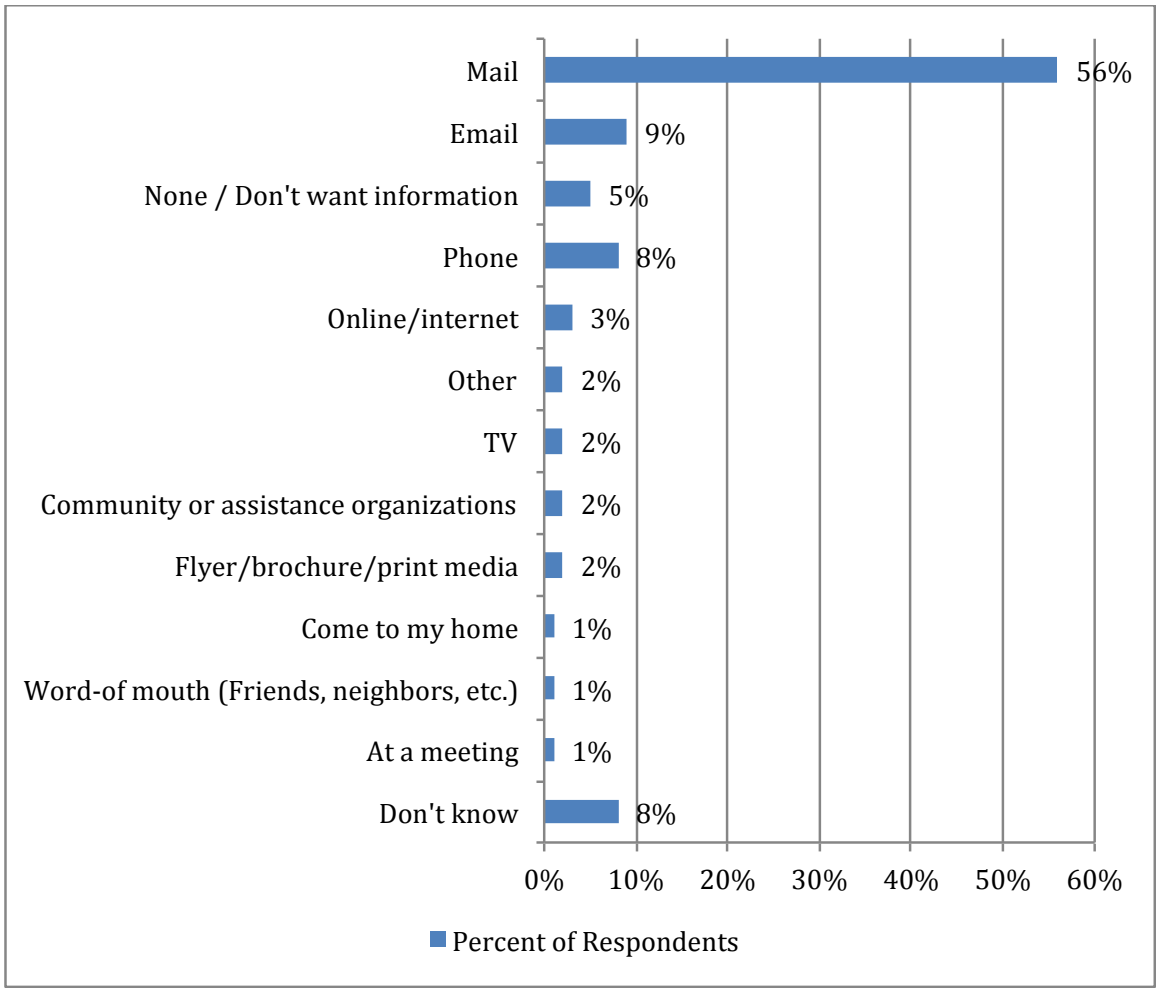
Figure 27: How ESA Participants and Non-Participants Heard of ESA Program (E1) (n=619) for California LI Population



Source: 2013 CARE Participant Telephone Survey.
Note: Multiple mentions allowed.

We asked survey respondents how they prefer to hear about programs that may be helpful to households like theirs (unprompted), as shown in Figure 28 below. The majority (56%) said they prefer mail, with 9 percent saying they prefer email or phone and 3 percent preferring online. There were no substantial differences in preferences across LI population segments or ESA participation status.

Figure 28: How Respondents prefer to hear about Programs that May be Helpful (FOa) (n=863) for California LI Population



Source: 2013 CARE Participant Telephone Survey.
Note: this question was added after the survey was already in the field, and has a slightly lower sample size as a result.

The next figure (Figure 29) summarizes results from several questions related to IOU contact with customers, including:

- How customers receive their bill
- Whether customers have access to Internet service
- How often customers use the IOU website
- How often customers pay their bill online
- How often customers call their IOU
- Whether customers read IOU emails (for those who said they pay their bill online) and bill inserts (for those who say they receive their bill by mail)

Of those surveyed, 82 percent of customers receive a paper bill, and 67 percent of those read the bill inserts. Only 15 percent receive their bill online, though 69 percent have Internet access and 35 percent pay their bill online sometimes or a lot. A high proportion (57%) say they "sometimes" call their IOU. Even with the increasing use of the Internet, mail and phone are still tried and true methods for outreaching to customers, at least for now. That may change in the near future as the IOUs expand their online bill payment efforts.

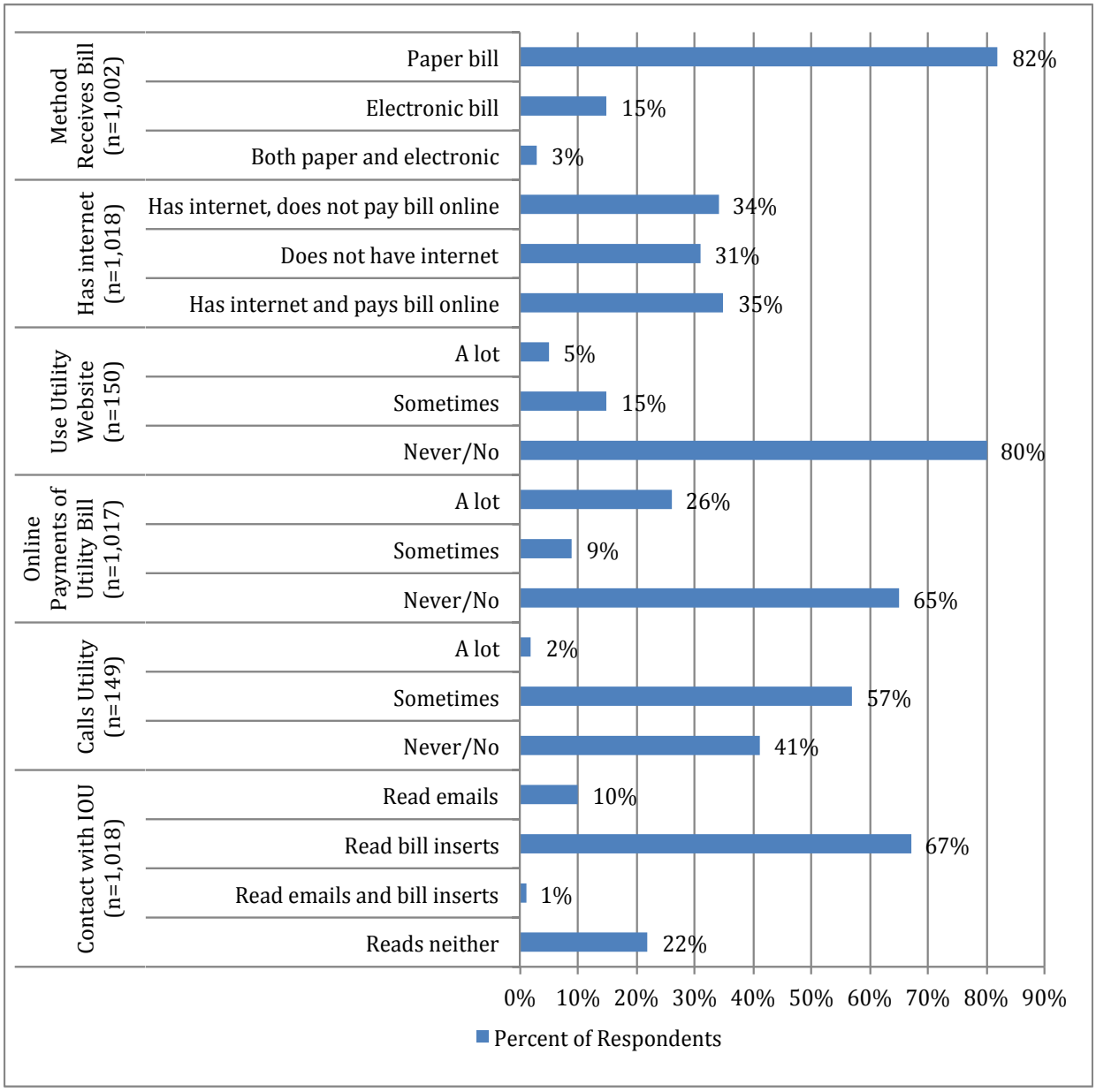
There are some differences in IOU contact across LI population segments. The following segments are more likely to pay their bill online:

- ESA non-participants (41%)
- English-only households (36%)
- Single-family renters (43%)

The following segments are more likely to read bill inserts:

- Single-family homeowners (73%)
- Mobile home dwellers (84%)
- Spanish-speaking households (74%)

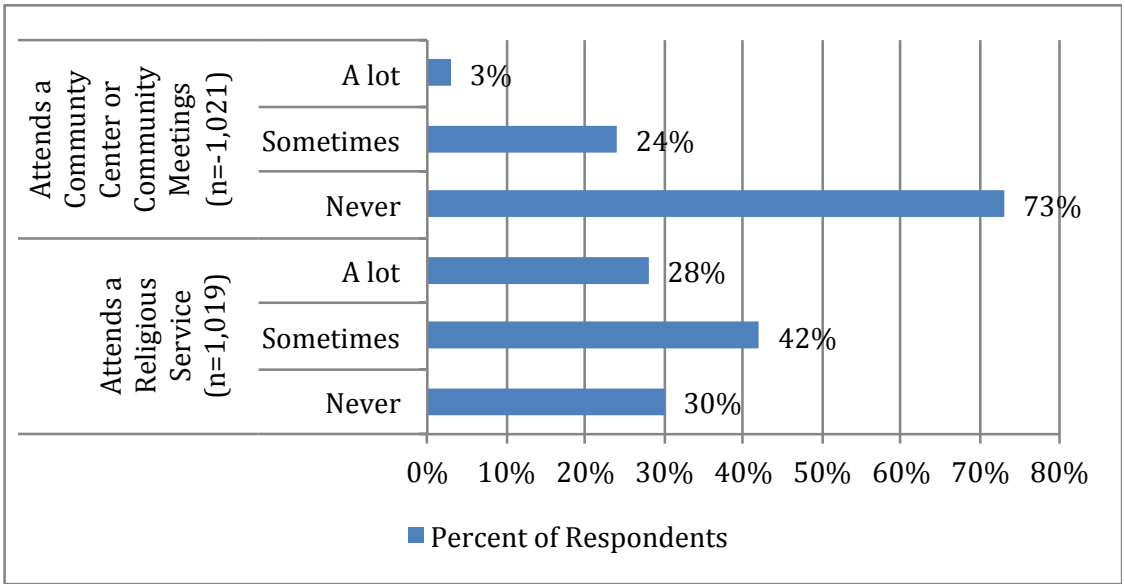
Figure 29: IOU Contact (I1a, I1aa, I1b, I1c, I1d) for California LI Population



Source: 2013 CARE Participant Telephone Survey.
Note: the "calls utility" and "utility website" questions were removed after the survey was already in the field, so they have a lower sample size as a result.

Figure 30 below presents self-reported attendance of religious or community meetings and events, which may be avenues that the ESA program (and CARE program) use to outreach to customers. 27 percent of LI customers go to a community center or meeting, while 70 percent attend church (an increase of 10 percent since the last study, which reported that 60% of LI customers attend church). A higher proportion of LI households located in rural and mountain geographic areas report going to church "a lot" (38% and 41%, respectively, compared to 28% for urban/coastal LI households.)

Figure 30: Community/Religious Involvement (F14a, F14b) for California LI Population



Source: 2013 CARE Participant Telephone Survey.

5.2.3 In-Home Visits

Households expressed nearly uniformly positive perceptions of their IOUs and think of them as good and trustworthy sources of information about ways to save on energy, although IOUs aren't necessarily top-of-mind about energy savings for a share of households. Customers mostly think of their electric provider more than their gas provider because, in most homes, annual electricity costs greatly exceed natural gas costs. We remind the reader that the sample is biased towards households who are willing to talk to a telephone and in-person surveyor about energy issues and the CARE program, so they may be more trusting of their IOU.

Several of the customers who had received ESA[28]—including those who received individual measures they ultimately disabled or that didn't work for them—showed appreciation for the IOU efforts and assistance.

Non-participants tend to rely on and suggest many typical outreach channels—television, radio, bill inserts, and presence on the Internet as important sources for program and energy efficiency related information—but deeper conversations with some interviewees pointed to a few channels that may offer the opportunity for more targeted outreach, as we describe below.

5.2.3.1 Ways Households Currently Hear of ESA

Those who were aware of the program tended to hear about it either directly from their IOU (or an IOU contractor) or by word of mouth from friends, family members or neighbors who had participated. Few people knew of ESA by its name or acronym, however, and seemed uncertain what to call the program. Sometimes they referred to it as "the program that provides free refrigerators." The lack of name recognition was true even of those customers who had participated previously or had recently had contact with the program.

In contrast, nearly all interviewees were aware of the CARE rate and most recognized it by its acronym. (Interestingly, people seemed more likely to find out about CARE than ESA from bill stuffers, whereas it seemed that direct calls or personal visits were a more common way for people to hear about ESA.)

While more widespread awareness of CARE was to be expected, the differences in the identities between the two programs were striking. Therefore, we think there are opportunities to better market ESA by*:*

- ***linking ESA marketing consistently with existing outreach efforts for CARE whenever that is not already done***—for example, customers could be offered ESA or pre-screened for interest and applicability at the time of CARE enrollment (although differences in the enrollment processes may still require separate administrative approaches).
- ***establishing a clearer identity and brand for ESA***—Establishing a brand identity by which customers consistently hear about the program and are able to refer to it themselves would facilitate word-of-mouth information dissemination and formal marketing by the IOUs and their contractors. Furthermore, it would help make the connection between these two types of outreach.

As noted, word-of-mouth remains an important information path about programs that are useful for people. Mostly, people talk to their social contacts about everyday life

[28] We targeted non-participating homes based on IOU tracking data through 2012. 16 of our respondents reported participating in ESA very recently, likely during 2013.

issues and social matters. Programs like CARE and ESA don't necessarily come up in these conversations, but there are some exceptions.

For LI households, making ends meet is a topic that does come up. We heard specifically of information sharing about ways to make ends meet—and sometimes even about CARE and ESA—among single mothers who compare notes at kids' activities or through school communications, family members who sometimes talk about ESA participation with each other, and amongst neighbors in some communities. In one LI neighborhood in particular, we heard from multiple people who said that everyone knows about ESA and CARE (apparently because eligibility and participation rates are high).

5.2.3.2 Opportunities to Reach Households during Key Life Events

Several interviewees discussed the circumstances that led them to become income eligible for LI programs and what other programs they use. While every household's story is unique, there are some common threads that point to opportunities for IOUs to reach out to customers at a moment when they are seeking assistance or transitioning toward program eligibility. Specifically, we heard numerous stories of households becoming income eligible as a result of:

- Retirement;
- Divorce;
- Major medical incidents;
- Job loss; and
- The addition of new dependents into the household.

A few people remarked that they were referred to a social worker at those times through whom they found out about resources to help them through their transition. Others commented that medical staff referred them to programs, such as WIC or Medi-Cal. These remarks highlighted the opportunity IOUs may have to disseminate information about ESA and CARE through the professionals likely to have contact with households as they transition to LI status, including divorce lawyers, hospital discharge personnel, human resources staff and unemployment offices.

Furthermore, some interviewees volunteered other need-based programs from which they receive assistances. In addition to Medi-Cal and WIC, these programs include Section 8 housing, welfare/food stamps, food pantries and church programs. Often, households eligible for these programs are also eligible for ESA and CARE. Cross-marketing with these programs may offer opportunities to reach more people and increase awareness of ESA.

5.2.3.3 Hard-to-Reach Groups

Two distinct groups may be more difficult to reach: immigrants and households outside LI neighborhoods.

The first group, immigrant populations, sometimes forms their own distinct communities and social networks through which they exchange information. We interviewed at least 10 households led by people who identified themselves as having come from another country. The national origin of LI households in California is very diverse. Our interviewees included people from El Salvador, Germany, Iran, Japan, Korea, Mexico, Pakistan, the Philippines, Russia, Somalia and Vietnam.

Reaching Spanish-speaking households, whether immigrants or not, was a focus for us and these households provide insights on the importance of communicating in the household's native language. The Spanish-speaking households we visited often emphasized the need for marketing materials to be in their language. Telephone, radio, television and direct-mail were often cited as communication modes that would be effective for Spanish-speaking households, although some households lacked cable access so telephone or direct mail would likely be the most encompassing mode. Only a few Spanish-speaking households mentioned the Internet as a means of accessing information; for a couple of the families that said they had internet access in the home, they cited their children's education as a reason for paying for internet access. There were a couple of Spanish-speaking households that expressed concern about potential language barriers in the ESA program process, specifically pertaining to the visiting contractor's language; they indicated a preference for contractors with whom they can communicate in Spanish and were not sure such contractors were available.

Among non-Hispanic immigrants, we noted some that seemed well integrated into the mainstream English-speaking aspects of California's social fabric and completely fluent in English, while others either encountered some language barriers or opted to associate mostly in ethnic communities connected with their country of origin.

We note that the ESA and CARE modeling indicated that Spanish-speaking households are more likely to participate in ESA than those that do not speak Spanish, suggesting that the programs' efforts to reach this particular demographic have been successful.

The second group, eligible households that are not closely connected with LI neighbors or other social contacts, seems to be less likely to hear about the program by word of mouth. Mostly, these households are located outside traditionally LI neighborhoods. They rely more heavily on IOU marketing. The ESA and CARE modeling efforts complement these findings, with households in less dense areas less likely to participate.

5.2.3.4 The Harder-to-Reach Households

While we recognize that we were not able to reach the "hardest-to-reach" eligible customers for the reasons noted above, a few of our recruited households that ultimately did not participate in the in-home visit may offer some glimpses into challenges of reaching the harder-to-reach non-participants (refer to the ESA stage one and CARE modeling results for more information on barriers and drivers of participate among the

population, since those were population, not survey sample, models). Among our scheduled homes, we encountered:

- *some homes that needed to cancel their appointments because of medical issues*—While we were on a tight timeline and couldn't always reschedule, programs will need to be able to accommodate rescheduling.
- *some households that never answered their telephone when we tried to confirm the appointment and did not have any way for us to leave a message*—Some of these households were present when we appeared at the scheduled time for our visit; some were not.
- *two households at which the person with whom we had made an appointment was never available when we called to confirm or appeared for our appointment, but other household members seemed leery of us or just uninterested*. In both cases, the household members with whom we interacted seemed suspicious of outsiders.

In addition, numerous households—some that participated in the visits and some that did not after being scheduled—were very cautious about letting people into their homes. Several said they had called the IOU call center to verify that the visit was legitimate, which highlights the importance of ensuring that the visits are clearly branded and identified by a name the household will recognize and be able to use if they call to validate the program with the IOU call center. While we do not have hard data on this issue, we noted it more often in PG&E's service territory, among women respondents, who were usually seniors living alone.

5.3 CARE Program Accessibility

This subsection presents study results that assess how well the CARE program is reaching eligible customers, preceded by an overview of program marketing and outreach. The CARE modeling was the basis of this assessment, since the primary customer research excluded CARE non-participants. As mentioned in Section 3.5, due to the reportedly very high CARE penetration rate (91%, based on the IOU ESA and CARE Programs 2012 Annual Reports), we did not attempt to conduct surveys with CARE non-participants. Instead, we conducted analysis incorporating data on CARE enrollment and eligibility combined with census data to inform an assessment of how well the CARE program is reaching eligible customers. We also leveraged the program staff/contractor in-depth interviews.

5.3.1 Overview of CARE Program Marketing and Outreach

The IOUs rely on Athens Research data to identify small geographic areas with high probability of CARE eligibility, and SoCalGas also uses PRIZM codes[29] to try to cost-effectively reach the remaining eligible population. The IOUs also benefit from data

[29] A widely used customer segmentation system for marketing in the United States, developed by Claritas Inc., which was then acquired by Nielsen Company.

sharing with other IOUs' CARE programs (for areas where the service territories overlap), as well as the Low Income Home Energy Assistance Program (LIHEAP),[30] ESA and water utilities. In addition, they will sometimes purchase third party data to help them identify and market to hard-to-reach segments of the targeted population.

The IOUs are required to include an annual solicitation in the June bill with a CARE program application for all non-CARE customers, timed to the updated income qualifications on June 1 (online billing customers receive an electronic version). In addition to the June mailing, the IOUs all deploy a variety of marketing and outreach methods to promote the CARE program, CARE awareness and enrollment, including:

- Working with communications agencies and third-party contractors to develop and deploy ethnic/targeted media such as community newspapers, radio and television advertisements tailored to specific hard-to-reach segments;
- Automated telephone systems (such as Automated Voice Message (AVM) or Interactive Voice Response (IVR)) that call customers or allow customers who call in to access automated menus and in some cases, if they select a certain option, to be directly connected to an IOU representative;
- A variety of mail tactics (direct mail, bill inserts and onserts, which prints information on the utility bill);
- E-mail to customers who are not already on the rate who are living in areas with high probability of eligibility;
- Enrollments by trained IOU call center staff, such as when customers call in to set up or change service;
- IOU branch (local) offices and payment kiosks (through advertisements and collateral at the kiosk);
- Community events – either attended by IOU staff, or community organizations that are hired by the IOU to target market to specific communities;
- Contractors to canvass neighborhoods;
- Online web enrollments; and
- Electronic data sharing with all of the major IOUs and nine water utilities.

The IOUs use source codes so they can track the effectiveness of most of their M&O strategies. However, some strategies are hard to track, such as community events, mass media and community organization outreach. These efforts drive customers to enroll online or by phone through the call center, or increase their likelihood of filling out the mailed application.

[30] A federally funded program that provides assistance to LI households to help them manage their energy costs, including weatherization and cash assistance. In California, LIHEAP is administered by the Department of Community Services Development.

Under the Capitation Fee program, the CPUC has authorized the IOUs to pay a flat fee to participating organizations for each new customer they help to enroll in the CARE program, but these contractors bring in a relatively low volume of new enrollments. These organizations do not have access to customer data, e.g., to target customers who are not already enrolled. They can use online enrollment and they can find out if the customer is already on the rate, or ask to see the customer's bill. Many of these contractors do "inreach" (not outreach) for clients that visit their organization for a range of potential services, including CARE, and this was the initial impetus for the capitation contractors.

Originally, all capitation contractors were community agencies already providing other services to their LI clients, and the small capitation fee was incremental, intended to offset the few extra minutes that the intake worker would need to help their eligible customers fill out the CARE enrollment form during the intake process that was already occurring, and to send the form to the IOU. The capitation fee is only paid for new enrollments, and since many qualified customers are already on CARE and the capitation contractors do not have access to IOU databases, fewer of their customers qualify. Some capitation workers take proactive steps to find and enroll eligible customers. For instance, some capitation contractors attend community events, church services, and senior center events and offer a variety of services for LI attendees including CARE.

Some IOUs hire contractors to do outreach for CARE, providing them with customer data including CARE status. This is a limited effort with a small number of contractors who typically do door-to-door canvassing, attend events and leverage their existing clientele, much like the capitation contractors. (But in contrast to capitation contractors, these contractors use updated IOU data on who is on and not on the CARE rate, often resulting in much higher enrollment rates.)

The IOUs offer applications and staff call centers with representatives covering multiple languages. When a customer dials an IOU call center or responds to automated calls and speaks a language not supported by the staff, a translation service is used that accommodates 100+ languages. This service provides an interpreter who is conferenced into the phone line and facilitates the conversation.

The IOUs track the language preference of customers who apply (online, call center, paper application)—or respond to automated calls—using a different language and then use that preferred language for follow-up communications (including re-certifications and post-enrollment verifications). Observed trends are used to guide development of new in-language collateral or marketing messages.

5.3.2 Program Staff Interviews

The CARE program reports very high penetration rates, as described in Section 1.1.1. Remaining barriers to enrollment cited by IOU program staff include:

- Language;
- Literacy;
- Lack of trust, fear: 'nothing is free';
- Issues providing necessary documentation;
- Pride/don't think they need the help;
- Mild winters and lower gas prices anecdotally making enrollment a harder value proposition (gas customers only); and
- Master Meter/Sub Metered customers who may be difficult to target and may encounter resistance from landlord/manager.

One program manager mentioned that an area of Southern California is a difficult area in which to increase penetration due to a "marbled" concentration of LI customers. These areas are hard to identify using PRIZM codes, zip-9 data mining. They start with the data to try to identify small areas that have lower relative penetration rates, and then partner with CBOs and attend small events such as food banks to find the pockets of need. The low-hanging fruit is gone and what remains will be challenging to address.

One of the difficulties in understanding barriers, raised by two IOUs, is that community responses to marketing efforts aren't readily translated into a success rate. Eligibility of each individual customer is not known, and low response rates may reflect lower-than-expected eligibility, or it may reflect real barriers.

5.3.3 Contractor Interviews

We conducted interviews with six contractors that conduct outreach for the CARE program, most of which are "capitation contractors" that do not hold formal contracts with the IOUs and lack information on whether customers are signed up for CARE. We did talk to two contractors that do hold contracts with an IOU to conduct outreach using IOU data on who is already enrolled. Note that these results are qualitative and not intended to represent all of the contractors that support the CARE program or the eligible customer base.

Most of the contractors that we interviewed have a regular client base that are LI and/or disabled. A challenge for contractors is finding customers that are not already signed up for CARE, due to broad-based IOU marketing and their own outreach/inreach efforts over the years. Overall, the respondents do not think many ineligible homes are actually getting signed up by them or through the IOUs, although none had actual data to confirm this. For some contractors that we spoke to, a key challenge is that their clients do not know if they are already on the CARE rate, and the contractors cannot easily help the clients to confirm.

All of the contractors reported high enrollment rates once customers were informed of the program; few customers decline the opportunity to get on the CARE rate and there are no distinct patterns reported regarding those that do enroll immediately. For the

"door-to-door" contractors, most customers sign up without asking any questions, and the enrollment process is very easy. Customers that proactively approach firms doing inreach have already self-selected so trust issues are not common. Overall, enrollment does not depend on the method of lead generation, but rather on other cultural and logistics factors. Anecdotally, we heard the following from one or more contractors that we interviewed:

- Pacific Islanders, who come from many places (Guam, Marshall Islands, Cook Islands, Western and Polynesian Samoa, etc.), have multiple barriers;
    - A culture of self-sufficiency, and desire to keep others from knowing they are receiving help
    - Diverse languages and high translation needs (Hawaiians are an exception as they mostly speak English)
    - Low education levels and preferences for visual learning
    - Initial distrust of free assistance and products
    - Frequent residence changes
- Many Muslim men will not speak with women contractor staff, and Muslim women are not supposed to seek assistance in general;
- Senior citizens cannot always read printed program materials;
- Non-English speakers not comfortable enrolling by phone;
- Gaining trust among Koreans, "who go to churches and community centers for help"; and
- Difficulty reaching potential customers at home. The contractor estimated that 60 percent of outreach targets from IOU lists cannot be reached at home, despite canvassing early mornings, evenings, workdays and weekends.

The contractors are using a range of diverse strategies to address the aforementioned challenges:

- For Pacific Islanders:
    - Using volunteers (often university students) to translate materials for Micronesian customers (a small group of Pacific Islanders.
    - Conducting home visits to provide privacy. Contractor visitation services are described in church newsletters and households call them up to arrange visits, where the applications are translated and completed in person at home. Laptops computers provided by SCE have been particularly helpful for this work.
    - Utilizing community elders to intermediate between contractors and community members to build trust.

- Not volunteering information about contractor reimbursement arrangements (i.e., per customer sign-up).
- Proactively instructing clients "to check in" with other IOUs if they are likely to move to enroll in CARE.

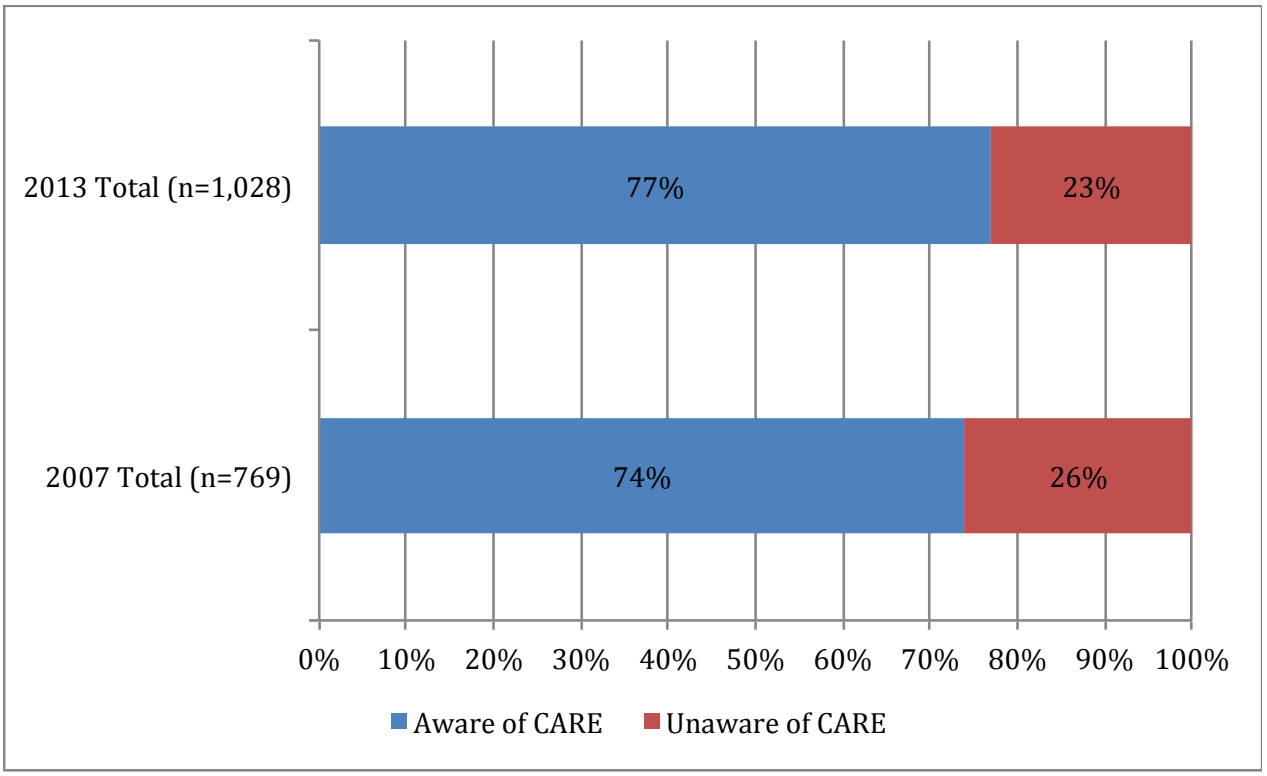
- For door-to-door recruitment:
  - Using leave-behind door hangers.
  - Giving subcontractors badges with IOU and company logos.
  - Hiring subcontractors with friendly, engaging personalities to build rapport and trust, and training them to know the CARE product well.
  - Utilizing ethnic subcontractors and deploying them in matching ethnic communities.
- Provide additional, personalized assistance to seniors with vision limitations.
- Proactively describing the CARE rate to Asian callers if only other assistance needs are mentioned on phone calls.

5.3.4 Customer Telephone Survey[31]

We asked telephone survey respondents (all of which are enrolled in CARE) whether they had heard of the CARE program, explaining that it provides a monthly discount on their utility bills for income-qualified customers. As shown in Figure 31 below, 77 percent said they had heard of CARE, slightly higher (but not a statistically significant increase) than the rate of awareness reported by the prior study (74%). The IOUs have made efforts to alert customers that they are on the CARE rate by adding messages and/or increasing visibility of the discount on the bill. Even with those efforts, there are still some respondents who are not aware their household is on the CARE rate. Someone else in the household may have signed up or it may have been awhile since they signed up or recertified.

[31] Note that the customer telephone survey sample frame is based on CARE participants. Due to the very high reported penetration rates and study resource constraints, we did not conduct a non-participant survey.

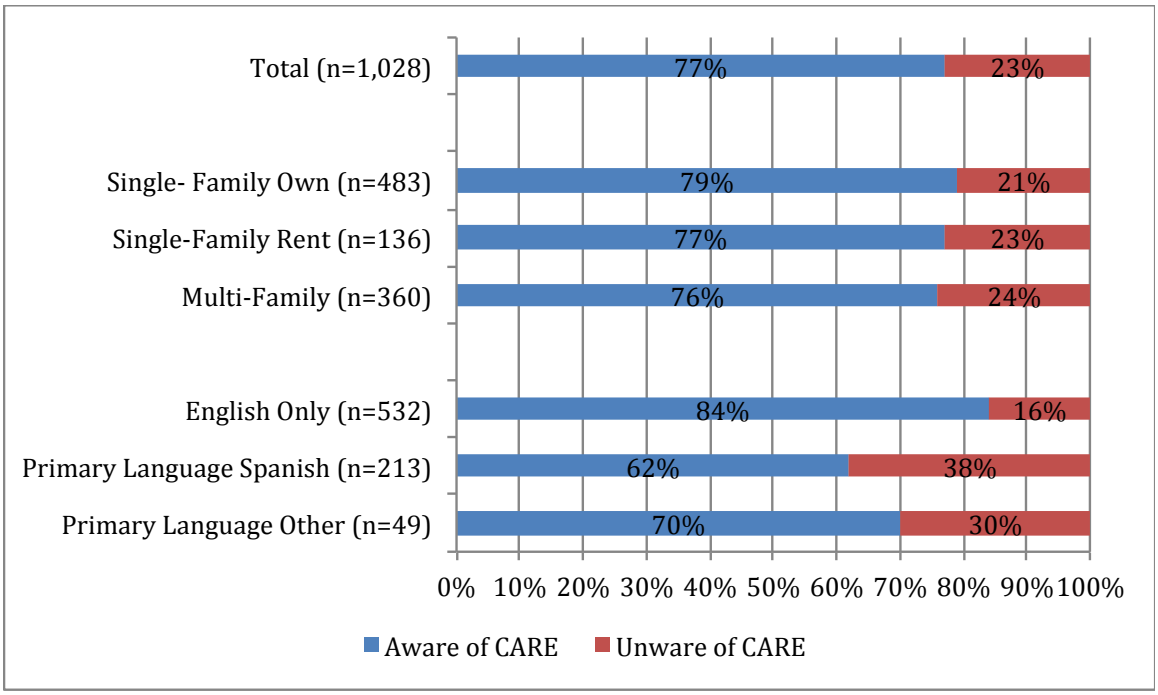
Figure 31: CARE Program Awareness Over Time (S9-S12) for California LI Population



2007 source: Table 5-40 in KEMA LINA report (the "total" reported here is of CARE participants, which is comparable to our survey sample total, since our sample frame is based on CARE participants.)
2013 Source: 2013 CARE Participant Telephone Survey.

Figure 32 shows CARE awareness by LI segments, with English-only households having higher awareness (85%) than other households. (As reported in Section 5.1, 95 percent of multi-family homes are occupied by renters, so we do not break out that home type by home ownership.)

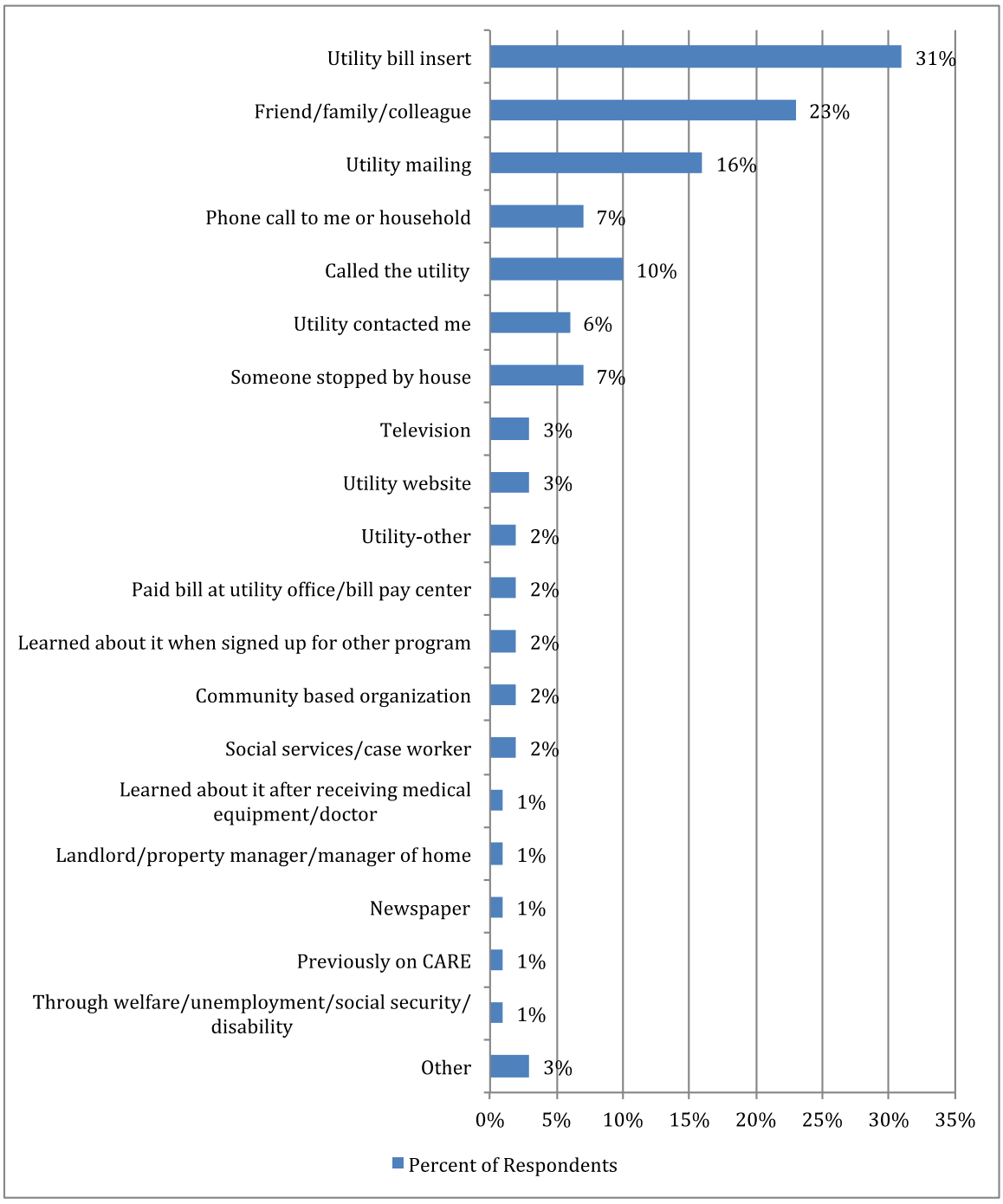
Figure 32: CARE Program Awareness by LI Segments (S9-S12) for California LI Population



Source: 2013 CARE Participant Telephone Survey.

Figure 33 below shows how respondents who are aware of CARE learned about the program. The most common method is the IOU bill insert (31%), followed by friend, family or colleague (which was the most common method that respondents learned about ESA). The other most common responses were IOU mailings, phone calls and general (IOU) contacts. We note that the IOUs use many methods to build awareness of CARE, and so while television ads or some of the other less commonly cited methods may not be at the top of mind, they may have helped to build a foundation that made some customers pay closer attention to a bill insert or IOU phone call about the program. It is difficult to attribute awareness of a brand or program to one single source, when multiple marketing methods are being used simultaneously. Also, as mentioned above regarding the ESA program, the IOUs do not rely on media advertising as a primary marketing delivery channel for CARE.

Figure 33: How Customers Found Out About CARE, of Those Aware of CARE (E22) (n=602) for California LI Population



Note: multiple mentions allowed
Source: 2013 CARE Participant Telephone Survey.

The next few tables report on how survey respondents who said they were aware that they are on CARE[32] submitted their application. We asked these questions to understand how customers prefer to enroll in CARE. We looked at the responses by LI population segments to determine if there are differences in the methods used, as shown in Table 40 below. There are minor differences across the segments, none of which are statistically significant. The most commonly cited method is mailing in an application, which is consistent with the previous finding that the most common method that customers find out about CARE is an IOU bill insert. A total of 16 percent used the phone, about half of those with support from an IOU customer service representative.

Table 40: How Customers Submitted Their CARE Applications, of Those Aware They Are on CARE (E30) for California LI Population

	LI Eligible Population								
	Total	Single-Family Own	Single-Family Rent	Multi-Family	English Only	Primary Language Spanish	Primary Language Other	Rural	Urban
How CARE Enrollee (Aware of Participation) Submitted Application									
Mailed in	62%	64%	60%	63%	60%	66%	64%	57%	62%
Phone	9%	9%	6%	7%	9%	11%	2%	8%	9%
Online	9%	9%	7%	11%	10%	5%	15%	14%	9%
My utility customer service representative helped me	7%	7%	8%	7%	6%	11%	10%	6%	7%
At a billing processing center/kiosk	3%	2%	1%	4%	1%	3%	8%	2%	3%
Through a community organization	1%	1%	4%	0%	2%	0%	0%	0%	1%
Faxed in application	0%	1%	1%	0%	0%	0%	0%	0%	0%
Turned in application to the office	1%	1%	2%	1%	2%	1%	0%	2%	1%
Other	2%	0%	3%	2%	2%	1%	1%	0%	2%
Don't know*	6%	6%	7%	5%	8%	3%	0%	11%	6%
Total	624	293	93	208	338	106	29	34	589

*Includes those who said that someone else in their household submitted the application
Source: 2013 Care Participant Telephone Survey

[32] 87 percent of those who said they were aware of CARE (77% of total respondents) knew they were on CARE.

5.3.5 In-Home Visits

As mentioned above under the ESA program access (Section 5.2), households expressed nearly uniformly positive perceptions of their IOUs and think of them as good and trustworthy sources of information about ways to save on energy, although IOUs aren't necessarily the information source that comes to mind for people when asked about energy savings. Customers mostly think of their electric provider more than their gas provider because, in most homes, annual electricity costs greatly exceed natural gas costs. As we did in the previous section, we remind the reader that the sample is biased towards households who are willing to talk to a telephone and in-person surveyor about energy issues and the ESA program, so they may be more trusting of their IOU.

Those customers who know that they are on the CARE rate or are aware of LI efficiency programs seemed to appreciate these efforts.

5.3.6 CARE Modeling Results

We developed and estimated statistical regression models to examine two aspects of the CARE program based on Athens Research data at the Census block group. The participation (first) model is based on the ratio of CARE customers to total customers in a given Census block group. The penetration (second) model is based on the ratio of CARE customers to CARE-eligible customers in a given census block group. The observations are Census block groups. The models are looking at variations in participation and penetration ratios across census block groups, and what variables (that we may observe at the Census block group level) might predict higher or lower rates, all else constant.

In the participation model, the dependent variable is the rate of CARE enrollment for a given Census block: the number of customers enrolled in the CARE program divided by the number of customers living in a given Census block group. In the penetration model, the dependent variable is the rate of CARE penetration for a given Census block: the number of customers enrolled in the CARE program divided by the number of customers estimated as eligible for the CARE program in a given Census block group. More detail on the model results is provided in Section 9.1 and on the model methods in Section 12.4.

Table 41 provides the key results translated to allow for relative comparisons across the models' explanatory variables. The columns are:

a. The row number;
b. The variables used in the CARE participation and penetration models;
c. The median value of each variable;
d. The 60th percentile of each variable;
e. The change in CARE participation associated with a hypothetical change in the variable shown in column b from the median (column c) to the 60th percentile value (column d), *holding all else constant*; and

f. The change in CARE penetration associated with a change in the variable shown in column b from the median (column c) to the 60th percentile value (column d), *holding all else constant*.

Table 41: Estimated Impact on CARE Participation and Penetration Associated with a Change in the Value of Each Independent Variable For California LI Population

a.	b.	c.	d.	e.	f.
Row	VARIABLE	Median (50th %tile)	60th %tile	Delta CARE Participation	Delta CARE Penetration
1	% HHs Living in Poverty (< 100% of FPL)	10.7%	14.0%	0.75%	-5.84%
2	Persons Per HH	2.9	3.0	0.73%	0.60%
3	% HHs with Person >= 65	19.1%	21.8%	0.84%	0.84%
4	% Spanish Speaking HHs	17.7%	24.4%	1.49%	1.97%
5	% Home Ownership	44.8%	51.7%	-1.34%	0.35%
6	% Non English/Spanish HHs	10.9%	14.5%	0.27%	0.55%
7	% Single Parent HHs	8.5%	10.1%	1.91%	3.59%
8	% HHs on Public Assistance	1.8%	2.9%	0.25%	0.62%
9	% HHs with Income > $200K	3.0%	5.2%	-2.53%	-2.20%
10	% African-American HHs	2.6%	3.7%	0.20%	0.53%
11	Avg. 2012 Energy Use CARE HHs (MMBTU)	64.8	69.3	NA	-0.92%
12	Pop Density (1,000 pers. per sq. mile)	2.9	3.7	NA	0.21%

Source: 2013 CARE Participant Telephone Survey.

Key takeaways from the CARE participation model results are presented below in order of magnitude on CARE participation rates by census block group. The CARE participation model largely reflects the characteristics of block groups that tend to have a higher fraction of households that are income-eligible for CARE. The results are not surprising, but do show the program has enrolled larger percentages of customers in block groups that have characteristics that may be associated with greater needs and/or barriers – seniors, single-parents, the very poor, non-English speakers (Spanish more than other languages), African-American.

We are examining block group-level ratios and interpreting these ratios as the probability of a randomly drawn household. The results of this analysis are intended to inform about spatial averages and trends, not about individual households.

All else constant, households living in small areas (i.e., census block groups) that have relatively higher rates of:

- (-) Higher-income households (income greater than $200,000) – are less likely to be enrolled in CARE;
- (+) Single-parent households – are more likely to be enrolled in CARE;
- (+) Spanish-speaking households – are more likely to be enrolled in CARE;
- (-) Home ownership – are less likely to be enrolled in CARE;
- (+) Seniors in the home – are more likely to be enrolled in CARE;
- (+) Poverty (income less than 100% of federal poverty guidelines) – are more likely to be enrolled in CARE;
- (+) Larger households (number of members) – are more likely to be enrolled in CARE;
- (+) Non-English/non-Spanish speaking households– are more likely to be enrolled in CARE;
- (+) Households on public assistance – are more likely to be enrolled in CARE; and
- (+) African-American households – are more likely to be enrolled in CARE

than households in other small areas.

Key takeaways from the CARE penetration model are presented below in order of magnitude on CARE penetration rates by block group. The CARE penetration model reflects both the characteristics of block groups that tend to have a higher fraction of households that are eligible for CARE and enrolled in CARE. However, just because a household is enrolled in CARE does not mean they are actually eligible, so the participation rate may include households who might be estimated as ineligible.

The implications of this are demonstrated by the explanatory variable, *% of homes below FPL*, in the CARE penetration model—small areas with relatively higher rates of very poor households (income less than 100% of federal poverty guidelines) are associated with *lower* CARE penetration rates (i.e., number of households enrolled in CARE as a fraction of households that are estimated by Athens Research to be eligible for CARE.), all else held constant. We hypothesize that this result is due to relatively higher-income small areas having larger numbers of households on CARE that are not actually eligible for CARE, thus resulting in higher (including above 100%) penetration rates. In addition, the lowest-income areas have very high (e.g., near or at 100%) eligibility rates and, though they may have high participation rates, they are likely to not be 100 percent of eligible due to the difficulty of signing-up every household in the given area. There may also be additional barriers in the highest poverty areas that might impede outreach and participation such as higher rates of crime, households lacking documents or not trusting IOUs and contractors.

We examined the correlation between poverty, CARE participation and CARE penetration across block groups. Below, we show the distribution of the poverty variable in quartiles along with the corresponding CARE participation and CARE penetration rates (based on Athens Research data), with penetration capped at 200 percent. These data show that the quartile of block groups with the lowest poverty rates have the lowest CARE *participation* rates, but the highest CARE *penetration* rates. Conversely, the quartile of block groups with the highest rates of poverty has the highest CARE participation rates, but the lowest CARE penetration rates. These data support our hypotheses from above.

Table 42: Poverty Rate (FPL) Correlation with CARE Participation and Penetration

Poverty Rate Quartile	CARE Participation	CARE Penetration
1	15.5%	126.4%
2	24.2%	97.1%
3	34.9%	90.4%
4	52.5%	86.7%
Total	**31.8%**	**100.1%**

The coefficient for higher-income (income greater than $200,000) households is negative, suggesting this effect is not occurring in higher-income areas. Households may be enrolling in CARE who are just above the income threshold or are staying on CARE even after their income increases, rather than high-income households enrolling. The IOU targeting of higher-income areas for more post-enrollment verification may also be showing an impact, though our data is from 2012 and prior.

Energy usage is another surprising result, with higher energy usage of CARE participants associated with a *lower* CARE penetration rate. This variable has a much greater impact on CARE participation than the other geographic variable in this model, population density (which is strongly correlated with energy usage). We believe that this variable is picking up on regional (which includes climate zone[33]) differences in program outreach and customer willingness to enroll.

We examined the correlation between energy usage, CARE participation and CARE penetration. Below, we show the distribution of CARE customer energy usage (based on IOU consumption data) in deciles along with the corresponding CARE participation and

[33] E.g., climate zone 16 has very high-energy usage but very low CARE penetration. It is a climate zone encompassing the very northern region of the state and the sierras, typically rural and remote with at least heating and often also cooling needs, but with unique geographic characteristics and participation barriers.

CARE penetration (based on Athens Research data). Decile 1 represents the 10 percent of CARE customers with the lowest average daily energy use, decile 2 represent the 10 percent of CARE customers with the next highest average daily energy use, and so forth. The data show that CARE participation differs little between the four deciles with the lowest average daily energy use, but as the average daily energy use of CARE participants increases, CARE participation drops significantly. Comparatively, CARE penetration increases between the lowest decile of energy use to the next lowest decile. Between the 20th percentile through the 80th percentile, CARE penetration is relatively constant and then drops over the two deciles of greatest energy use (the top 20% of CARE customers).

Table 43 – CARE Customer Energy Usage Correlation with CARE Participation and Penetration

CARE Customer Energy Usage (BTUs)	CARE Participation	CARE Penetration
1	37.2%	78.5%
2	38.5%	83.8%
3	38.7%	85.1%
4	37.3%	84.9%
5	34.7%	84.3%
6	33.9%	85.3%
7	31.5%	84.6%
8	28.0%	83.4%
9	22.9%	81.0%
10	13.6%	69.0%
Total	**31.8%**	**82.1%**

Home ownership has a reverse impact on CARE penetration as CARE participation, with small areas with more homeowners who are eligible having *higher* penetration rates than small areas with more renters. This is likely because it is easier to engage a homeowner about their utility bill; they are much less transient than renters and pay for all their energy usage (whereas renters may not pay for usage associated with shared systems).

Other results complement the CARE participation model, indicating the program has had success in reaching many of the targeted customer segments that are perceived to have greater need and/or burden. The coefficients for single parents, households on public assistance and African-Americans are larger in the CARE penetration model (compared

to the participation model), suggesting that the program is even more impactful with these segments among the eligible population. As noted following the first CARE model results, we are examining block group-level ratios and interpreting these ratios as the probability of a randomly drawn household. The results of this analysis are intended to inform about spatial averages and trends, not about individual households.

All else constant, small areas (i.e., census block groups) of households that have relatively higher rates of:

- (-) Poverty (income less than 100% of federal poverty guidelines) – have ***lower*** CARE penetration rates;
- (+) Single-parent households – have higher CARE penetration rates;
- (-) Higher-income households (income greater than $200,000) – have lower CARE penetration rates;
- (+) Spanish-speaking households – have higher CARE penetration rates;
- (-) High energy usage (average CARE 2012 MMBTU) – have ***lower*** CARE penetration rates;
- (+) Seniors in the home – have higher CARE penetration rates;
- (+) Households on public assistance – have higher CARE penetration rates;
- (+) Larger households (number of members) – have higher CARE penetration rates;
- (+) Non-English/non-Spanish speaking households – have higher CARE penetration rates;
- (+) African-American households – have higher CARE penetration rates;
- (+) Home ownership – have higher CARE penetration rates; and
- (+) Higher residential population density – have higher CARE penetration rates

than other small areas of households.

5.4 ESA Participation Drivers and Barriers

This subsection describes study results related to ESA drivers and barriers to participation, preceded by an overview of the enrollment and assessment process. We drew upon all the study primary and secondary research sources for this subsection.

5.4.1 Overview of Customer Enrollment and Assessment

Customers must provide documents proving their income (e.g., income tax return, paycheck, social security, etc.) or that they are enrolled in another qualified LI program to participate in ESA, even if they are enrolled in CARE (which does not require proof of income). In addition to proving their income, customers must also prove they either own their home (i.e., showing the title) or for renters, get their landlord to sign a waiver allowing ESA measure installations and agreeing to make a small copayment for certain

measures. There is an exception for renters who do not qualify for any services that require changes to the home and who own their refrigerator, who may qualify for a new refrigerator.

The IOUs are working to create a joint improved property owner waiver consistent across the state and to expand the languages the waiver forms are offered in. SCE modified the waiver in 2012 so the landlord could agree to participate only for measures that do not require a co-pay so it's not an all or nothing proposition (unlike before when they had to sign something that said they would be liable for co-pays).

Customers must also be eligible for three measures or if less than that, measure(s) that will yield at least 125 kWh or 25 therm savings to be eligible to participate in ESA. This rule affects the single-fuel utilities more since they sometimes assess homes for their single-fuel only. If a customer is being assessed by a contractor who does ESA for both SCE and SoCalGas, they can assess electric and gas measures, but if the contractor only works for SCE or SoCalGas, the customer is only assessed for electric or gas and could fail the three-measure minimum requirement. If they don't fail the three measure minimum requirement, through data sharing the other IOU could then follow up with the customer and provide additional measures covering the other fuel.

Contractors that are also LIHEAP providers can leverage ESA and LIHEAP towards the three measure minimum requirement – for LIHEAP measures that are also offered under ESA. LIHEAP has a dollar cap and the contractors try to maximize dollars from both programs, so they may enroll customers in both programs. LIHEAP also offers measures that ESA does not.

For customers with natural gas service, there is the potential for an additional barrier to participate, based on how much combustion ventilation is present since any weatherization measures will tighten the home and reduce ventilation and could create a carbon monoxide problem.

5.4.1.1 Eligibility Requirements of Other Programs Nationwide

Based on our review of LI programs nationwide, other LI programs also have an income threshold under which a household is eligible. The threshold varies by state and also varies by size of household. Most programs use the Federal Poverty Level as a point of reference and set the threshold as a percentage of the FPL (i.e. 150% of the FPL, 200% of the FPL, etc). Some programs base the income eligibility thresholds on the state median income levels.

Eligibility for an LI weatherization program may be granted if a household also qualifies for another LI program, such as bill-pay assistance or a percent of income program. Some programs, such as the Ohio Energy Partnership Program (EPP), require that a household participate in the weatherization program if they are part of a bill-pay assistance program; by requiring participation in the program, both the recipients of the

assistance (who reduce their bills) and the ratepayers (who subsidize the bill-pay assistance program) benefit from the energy cost savings.

All programs require some proof of income either through the application process for the specific program or for the other LI programs through which the participants were referred. Providing proof of income did not appear to be a substantial barrier to participation, although program staff expressed the need to make the application process simple. The NYSERDA EmPower program accepts verification of income by a utility, the Weatherization Assistance Program or another approved entity; verification is only requested if not already verified. For participants that have already provided proof of income, allowing verification across programs makes for a more streamlined process which may reduce barriers to participation.

5.4.1.2 Targeting Strategies Used by Other Programs Nationwide

Based on our review of LI programs nationwide, in addition to income eligibility, LI programs often prioritize higher energy users or may limit eligibility to those customers that reach a minimum usage amount. When combined with other programs, such as bill-pay assistance, targeting high-users becomes a direct way to sign up participants; program implementers can sort the list of those households on bill-pay assistance by amount of energy used per home and use that list to prioritize and target future participants.

Targeting high users offers an advantage when trying to maximize energy savings, as higher users often have more opportunities to save energy. The most energy impacts come from those homes that have poor building insulation and sealing or inefficient equipment; their baseline energy usage is higher so energy upgrades make a stronger impact than those households that have a higher baseline efficiency level. At similar incomes, high users also face higher energy burdens. However, considerations should be made to not overlook those low energy users who are not using energy using equipment as a means to reduce costs.

For those energy efficiency programs that are implemented through a utility, acquiring usage data is straightforward. However, for those non-utility based programs that do not have access to utility data, acquiring household usage data can be an insurmountable barrier to targeting high users. For example, the NYSERDA EmPower program attempts to acquire utility data from a number of utilities across the state, yet each utility has different data privacy requirements (and confidentiality issues are ballooning), which prevents some utilities from sharing their customers' data, making it difficult to identify high user customers.

5.4.2 Program Staff Interviews

We spoke with IOU program staff about ESA program outreach and barriers to participation. They offered their opinions on remaining barriers to participation based on their experience managing the program and working with outreach and assessment

contractors. These findings are qualitative and help round out the customer research reported on this section. These results are not intended to reflect a comprehensive characterization of the programs.

Customer barriers to ESA participation noted by program staff include the following:

- Disabled customers - the IOUs have trouble meeting the disabled customer target of 15 percent since they are not allowed to ask about disabilities, so they may only report disabilities that are visible to them at the time of enrollment.
- Pride/others are more deserving of help.
- Cell phone-only customers – the IOUs have to match cell phones (but not land lines) to the do not call list, so a lot are screened out. Cell phone-only customers are increasing so this is becoming more of an issue. There are some developments at the IOU corporate levels to allow customers to opt in to be contacted by the IOU via their cell phone, but this won't be an easy or fast fix.
- Suspicion of fraud; customers that don't believe it's really free or that it's an actual program
- Newly income qualified: Some previously middle-income households may have fallen on harder financial times or taken in a number of new occupants into their home. Since they have not historically been eligible for income-qualified programs it often does not occur to them that programs providing these types of free energy-saving measures and services might be an option.
- Remote locations/rural barriers. Interviewees noted that sometimes it takes a face to face encounter to reach a household – that direct mailing has limitations that can be addressed with in-person efforts. They also note that these are very expensive.
- Master-metered customers that are not sub-metered and do not pay their electric bill, so the program has to sell the customer only on health, comfort and safety.
- Trouble providing required income documents (e.g., undocumented income, no income, or concerns over having to share immigration status).
- Don't have enough time.
- Language barriers – customers that do not understand program informational and marketing material, or have trouble filling out forms.
- Identity/social perception issues e.g. customers that don't want to participate in a "government" program, or take "hand-outs".
- Requirement of multiple appointments with contractors – by the 2nd or 3rd visit, the customer may drop off – especially for customers that work outside the home.

- Customers with no access to a bank account or knowledge of how to adequately leverage the banking system adequately may face additional barriers in managing their energy costs and bills.
- Renter/Landlord:
    - Must give permission but have a lack of incentive to do so. Property manager may not pay the electricity bill and therefore may not perceive a direct benefit from participation (participation unless the appliances are part of the building property.)
    - Fear the IOU will find a problem with building not meeting codes / standards.
    - Fear they will be liable for a co-payment.

The IOUs are working to create a joint improved property owner waiver consistent across the state and to expand the languages the waiver forms are offered in. The IOUs are developing a fact sheet and have done direct mail campaigns targeted to property owners/mangers, to help them understand the program and the benefits of participating.

5.4.2.1 Modified 3-Measure Minimum

Customers must be eligible for three measures or if less than that, measure(s) that will yield at least 125 kWh or 25 therm savings to be eligible to participate in ESA—this affects the single-fuel IOUs more, and in areas where the dual-fuel IOUs only provide a single commodity, where homes may only be assessed for a single fuel. Though in the SCE and SoCalGas overlap area, often the contractors may assess a customer's home for both fuels if they hold contracts with both IOUs.

Contractors that are also LIHEAP providers can leverage ESA and LIHEAP towards the three measure minimum rule—for LIHEAP measures that are also offered under ESA. LIHEAP has a dollar cap and the contractors try to maximize dollars from both programs, so they may enroll customers in both programs. LIHEAP also offers measures that ESA does not.

Homes that fail the three measure minimum rule may be losing out on energy-savings opportunities. The IOU has to pay the contractor to conduct the home assessment and enroll the customer and confirm income qualification. Customers who then fail due to lack of at least three measures are not allowed to get any measures, including energy education or CFLs. This rule may be impacting multi-family homes more often.

5.4.2.2 Measure-related Barriers

Program staff reported that ESA implementation contractors encounter some customer resistance to certain measures—or barriers to measure acceptance. This resistance is encountered during both the home assessment visit, and again during the measure

installation(s). During assessment the customer may be reluctant to sign up because they do not believe they will get "free" measures, and assume the big ticket items must be sub-standard. For SoCalGas, the main benefit/service is weatherization, and that can be a hard sell to customers – especially when compared with a refrigerator that is more tangible benefit of the electric program. Contractors explain to customers that there are health, safety and comfort benefits and their home will be cheaper to heat/cool, but *"..the message doesn't always "click"".*

During installation some customers may object to the way the new equipment looks or sounds or express disappointment that they didn't receive the measures they had expected. For example, a customer may be disappointed if they only qualified for water-saving measures such as aerators and showerheads and didn't get a new refrigerator or attic insulation or other big ticket items.

Lack of sufficient combustion ventilation air (CVA) can be a barrier to installing infiltration measures, both at the assessment and installation phases. If there is not sufficient CVA detected at assessment phase, the customer will only be assessed for non-infiltration measures and the three measure minimum becomes more probable and may result in the customer not being eligible for measures. (This most often occurs when there is a wall furnace and no place to obtain additional air, e.g., a multi-family interior unit or a small home.) For owner-occupied homes, the ESA program may be able to repair or replace the problem appliance, but for renter-occupied homes, the landlord must do the necessary repairs.

5.4.3 Contractor Interviews

We also obtained information from ESA outreach and assessment contractors on their opinions regarding remaining barriers to ESA participation. As we noted previously, the sample of contractors is not representative of all contractors and these findings are qualitative and intended to round out the customer research reported in this section.

The contractors that we interviewed reported that (and program staff corroborated) they are generally able to reach adequate numbers of income-eligible customers based on IOU referrals and supplemental outreach in order to meet their goals. However, even though a customer is enrolled in the CARE program, to participate in ESA they must provide documents proving their income or that they are enrolled in another CPUC-accepted means-tested LI program. Contractors indicate that for some customers, proving income-eligibility can be challenging. In this regard, contractors that provide multiple services to LI clients can have an advantage, since customers often come in with SSI or CalFresh documentation, which proves categorical eligibility.

The most commonly mentioned challenge is that many prospects are hesitant to provide private information (e.g., pay stubs or Social Security information), seniors and rural customers in particular (seniors also need more time to locate acceptable documentation).

In addition to proving their income, customers must also prove they either own their home (i.e., showing the title) or for renters, get their landlord to sign a waiver allowing ESA measure installations and agreeing to pay for certain measures that are not allowed to be installed for renters under the ESA program. For customers with natural gas service, there is the potential for an additional barrier to participate, based on how much combustion ventilation is present since any weatherization measures will tighten the home and reduce ventilation and could create a carbon monoxide problem.

Following are the enrollment barriers that the contractors described:

- Obtaining apartment owner permissions (i.e., split incentives, out of state and cannot reach or risk averse). This is a key barrier and the contractors did not describe any patterns regarding engaged and non-engaged, in-state owners.
- Suspicion of free measures and services. This is another key barrier; seniors are especially skeptical about whether measures are really free, and some apartment owners are wary of free assessments. More established contractors have fewer trust issues as their "brand" becomes accepted over time in the communities where they work.
- Transient customers. This is another key barrier, as many customers on IOU lists have changed/disconnected phone numbers or have moved.
- Seniors can be more wary of new technology.
- Customers lose interest when they cannot get the measures they want most (often refrigerators that are less than 15 years old, water heaters, ovens and AC units in certain climate zones where they are restricted).
- Some neighborhoods are not safe to visit.
- Contractor uncertainty regarding which measures the CPUC is funding at the end of program cycles and during bridge funding periods.

The contractors reported that they are using a range of diverse strategies to address the aforementioned challenges:

- Door-to-door canvassing:
    - Door to door enhances credibility and trust compared to phone canvassing. Contractors can and do show customers IOU authorizations and 1-800 numbers for questions or concerns.
    - The IOU lists and databases often have outdated phone numbers.
    - According to one contractor, "a higher percent of people open their doors than answer the phones (if they are home)."
    - For manufactured homes, it is easier to find new units that have not been recruited before.

    - Canvassing with ethnic apartment managers present (particularly Hispanic) leverages their rapport and enhances customer trust.
- Canvassing/telemarketing and doing projects in large contiguous areas to increase visibility, build awareness and gain trust
- Using translated materials and interpreters:
- Emphasizing improved home safety to seniors, who are often concerned about potential gas leaks.
- Encouraging word of mouth referrals by previous participants.
- Using routing software to increase efficiency of canvassing travel (i.e., can visit more homes).
- Equipping staff with uniforms with badges (which are required by the IOUs).
- Encouraging seniors to verify contractors with the IOU's by providing a 1-800 number and company and staff names (ideally visible on a badge too).
- IOU branding on fliers and door hangers.

We asked contractors how the IOU could help overcome barriers. Not surprisingly, some asked for additional mass marketing, which though it may help some customers overcome barriers, is not usually the most cost-effective way to address participation barriers. These suggestions are reported here without an assessment of their cost-effectiveness, and without comparing against current IOU marketing strategies and available budgets.

Contractors noted some areas where additional IOU assistance could improve their enrollment, mostly regarding marketing (one would like to see a simplified joint application for SCE and SoCalGas). One PG&E contractor would like to see more billboards and posters with 1-800 numbers to supplement the household mailers and 60-second phone messages that PG&E already delivers. Another PG&E contractor reported that having the IOU logo on their shirts used to enhance their credibility a lot, and would like PG&E to allow this again. Lastly, one SDG&E contractor would like to see more marketing in rural areas, where they perceive energy efficiency awareness still lags.

Regarding the marketing content, one contractor would like more "specifics" that describes contractors' involvement, so households are not subsequently skeptical of their offers of free measures. Another contractor perceived that, "customers have no clue about equipment, they don't see the ducts holes, they only know they have high electric bills, low comfort and always need to run the AC - that's what they relate to."

5.4.4 Customer Telephone Survey

This subsection includes telephone survey results on willingness to participate in ESA, ESA participation drivers and barriers.

5.4.4.1 Willingness to Participate in ESA

We asked ESA non-participants how willing they would be to participate in the ESA program. We provided as much information as we could to the respondent so their response would be based on some understanding of the various steps they would need to take and requirements they would have to meet in order to receive program services. The description varied for homeowners and renters, since they have different requirements:

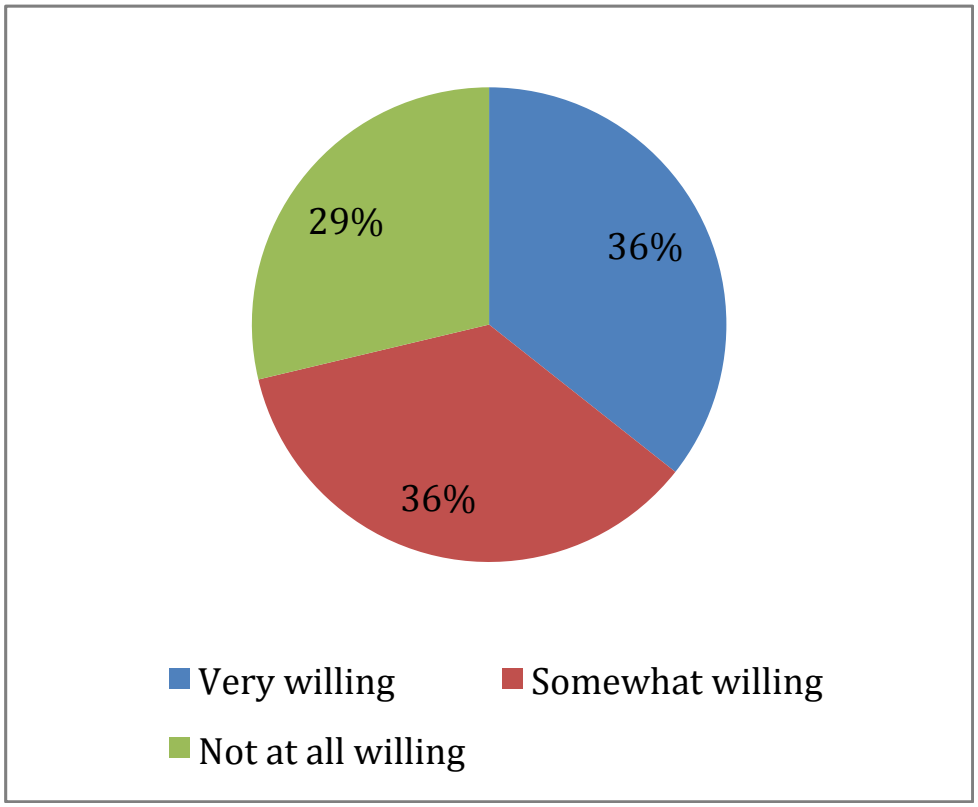
> "If you sign up for Energy Savings Assistance, a contractor will visit your home and look at your income [owners only: and home ownership documents] and fill out an application with you. [Renters only: The contractor will also need to have papers signed by your landlord approving the work.] A different contractor will come on another day and look at your home to see what home improvements you may qualify for, such as energy efficient light bulbs, weather stripping around doors and windows and sometimes new appliances or equipment to replace old or broken ones. These home improvements would be installed by another contractor during another visit or two to your home." [34]

As shown in Figure 34 below, 36 percent said they would be very willing to participate in ESA, after hearing that description. Another 36 percent said they would be somewhat willing (for a total of 72% that are willing), and the remainder (29%) said they were not willing.[35]

[34] Note that this description is not exactly how customers would participate in the program. E.g., some fraction will undergo an additional visit for inspection of measures, some will have the assessment take place during the enrollment visit, etc.

[35] The prior LINA estimated 95 percent of ESA (referred to as LIEE at that time) non-participants were very or somewhat wiling to participate in ESA, but they did not include a detailed description of the program. The prior estimate was an upper bound estimate. Many more households have participated since the time of that study, leaving a harder to reach non-participant pool that may be less willing than the non-participant population in 2004, when the prior research was conducted.

Figure 34: ESA Non-Participant Willingness to Participate (O2) for California LI Population (n=400)

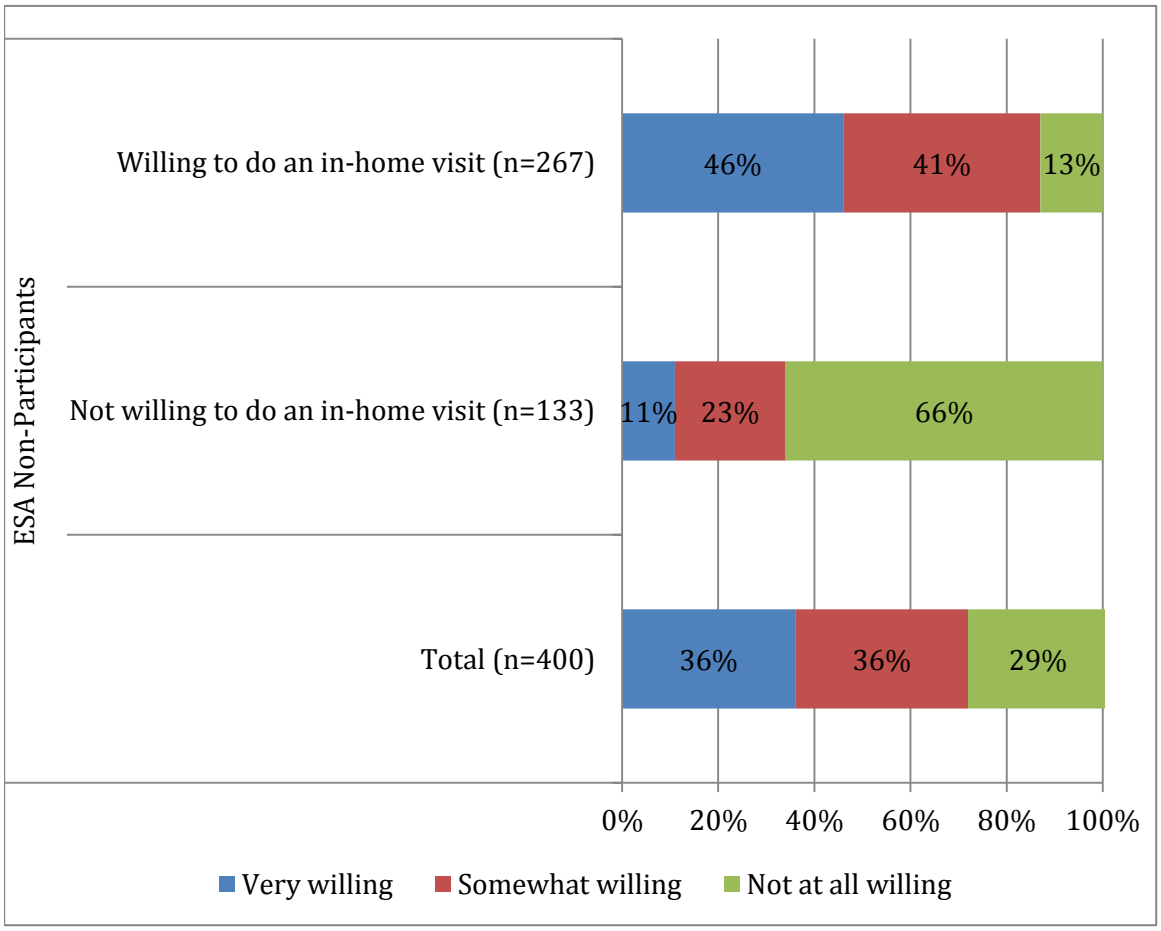


Source: 2013 Care Participant Telephone Survey.

We remind the reader to consider the sample bias when interpreting this result. We believe our telephone survey sample represents roughly half the ESA non-participant population that lacks major outreach barriers (i.e., is willing and able to respond to a telephone survey sponsored by their IOU related to energy issues.) The other half of the population that is not represented by our sample probably as much lower willingness to participate and must be considered when using these results for developing program plans and policies.

We examined willingness to participate based on the respondent's willingness to be in our recruitment pool for the in-home visit, which was recruited from the ESA non-participant respondents. In Figure 35 below, we show how willingness to participate in ESA is strongly correlated with willingness to do an in-home survey. Only 34 percent that declined to be in the in-home pool are "very" or "somewhat willing" to participate in ESA, versus 87 percent of those who joined our recruitment pool.

Figure 35: ESA Non-Participant Willingness to Participate, by Willingess to do Onsite Visit (O2/R1a) for California LI Population



Source: 2013 CARE Participant Telephone Survey.

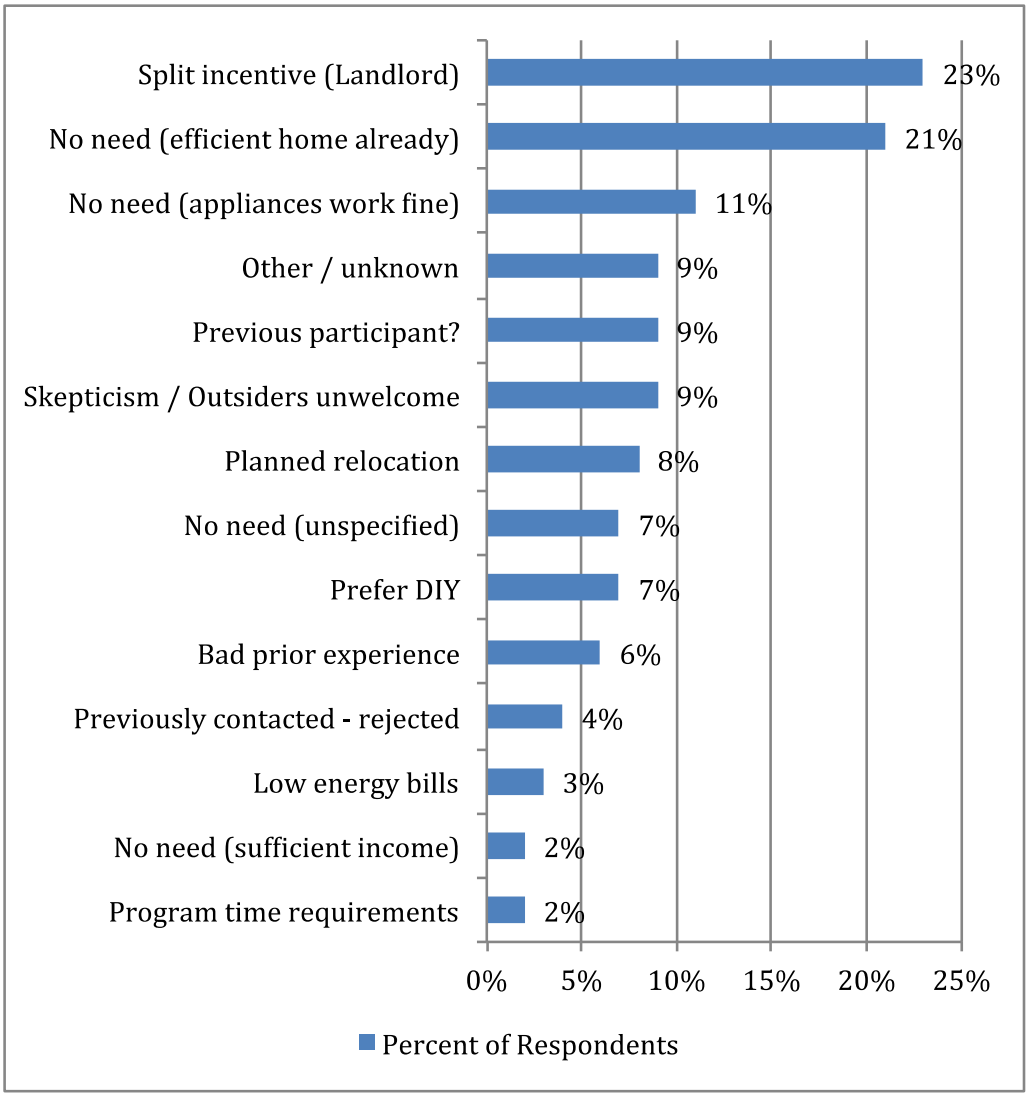
If we assumed that the ESA non-participants that we could not reach by telephone had the same willingness to participate as those respondents who declined to join our in-home pool, the percent who are willing to participate (summing the "very" and "somewhat") drops from 72 percent to 52 percent. We do not really know whether the non-respondents are the same as those who declined to join the in-home pool, but lacking better data, this adjusted willingness estimate is a proxy for a population estimate.

We asked respondents who said they were unwilling to participate in ESA (29% of non-participants) to tell us why they were unwilling (Figure 36 below), and the primary reason (only cited by renters) was that their landlord would not let them or they did not want to ask their landlord (23% of total unwilling respondents) – 28 percent of single-family renters and 42 percent of multi-family households. The next most commonly

cited reason was that they have no need for the program (21%), followed by a similar response that their appliances are working well (11%).

Note that if the willingness to participate estimates presented above (e.g., the 52% adjusted estimate) are used to update ESA program treatment goals, the reasons for not being willing to participate should be factored in. For example, the estimate could include LI customers who said they were unwilling to participate (which is 7% of LI customers) due to having to get permission from their landlord, which is a barrier that the program may want to address and attempt to serve those customers.

Figure 36: Reason Non-Participants Are Unwilling to Sign up for ESA (O2a) (n=79) for California LI Population



Note that there were likely a few respondents, similar to the in-home visit sample, which may have participated in ESA in 2013 that were in our sample (which explains the "previous participant" responses). Our sample frame was based on ESA participation through 2012.
Source: 2013 CARE Participant Telephone Survey.

We looked at segments of non-participants to determine if there are differences in their reasons for being unwilling to participate in ESA. We found that households in rural and mountain geographic areas were more likely to cite skepticism and trust issues (outsiders unwelcome) than other households (64% and 76% respectively, compared to only 9% of total unwilling respondents.) Rural and mountain households were also less likely to cite their landlord as the reason for their unwillingness (46% and 51%,

respectively, compared to 22% of urban respondents), though this particular difference is not statistically significant.

Mobile home dwellers (91%) and single-family homeowners (56%) were more likely to say they have no need than single-family renters (18%) and multi-family (36%) households. English-only households were also more likely to say they have no need (53% compared to 20% of Spanish-speaking households).

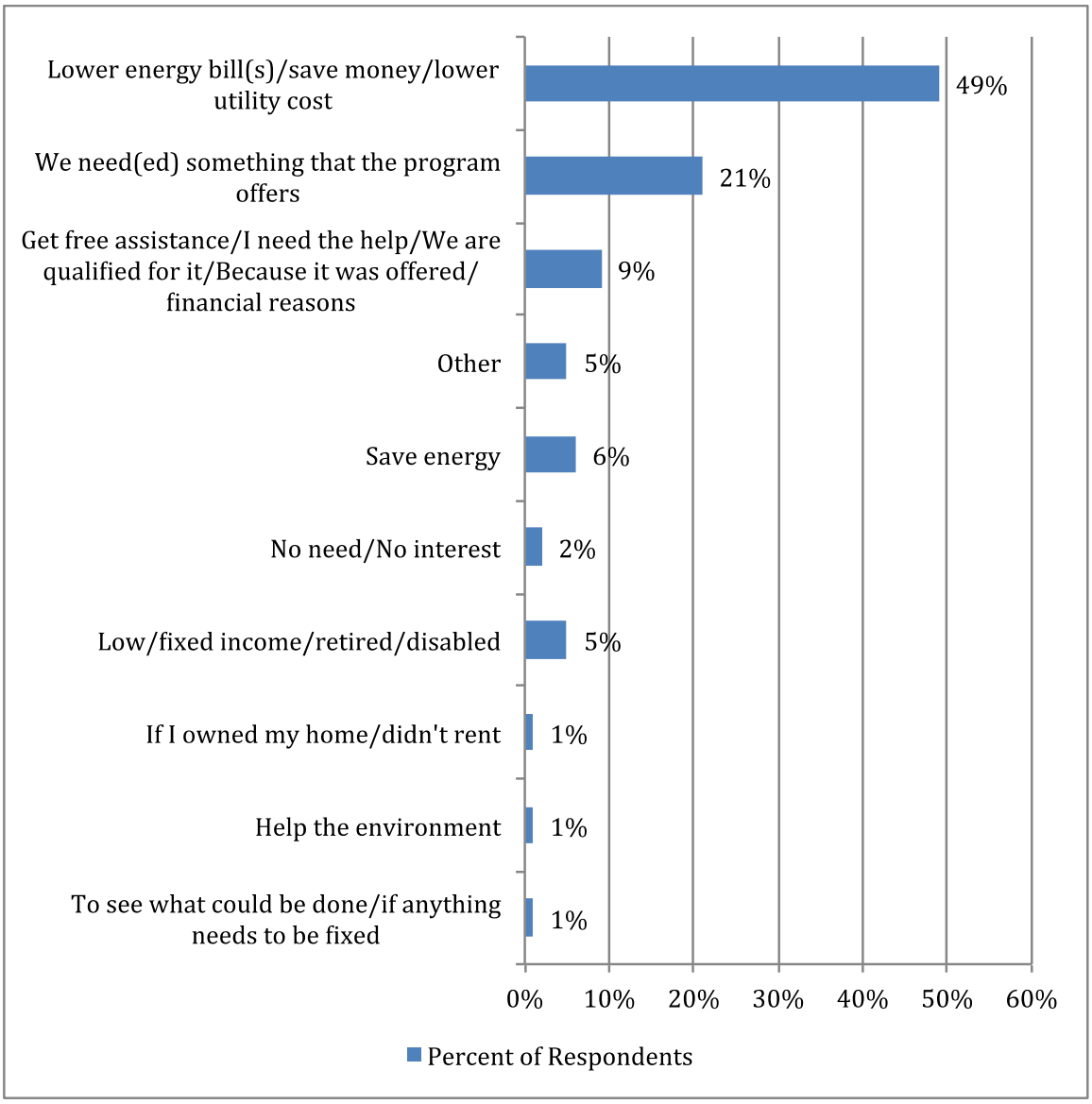
5.4.4.2 ESA Participation Drivers and Barriers

We asked telephone survey respondents a series of questions related to drivers of participation. We adapted the questions to apply to both ESA participants and non-participants. First, we asked (unprompted) why they participated in ESA (for participants) or why would they participate in ESA (for non-participants who said they were willing to participate, after reading them a description of the program and steps they would go through to participate). Next we presented a list of potential participation drivers and asked how important each of these were in deciding to participate (for participants) or might be (for willing non-participants). We followed with a similar set of questions regarding potential barriers to participation – first asking an unprompted question about what, if anything, was difficult (or might be difficult) about participation, followed by reading a list of potential barriers and asking how easy or hard they were (or might be).[36]

Figure 37 below presents the open-ended responses to what made them decide to (participants) or why they would decide to (non-participants) participate in ESA. The most commonly cited reason was to lower their bills/save money, cited by 49 percent of respondents. The next most commonly cited reason was that they needed something the program offered, cited by 21 percent of respondents. These results do not differ across LI population segments, or by ESA participation status.

[36] Recent participants who did not recall participating were not asked this series.

Figure 37: Why Respondents Did/Would Decide to Participate in ESA – Unprompted (E1a) (n=925) for California LI Population



Source: 2013 Care Participant Telephone Survey.

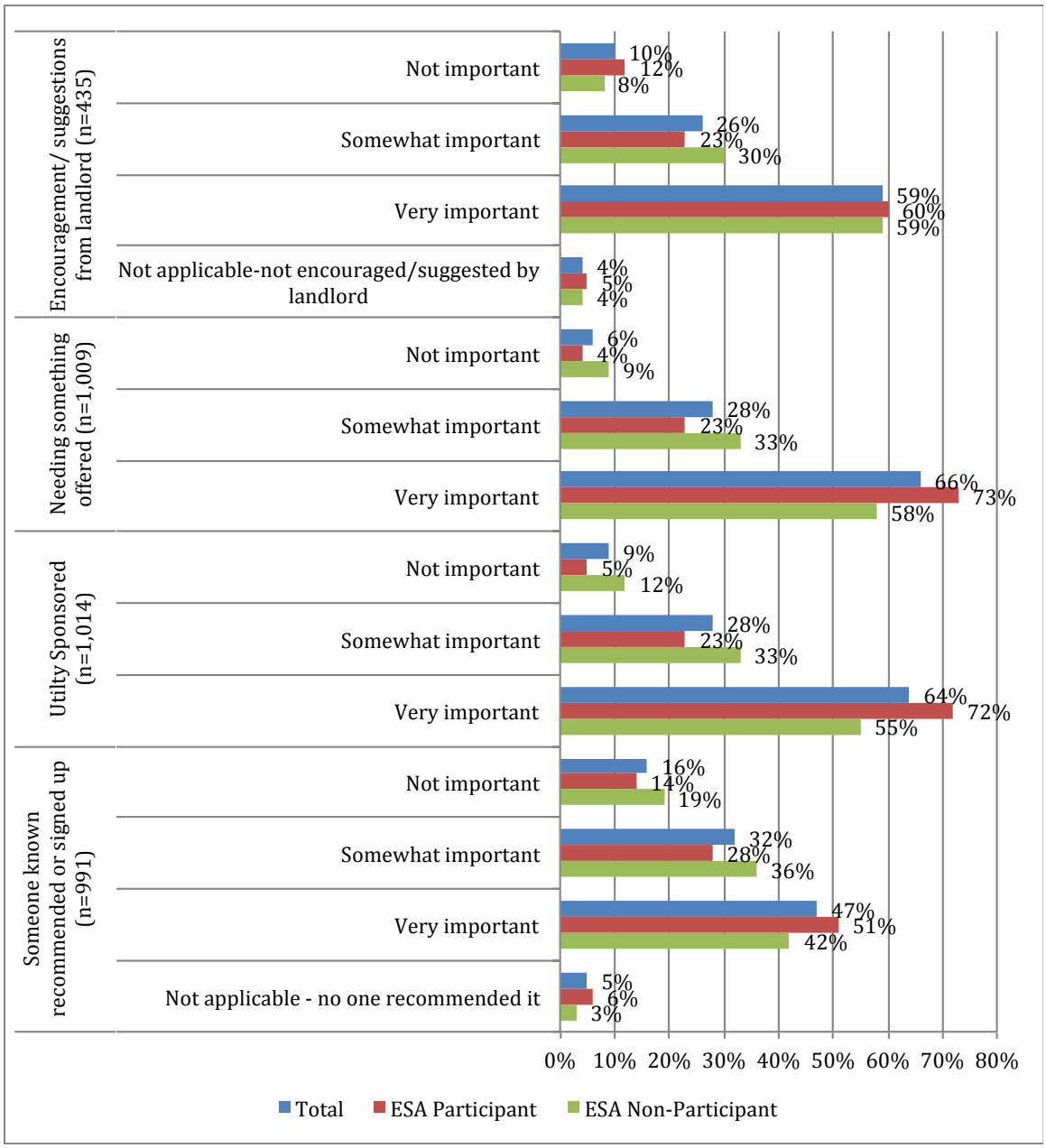
Figure 38 shows the results from the prompted question series, where respondents were asked how important various factors were or would be in deciding to participate. Between one-half and two-thirds of respondents said each of the factors were "very important":

- Encouragement / suggestion from their landlord (renters only)
- Needing something the program offers
- IOU sponsorship
- Someone they know recommended it or already signed up

The last driver, having a recommendation, was cited as "very important" the least.

ESA participants were more likely to say that needing something the program offered and IOU sponsorship was very important than non-participants. These were the top two drivers for ESA participants. The ESA modeling that included the phone survey data (stage two, see Section 5.4.5) indicated that these potential drivers were not significant in predicting participation, suggesting that these two drivers reflect underlying differences between participants and non-participants. The top driver for ESA non-participants was landlord encouragement, but almost as many non-participants also cited needing something the program offers and IOU sponsorship.

Figure 38: Importance of Various Factors in Considering ESA Participation – Prompted (E2) for California LI Population



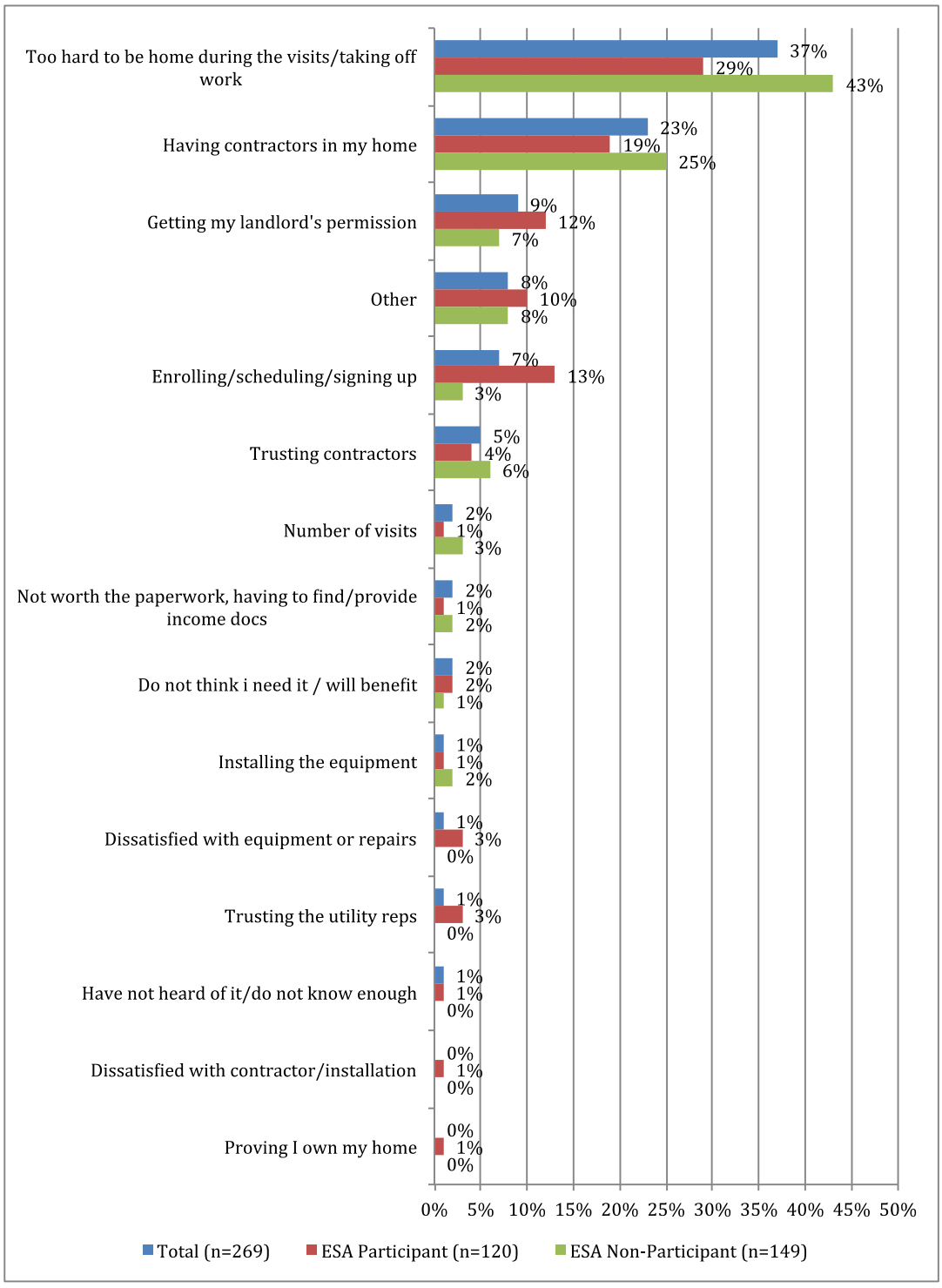
Source: 2013 CARE Participant Telephone Survey

We asked respondents whether they had any problems (participants) or anticipate having problems (non-participants, after having been read a description about the program) signing up for ESA. 25 percent said of total respondents said yes, and 17 percent of participants and 33 percent of non-participants said yes. Rural and mountain

respondents were more likely to say they would have or did have problems – 43 percent and 48 percent, respectively.

Figure 39 presents the open-ended responses regarding what was (participants) or would be (non-participants) most difficult about ESA participation, for the 25 percent that said they had or would have a problem. Being home during the day/taking time off work was the most commonly cited barrier, mentioned by 43 percent of non-participants and 29 percent of participants (not a statistically significant difference). Households where Spanish is the primary language were more likely to cite this barrier than homes where English is the primary language (54% versus 34%). 'Having contractors in my home' was the next most commonly cited barrier, cited by 23 percent respondents who mentioned they had or would have a problem participating in ESA. 9 percent mentioned getting permission from their landlord, and excluding homeowners, 12 percent of renters cited that reason.

Figure 39: ESA Participation Components that Were/Would be the Most Difficult – Unprompted (B1) for California LI Population



Source: 2013 CARE Participant Telephone Survey.

Figure 40 shows the results of prompted barriers that we asked participants and non-participants about, including:

- Providing documentation of home ownership (for owners only);
- Providing income documentation such as a tax return;
- Trusting the utility;
- Filling out a program application with a contractor;
- Arranging to be home for contractor visits;
- Getting the landlord's permission (for renters only); and
- Trusting the contractor.

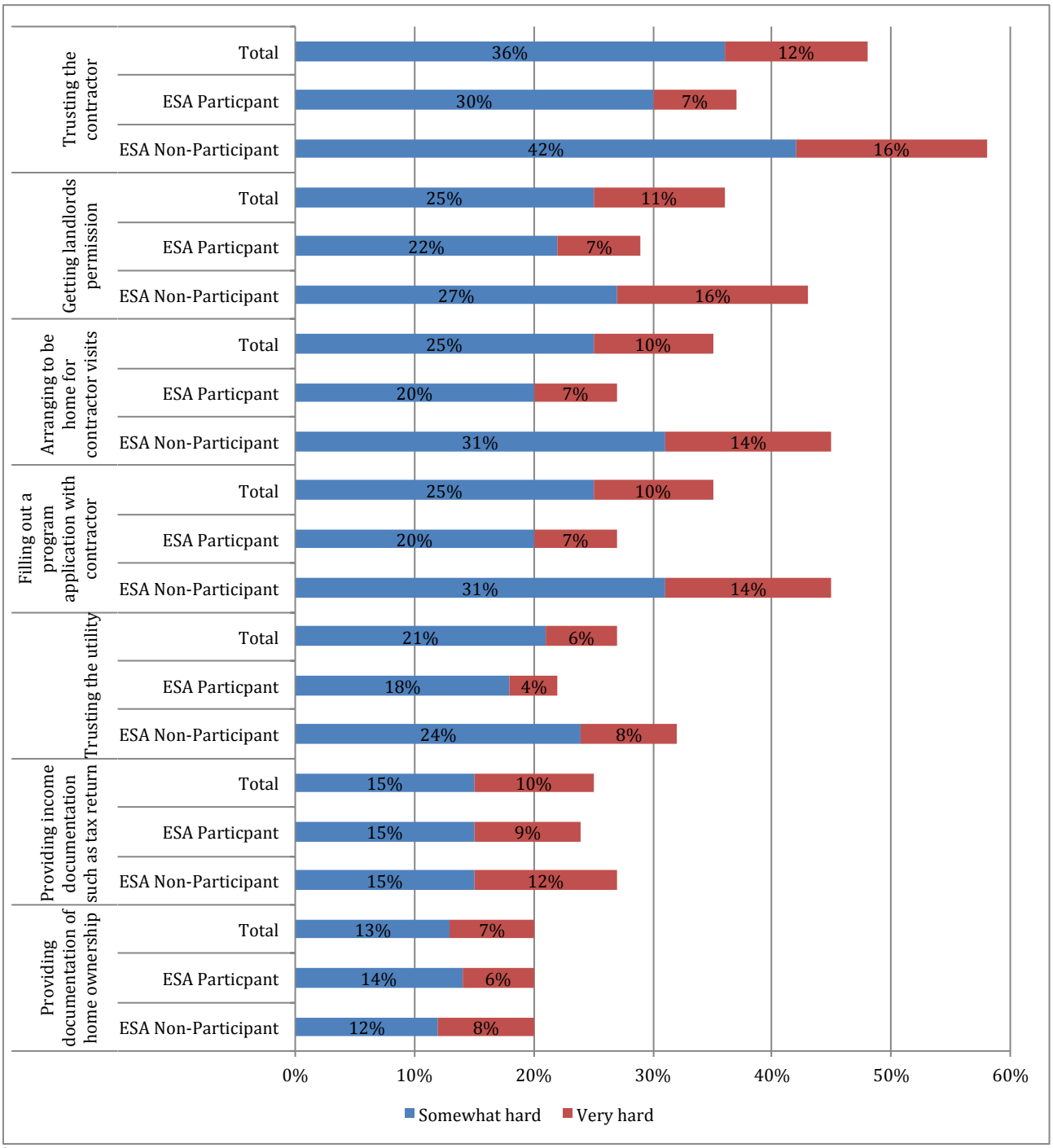
We asked respondents whether those potential barriers would be easy, somewhat hard or very hard. The potential barriers that respondents said would be very or somewhat hard most often was trusting the contractor and getting landlord's permission (tied at 47%). Single-family owners and other primary language households were more likely to say that trusting the contractor would be hard (55% and 65%, respectively). More multi-family respondents said that getting their landlord's permission would be hard (55%). These prompted potential barriers elicited a higher percentage of respondents that said they would be problematic, as compared to the previous question that we reported, which was unprompted and allowed only one response. In the prompted series, respondents could mention more than one potential barrier as problematic.

Arranging to be home for contractor visits and filling out an application with a contractor were tied for third and fourth (35% said these would be very or somewhat hard). All of those barriers except filling out an application were cited more often as "hard" by non-participants than participants. Non-English as a primary language households were more likely to say that filling out an application would be hard.

Trusting the IOU was not much of a potential barrier, with only 26 percent saying that would be hard – though more non-participants said this would be hard (32% versus 21% of participants).

Homeowners were not very likely to mention providing proof of ownership documents (80%), and only 25 percent of respondents said that providing income documents would be hard. (More single-family renters [57%] said that would be hard than other home types.) We remind the reader again that our sample is biased towards non-participants that would talk to us about IOU programs and energy usage, so our sample is likely more trusting and willing to share information.

Figure 40: How Hard ESA Participation Components Were/Would Be – Prompted (B2) for California LI Population[1]



[1]Sample sizes: total = 1,021, participant = 607, non-participant = 414; for landlord barrier: total = 475, participant = 253, non-participant = 204.
Source: 2013 CARE Participant Telephone Survey.

5.4.5 ESA Modeling Results

As described previously in this subsection, participation in the ESA program is dependent upon a number of factors and is often not simply a choice made by an eligible customer. Each of the IOUs engages in outreach activities, which influence the number and characteristics of customers that enroll in the ESA program, such as neighborhood canvasing, marketing through community or religious institution, or inserts in monthly bills intended to appeal to a particular socio-demographic segment of the customer base.

We conducted two types of models to assess drivers of and barriers to ESA participation. For "Stage 1", we used population data and developed four IOU-specific models, taking advantage of whatever data the IOUs could provide.[37] For "Stage 2", we developed one cross-IOU model using IOU data combined with telephone survey data.

We examined differences between participant and (likely income-eligible, since they are enrolled in CARE) non-participant characteristics, to provide context for the analysis that follows of drivers of and barriers to participating in ESA. We based these comparisons on the self-reported demographic survey battery of our telephone survey (which are included in Section 7.2, within the demographic characteristics detailed results tables.)[38]

Characteristics that differ across ESA participants and non-participants (technically, across homes that have been treated by ESA[39] and have not) are:

- Race: 35 percent of respondents living in homes that have been treated by ESA are White; comparatively 44 percent of respondents living in homes that have *not* been treated by ESA are White. 42 percent of respondents living in homes that have been treated by ESA are Hispanic; comparatively 34 percent of respondents living in homes that have *not* been treated by ESA are Hispanic.
- Income: Respondents living in homes that have been treated by ESA have an average income of $20,377; comparatively respondents living in homes that have *not* been treated by ESA have an average income of $25,886.
- Disabled: 63 percent of respondents living in homes that have been treated by ESA have a disabled household member;[40] comparatively 54 percent of

[37] If one IOU had certain variables but the others did not, this approach allowed us to use the variable in the model. In Stage 2, we had to restrict the cross-IOU model to whatever variables the IOUs had in common (the least common denominator). (We were able to impute missing values for some incomplete variables, but we could not use a variable that was completely missing from one or more IOUs.)

[38] Note that we determined ESA participation based on "home", while the survey was conducted with the current household residing in the home, which may or may have not been treated by ESA. Technically, we are reporting characteristics of households that live in ESA treated homes versus those that lie in homes that have not been treated by ESA.

[39] For the purpose of this study, "treated by ESA" is defined as treated through the ESA program since 2002.

respondents living in homes that have *not* been treated by ESA have a disabled household member.

- Education: 16 percent of respondents living in homes that have been treated by ESA have received a bachelor's degree or higher; comparatively 22 percent of respondents living in homes that have *not* been treated by ESA have received a bachelor's degree or higher. 27 percent of respondents living in homes that have been treated by ESA have not completed high school; comparatively 18 percent of respondents living in homes that have *not* been treated by ESA have not completed high school.
- Tenure: 29 percent of respondents living in homes that have been treated by ESA have lived at their home for 20 years or more; comparatively 16 percent of respondents living in homes that have *not* been treated by ESA have lived at their home for 20 years or more.
- Presence of elderly member(s): 54 percent of respondents living in homes that have been treated by ESA have one or more elderly household member(s); comparatively 45 percent of respondents living in homes that have *not* been treated by ESA have one or more elderly household member(s).

These results should be viewed as "zero-order" associations in that they do not control for other characteristics that may influence participation in the ESA program. Comparatively, the logistic regression models presented in this report control for the various factors that influence participation in ESA, which allows us to derive estimates of the marginal impacts associated with various characteristics and factors.

Characteristics of households living in homes that have and have not been treated by ESA that do *not* differ are:

- Home ownership
- Home age
- Population density (urban v. rural)
- Building type (single-family versus multi-family)
- Presence of children
- Household size
- Language spoken
- Employment status

These comparisons (based on cross-frequencies) provide a simple, two-dimensional view of the relationship between ESA participation and another variable that, while

[40] See the telephone survey instrument in Section 13, questions D15a-15e. If the respondent said "yes" to any of those questions related to household member(s) disability(ies), the household was coded to have a disabled member.

instructive, can be misleading because cross-frequencies do not account for other characteristics important in the decision by or opportunity for a household to participate in CARE. For example, while participant households are more likely to be White than non-participant households, White households are also more likely to be homeowners, to have longer tenure within their home, and to be over 65 years of age or live in a community with a high percentage of households with persons over 65 years of age. These are all factors that have a positive influence on ESA participation, but which cannot be considered within a simple cross-frequency. The (multivariate) logistic regression model will estimate the impacts that each of these factors has on ESA participation while controlling for other confounding factors.

Comparatively, regression analysis allows us to measure the marginal relationship between ESA participation and each explanatory variable, while controlling for ("holding constant") all other explanatory variables. The result is that after controlling for all other factors, White households are not more likely to participate in ESA than other, non-White households.

5.4.5.1 Stage 1

Using customer-level data provided by the IOUs for CARE customers and supplemented with block-group level data from the U.S. Census Bureau and Athens Research, we developed and estimated independent logistic regression models for each of the four IOUs. For each model, the dependent variable is equal to 1 if the customer is living in a premise treated through the ESA program since 2002, else 0 if the premise was not treated through the ESA program (but is assumed to be income-eligible since the household is on the CARE rate).[41]

The independent variables in the models include characteristics of the household (e.g. number of persons) and neighborhood (e.g. percent Spanish speaking households), and relationship with the respective IOU (e.g. length of time the service account has been active, number of late payments).

The purpose of the models is to quantify the effect that these various characteristics have on the likelihood that a customer will participate in the ESA program. Section 9.2 provides additional details on the Stage 1 ESA model results and Section 6.1 provides additional details on the methods used to develop those models.

Table 44 provides the key results translated to allow for relative comparisons across the models' explanatory variables for each IOU. Note that not all variables were available for each IOU, and even when available, some were not significant (shown as a blank cell in the table). The columns are described below, and are similar to the CARE modeling described previously:

[41] Note: we do not account for, nor do we know if the customer was living in the premise when the residence when it was treated through the ESA program.

a. The row number;
b. The variables used in the ESA participation models; and
c-f. The change in ESA participation associated with a hypothetical change in the variable shown in column b from the median to the 60th percentile value (for continuous variables), from the mid-point to mid-point plus one for discrete variables and from 0 to 1 for binary variables, *holding all else constant* for each IOU.

Table 44: Estimated Impact on ESA Participation Associated with a Change in the Value of Each Independent Variable for California LI Population

a.	b.	c.	d.	e.	f.
		Delta ESA Participation			
Row	VARIABLE	SDG&E	SoCalGas	SCE	PG&E
Continuous variables:					
1	Median Income for the block group (divided by 1000)	-2.01%	-1.39%	-0.63%	-0.57%
2	% HHs in the block group with Person >= 65	0.17%	0.35%	0.31%	0.84%
3	% Spanish Speaking HHs in the block group	0.42%	2.10%	2.31%	1.54%
4	% Non English/Spanish HHs in the block group	-0.66%	1.01%	0.26%	0.60%
5	% Single Parent HHs	2.70%	0.22%	0.77%	0.60%
6	% HHs on Medicaid in the block group	3.78%			1.76%
7	% African-American HHs in the block group		0.62%	0.56%	
8	Avg. 2012 Electricity Use (daily kWh)	-1.32%		-1.44%	-0.46%
9	Avg. 2012 Gas Use (daily therms)		-0.02%		
10	Pop Density (1,000 pers. per sq. mile) of the block group	0.37%		0.11%	-0.15%
11	Service account age (Occupant tenure)	-0.21%	0.45%	2.30%	0.77%
12	Building age (imputed where missing based on block group)	0.30%		0.63%	0.68%
13	Time on CARE rate (years)		0.87%	0.49%	
Discrete variables:					
14	Persons Per HH		1.49%	1.68%	
15	Number of failed bill payments	1.87%		0.32%	-2.85%
16	Number of overdue payments	0.07%		0.55%	
17	Calls to customer re delinquent bill	0.35%			
18	Number of disconnects	-2.4%			-3.89%
Binary variables:					
19	Medical baseline (0/1)		17.61%	13.65%	5.33%
20	Coastal location (0/1)	-2.7%	-14.34%	-5.60%	
21	Has IOU Electricity (0/1)		8.56%		5.33%

a.	b.	c.	d.	e.	f.
			Delta ESA Participation		
Row	VARIABLE	SDG&E	SoCalGas	SCE	PG&E
22	Has IOU Electricity and Gas (0/1)				17.57%
23	Single-family dwelling (0/1)			18.65%	
24	Has recertified for CARE (0/1)			13.97%	
25	Categorical CARE enrollment (0/1)			3.84%	
26	Located in climate zones 10-16[1] (0/1)			15.84%	
27	Located in climate zones 13-15[2] (0/1)			18.50%	

[1] Eligible for Central and Room AC during program years 2009-2011
[2] Eligible for Room AC but not Central AC during program years 2009-2011
Source: 2013 CARE Participant Telephone Survey.

Key takeaways from the ESA participation model results are presented below by the three categories of variables (continuous, discrete and binary) along with an interpretation of the result. We sorted by ascending magnitude of the variable on delta ESA participation across the four IOUs. Where applicable, we indicate whether the results are consistent with the CARE models.

Continuous variables:

- (+) Spanish-speaking households – the more households that speak Spanish as their primary language in the block group, the more likely households have participated in ESA – the programs have made substantial efforts to target Spanish-speaking households (this result is consistent with the CARE model) - it is also possible that concentration of Spanish speaking households is positively related to concentration of income-eligible customers;
- (+) Households on Medicaid – the more households that are enrolled in Medicaid in the neighborhood, the more likely a household has participated in ESA – similar interpretation as the median income variable above (this result is consistent with the CARE model); and
- (-) Median income – the lower the income of the neighborhood, the more likely the household is enrolled in ESA – the ESA program targets customers based on CARE enrollment and neighborhoods based on income level (this result is consistent with the CARE model, which looked at a similar variable: income less than 100% of federal poverty guidelines);
- (+) Single-parent households – the more single-parent households in the neighborhood, the more likely a household has participated in ESA – these households may have an easier time qualifying for CARE and ESA since they have

only one income to report, and the IOUs typically conduct outreach for ESA based on CARE enrollees;

- (+/-) Service account age/occupant tenure – for all but SDG&E,[42] the longer the household has lived in their current home the more likely they are to have participated in ESA – households that move around are harder to reach [43]
- (-) Electricity usage – the lower the electricity usage the more likely the household has participated in ESA – this is consistent with the CARE model; we hypothesize that customers with very high electricity usage either may not truly be eligible for CARE or may have other resources available to them that makes them less likely to respond to ESA program outreach, and conversely, those with lower usage may be actively trying to conserve and more interested in participating in ESA;
- (+/-) Non-English/non-Spanish speaking households– the more households where a language other than Spanish or English is their primary language in the block group, the more likely households have participated in all IOUs' ESA programs with the exception of SDG&E[44] (this result is consistent with CARE, with the exception of SDG&E);
- (+) Seniors in the home – the more seniors living in the neighborhood, the more likely households are enrolled in CARE and income-eligible and the more likely someone will be home at the household and available to participate in the ESA program (this result is consistent with the CARE model);
- (+) Building age – the older the building, the more likely it has been treated by ESA – older homes typically have more savings potential and are probably targeted by the IOUs;
- (+) Time on CARE – the longer that a household has been on the CARE rate, the more likely their home has been treated by ESA – they have had a longer amount of time to be on an outreach list developed by the IOU based on CARE enrollees;

[42] The impact on SDG&E ESA participation is very small. SDG&E has fewer older homes than the other IOUs.

[43] We recognize that many of the homes currently occupied by LI customers that have been treated through the ESA program were actually treated prior to the current residence living in the home. Therefore, the explanatory variables in the regression models that are specific to the customer do not explain why a prior resident chose to participate in the ESA program. Nevertheless, the measure of success for the ESA program is that the premise lived in by a LI customer be treated through the ESA program—regardless of who made the decision to participate when. We, therefore, set as a 'success' any CARE participant living in a premise treated through the ESA program, regardless of whether the premise was treated by a prior residence.

[44] SDG&E has significantly fewer Spanish-speaking households than SoCalGas and SCE (14% compared to around 30%), but about the same as PG&E (which has 17%).

- (+) African-American households – the more households that are African-American in the block group, the more likely households have participated in ESA – the programs have made substantial efforts to target segments that were considered hard-to-reach such as through working with community organizations, this result might reflect the success of those efforts (this result is consistent with the CARE model);
- (+/-) Population density – for all but PG&E, the more dense the block group the more likely the home has been treated by ESA – though this variable has a relatively small impact on ESA participation for all IOUs; and
- (-) Gas usage – for SoCalGas, households with higher gas bills have lower ESA participation rates, but the impact of this variable on participation is very small.

Discrete variables:

- (-) Number of disconnects and number of failed payments – households with more of these payment issues (with the exception of PG&E for failed payments) are less likely to have participated in ESA - these measures of negative behavior on the part of the customer may indicate a lack of engagement on the part of the customer to work with the IOU to find a solution to their inability to pay their bill;
- (+) Number of people per household – the more people in the household, the more likely the home has been treated by ESA – since households qualify based on income and number of people in the home, households with more people are more likely to quality for CARE and ESA (this result is consistent with the CARE model); and
- (+) Number of overdue payments, number of IOU calls to customer regarding delinquent bills and number of failed payments (for PG&E only)– the more of these payment issues, the more likely the customer is to participate in ESA – this is probably the desired result, where the program is helping customers with bill payment issues.

Binary variables:

- (+) Medical baseline – households that are on a medical baseline rate are more likely to participate in ESA, which is likely a desired result;
- (-) Coastal location – homes located in coastal areas are less likely to participate in ESA, likely because there is less need for it and less potential savings, so contractors may target these areas less often and households in these areas may perceive fewer participation benefits;

- (+) Single-family dwelling[45] – single-family homes are more likely to have participated in ESA, multi-family homes are very likely to be rented and require landlord cooperation;
- (+) Located in climate zones 13-15 – homes that are in these climate zones are more likely to participate, these are climate zones where customers are eligible for Central ACs, where there may be more need and energy savings potential;
- (+) Has IOU gas and electricity service – homes that have both services from their IOU are more likely to participate, likely due to more available measures so these homes may be more likely to be targeted by contractors and more likely a household would agree to participate;
- (+) Located in climate zones 10-16 – homes that are in these climate zones are more likely to participate, these are climate zones where customers are eligible for Room ACs, where there may be more need and energy savings potential; note that these homes are less likely than those in just climate zones 13-15 to participate;
- (+) Has recertified for CARE – households that have recertified for CARE are more likely to participate in ESA, likely because they are able and willing to respond to IOU requests for a response and may be more likely to be truly income-eligible for CARE and thus willing and able to provide income documents for ESA;
- (+) Has IOU electricity – for PG&E and SoCalGas, homes that have electricity from PG&E or SCE are more likely to participate in ESA; and
- (+) Categorically enrolled in CARE – households that categorically enrolled in CARE are more likely to have participated in ESA – these homes may be more likely to be income-eligible and willing to participate in ESA and have an easier time providing income or other qualification documents; they also may lack trust issues since they have opted to take assistance in other formats.

Note that we did not include an indicator variable of renter status, which was significant in the CARE model, since the stage one model is at the customer level and we lacked a variable that would tell us if the home was rented or not. (We had block group level data, but while such data may help with other indicators such as race and income, there may be less likely to be trends in home ownership at the neighborhood level.) We tried a home ownership variable in the stage two model, but it was insignificant (as discussed below). However, the self-reported barrier of getting a landlord to sign paperwork is

[45] Note that this variable was only available for SCE. The stage two model included a variable across all IOUs based on the survey data with home type, but was not statistically significant. We do note that the stage two model is based on the phone survey data that excludes non-participants who would not respond to a telephone survey, so home type may be an important barrier, though our results are not conclusive.

significant. In addition, the incentive for a renter to participate in the ESA program would be influenced by whether their dwelling is individually metered.

5.4.5.2 Stage 2

Using data gathered from the telephone survey of CARE participants and supplemented with customer-level data for CARE customers from the IOUs and block-group level data from the U.S. Census Bureau and Athens Research, we developed and estimated a logistic regression model that attempts to explain the factors affecting participation in the ESA program. The dependent variable in the model is equal to 1 if the customer is living in a premise treated through the ESA program since 2002, else 0 if the premise was not treated through the ESA program (but is assumed to be income-eligible since the household is on the CARE rate).[46]

The independent variables in the models include characteristics of the household and residence gathered through the telephone survey, as well as neighborhood characteristics and household electricity usage. The purpose of the model is to quantify the effect that these various characteristics have on the likelihood that a customer will participate in the ESA program.

While this model is closely related to the Stage 1 models developed for each of the respective IOUs, it differs substantively from those models in that it is primarily based on information gathered from CARE participants through the telephone surveys. While this model has the advantage of incorporating additional customer-level variables that we could not obtain in the IOU and Census/Athens data, it has two limitations. One, the telephone survey data are biased towards non-participants that lack major outreach barriers, as previously discussed. The interpretation of the presence and lack of barriers to ESA participation factors in this issue. Two, the model is cross-IOU (due to the much smaller number of observations) and we are limited to variables present across the IOUs (as mentioned above, the lowest common denominator). Section 9.2 provides additional details on the Stage 2 ESA model results and Section 6.1 provides additional details on the methods used to develop the model.

Table 45 provides the key results translated to allow for relative comparisons across the models' explanatory variables, similar to the Stage 1 table, but across IOUs. In this table we also include the median and 60th percentile of each variable (for Stage 1 that information is included in the appendix due to space constraints). Note that we included all the variables that were common across IOUs and that were comparable across participants and non-participants from the telephone survey, however, many variables were not significant. The columns are described below, and are equivalent to the CARE modeling described previously:

[46] Note: we do not account for, nor do we know if the customer was living in the premise when the residence when it was treated through the ESA program.

a. The row number;
b. The variables used in the ESA participation model;
c. The median value of each continuous and discrete variable;
d. The 60th percentile of each continuous variable/median value plus one for discrete variables; and
e. The change in ESA participation associated with a hypothetical change in the variable shown in column b from the median (column c) to the 60th percentile value/median plus one (column d), *holding all else constant*.

Table 45: Estimated Impact on ESA Participation Associated with a Change in the Value of Each Independent Variable for California LI Population

a.	b.	c.	d.	e.
	VARIABLE	Median	60th %tile[1]	Delta ESA Participation
1	AvgDailyKWH	16.18	17.99	-1.12%
2	PopDensity1000	3.54	4.54	-0.70%
3	HomeTenure	12.00	16.00	4.01%
4	Income1000	22.50	27.50	-1.70%
	Discrete & Countable			
5	HHsize	3.00	4.00	3.70%
	Binary Variables			
6	Male	0.00	1.00	-8.15%
7	Married	0.00	1.00	-11.80%
8	EnglishProficient	0.00	1.00	-9.31%
9	Home1970_1989	0.00	1.00	8.39%
10	OtherRace	0.00	1.00	10.01%
11	NotEnglishSpanishPrimary	0.00	1.00	-15.36%
12	ChronicMedical	0.00	1.00	8.25%
13	careaware	0.00	1.00	-7.57%
14	ReportedTurnOffHeat	0.00	1.00	12.76%
15	NeedESA	0.00	1.00	10.20%
16	BarrierLandlordEasy	0.00	1.00	11.37%
17	BarrierBeHomeEasy	0.00	1.00	11.18%
18	BarrierDocumentEasy	0.00	1.00	-6.78%
19	BarrierContractorEasy	0.00	1.00	14.89%
20	Constant			

[1]For discrete variables, the 60th percentile value is rounded to the nearest place. For binary variables, we compute delta ESA participation based on a change from "on" (or 0) to "off" (1).
Source: 2013 CARE Participant Telephone Survey.

Key takeaways from the ESA participation model results are presented below by the three categories of variables (continuous, discrete and binary) along with an interpretation of the result. We sorted by descending significance, accounting for the magnitude of the variable on delta ESA participation. Where applicable, we indicate whether the results are consistent with the ESA Stage 1 and CARE models.

Continuous variables:

- (+) Tenure – the longer that a household has been in their home, the more likely their home has been treated by ESA – they have had a longer amount of time to be on an outreach list developed by the IOU based on CARE enrollees (this variable is similar to "time on CARE", which was significant and positive in the ESA Stage 1 model);
- (-) Median income – the lower the income of the neighborhood, the more likely the household is enrolled in ESA – the ESA program targets customers based on CARE enrollment and neighborhoods based on income level (this result is consistent with the CARE and ESA Stage 1 models);
- (-) Electricity usage – the lower the electricity usage the more likely the household has participated in ESA or lives in a premise treated through the ESA program – this result is consistent with the CARE and ESA Stage 1 models; we hypothesize that customers with very high electricity usage either may not truly be eligible for CARE or may have other resources available to them that makes them less likely to respond to ESA program outreach, and conversely, customers with lower usage may be more interested in conserving energy and interested in participating in ESA. There may be third, unmeasured variable that explains why households that tend to have low kWh also have high ESA participation (e.g., a variable that measures a household's interest in energy conservation). It is also possible that households that participated in ESA lowered their kWh usage due to the installation of the energy efficiency measures; and
- (-) Population density – the less dense the block group the more likely the home has been treated by ESA – this outcome is the opposite of the Stage 1 model, except for PG&E.

Discrete variable:

- (+) Number of people per household – the more people in the household, the more likely the home has been treated by ESA – since households qualify based on income and number of people in the home, households with more people are more likely to quality for CARE and ESA (this result is consistent with the CARE and ESA Stage 1 models); an alternative explanation is that the greater the

number of household members, the greater the opportunity for the customer to be aware of the program (e.g. through school, church, community organization, work, etc.).

Binary variables:

- (-) Non-English/non-Spanish speaking households– households with "other" language as their primary language are less likely to participate in ESA, though our survey data does not represent this population, instead just a fraction of "other" language speakers who are proficient in either English or Spanish, the two languages we used to conduct the survey; while this result is the opposite sign (except for SDG&E in ESA Stage 1) of the CARE and ESA Stage 1 model results, those models were examining population data; and are more reliable sources for explaining participation among this population;
- (+) It was or would be easy to trust a contractor – households that said they thought it was or would be easy to trust a contractor in order to participate in ESA were more likely than those that did not trust a contractor to participate in ESA;
- (+) Turn off heat or cooling to keep the bill down – households that use less heating or cooling to try to keep their bill down are more likely to have participated in ESA;
- (-) Married households – are less likely to participate than unmarried;
- (+) It was or would be easy to get my landlord's approval - households that said they thought it was or would be easy to get their landlord's approval in order to participate in ESA were more likely to participate in ESA; note that being a renter was not a significant variable, suggesting that for non-participants that we are able to talk to on the phone (i.e., they trust the IOU sufficiently and may be reached by phone), renters in general are not less likely than owners to participate, but only the renters that worry about getting their landlord's approval;
- (+) It was or would be easy to be home for appointments – households that said they thought it was or would be easy to be home were more likely to participate in ESA;
- (+) Need something that ESA offers – households that said that needing something in particular that ESA offered was important are more likely to participate in ESA;
- (+) Other race – households that are a race other than White, African-American, Asian and Hispanic are more likely to participate – however we lack other racial households that speak languages other than English, so more precisely it is that

other racial households that speak English or Spanish are more likely to participate;

- (-) English survey – households that conducted the survey in English versus Spanish were more likely to participate; this is inconsistent with the CARE and ESA Stage 1 results, where Spanish language households were more likely to be treated; however, this model includes variables related to specific barriers (landlord permission, being home, trusting a contractor), such that once those barriers are accounted for, Spanish-speaking households that lack those barriers are less likely to participate;
- (+) Building age between 1970 and 1989 – homes built between those years are more likely to have participated, which could be a reflection of the program targeting older housing stock, or perhaps the concentration of that age of housing stock in urban areas such as multi-family buildings;
- (+) Chronic medical condition – households that report that at least one member has a chronic medical condition are more likely to participate;
- (-) Male survey respondent – households where a male respondent conducted the telephone survey (which might indicate the household is headed by a male or that a male is more likely to be home) are less likely to have participated;
- (-) Aware of the CARE rate - this result is counter-intuitive, that those who have heard of the CARE rate are less likely to participate in ESA; and
- (-) It was or would be easy to provide income documents – this result is counter-intuitive, that those who would find it easy to provide income documents are less likely to participate in ESA.

5.4.6 Conjoint Analysis Results

For the conjoint exercise, telephone survey respondents were recruited to participate in a brief web-based survey where they were provided with a general description of the ESA program:

> The Energy Savings Assistance (ESA) Program is a program offered by [utility] to help low income households save money on their energy bills. This is accomplished by scheduling a home inspection to establish eligibility and identify what types of efficiency equipment should be installed, followed by additional home visits to install the equipment. Depending on the needs of the household, customers can receive a variety of things such as information on safety and ways to save energy, energy efficient light bulbs, refrigerators, attic insulation, caulking, maintenance services for some appliances, and in some areas heating and air conditioning systems. The ESA Program pays 100 percent of the cost of the energy efficiency equipment – there is no charge to the customer.

With this program description as context, respondents are asked to rank eight possible options for the ESA program.[47] Each program option is defined as a combination of energy savings, number of home visits, income verification requirements, etc. The various attribute levels for each of these characteristics are shown in Table 46. These attribute levels are randomly assigned to create 18 possible programs that the respondent then ranked during the on-line conjoint session. Descriptions of these program attributes given to respondents during the survey are as follows:

- **Monthly Energy Savings:** Amount that households can expect to save on their monthly energy bill if they participate in the ESA program.
- **Income verification:** Whether or not customers must provide income verification such as a tax return to prove program eligibility.
- **Number of home visits:** Number of times that someone from the ESA program (both initial visit and measure installation) will visit the home, with each visit requiring some sort of scheduling and coordination on the part of the homeowner.
- **Timing of home visits:** Installation work done during the day (requiring that someone be at the home), evenings, or a combination of evenings and weekends.
- **Duration of home visits:** Total amount of time that program staff will spend at the home (both initial visit and installations).
- **Comfort:** Change in comfort level due to participation, defined as home being less drafty during cold weather and cooler during warm weather.

The values used to describe each choice option are randomly assigned, which forces the respondent to choose which attributes to focus on to rank the choices.

The conjoint analysis resulted in the following findings:

- **Energy savings and an increase in home comfort are dominant factors.** Not surprisingly, energy savings, in the form of ongoing cost reductions through bill savings, and changes in comfort are the most important factors driving customer preferences in both sets of program scenarios.

- **An increase in comfort is most likely to induce program participation.** Excluding monthly bill savings, an increase in home comfort was consistently found to have the highest equivalent monthly bill savings amount due to the large coefficient associated with his attribute in both participation models.

[47] Respondents are first given a practice conjoint exercise to complete using a non-energy example in order to get them familiar with the online conjoint ranking process.

- **For each additional home visit, and each additional hour home visits take, participants must be compensated with an increased amount of monthly bill savings to maintain the same likelihood of program participation.** In the ESA Program Option 1 scenario, for example, every home visit is worth an equivalent $8 in monthly bill savings, and each hour of home visits is worth $7 in bill savings. More detail on the tradeoffs customers make between monthly bill savings and other program features is included in Table 46 below.

Table 46: Equivalent Monthly Bill Savings Amounts[1] for California LI Population

ESA Program Option	Attributes	Equivalent Monthly Bill Savings Amount
1	Comfort Improvement	$28
	Income Verification Requirement	$9
	Additional Home Visit	$8
	Additional Hour of Home Visit	$7
2	Comfort Improvement	$28
	Additional Home Visit	$16
	Nights/Weekends vs. Day Home Visits	$9
	Income Verification Requirement	$4

Source: 2013 CARE Participant Telephone Survey.

- **The current program design should result in 60 percent ESA eligible non-participants' future program enrollment – based on those who responded to our telephone and web-based conjoint survey.** Our analysis finds that a program offering $10 of monthly bill savings,[48] achieving a significant improvement in household comfort, and requiring one daytime home visit lasting one hour as well as income verification documentation should result in the enrollment of slightly more than 60 percent of current program eligible non-participants. This result is analogous to the willingness to pay estimate, which was 72 percent based on telephone survey respondents. We estimated that that was the upper bound of a range from 52 to 72 percent, once we attempt to address the non-response bias. Thus, 60 percent is the upper bound of the conjoint analysis' independent estimate of willingness to participate.

[48] This is about twice the savings that the average participant realized based on the 2013 ESA Impact Evaluation Study (Evergreen Economics).

5.4.6.1 ESA Program Option 1 Conjoint Analysis

The first conjoint model is for the ranking of a first set of ESA program options. Respondents were asked to rank eight options of program designs with varying attributes for the monthly energy savings, number of home visits, income verification, change in home comfort, and the duration of home visits. The results of the discrete choice model are shown below in Table 47.

As shown in Table 47, three of the five variables in the regression are statistically significant at the 5 percent level or better. As expected, the coefficient on Monthly Energy Savings and Comfort are positive, indicating that respondents prefer higher monthly energy bill savings and an increased level of comfort, holding all other program attributes constant. Coefficients on the Number of Home Visits and Total Time In Home, and Income Verification variables are negative, as expected, indicating that respondents prefer a lower number of shorter visits and no income verification, all else constant.

The far right column of Table 47 shows the relative importance statistics calculated for each of the attributes, with higher numbers indicating a greater influence on the stated preferences for efficiency programs. From these results, Monthly Energy Savings was the most important (Relative Importance = 56 percent) followed by Comfort (Relative Importance = 26 percent). Total Time in Home was also fairly influential (Relative Importance = 12 percent). Finally, Income Verification and Number of Home Visits had the least influence (Relative Importance = 6 and 1 percent, respectively).

Table 47: Conjoint Results – ESA Program Option 1 for California LI Population

Attribute	Estimate	Standard Error	Significance	Relative Importance
Monthly Energy Savings	0.03477486	0.00322339	< 1%	56%
Number of Home Visits	-0.01560082	0.0598945	79%	1%
Income Verification	-0.17274521	0.11819362	14%	6%
Comfort	0.79417172	0.125864	< 1%	26%
Total Time in Home	-0.122632	0.03930942	< 1%	12%

Source: 2013 CARE Participant Telephone Survey.

5.4.6.2 ESA Program Option 2 Conjoint Analysis

A second conjoint model was created for the ranking of a second set of ESA program options. Respondents were asked to rank a further eight options of program designs with varying attributes for the monthly energy savings, number of home visits, income verification, change in home comfort, and the timing of home visits. The results of the discrete choice model are shown below in Table 48.

As shown in Table 48, two of the five variables in the regression are statistically significant at the 5 percent level or better. As expected, the coefficient on Monthly

Energy Savings, Comfort, and Timing of Home Visits are positive, indicating that respondents prefer higher monthly energy bill savings, an increased level of comfort, and evening or weekend visits, holding all other program attributes constant. The coefficient on the Number of Home Visits variable is negative, as expected, indicating that respondents prefer fewer home visits, all else constant. Somewhat unexpectedly, the coefficient on Income Verification is positive indicating that participants prefer if program staff review the participants' most recent tax return; however, the Income Verification variable not statistically significant so no inference on the variables effect on rank can be made from this model (this also holds true for Number of Home Visits and Timing of Home Visits).

The far right column of Table 48 shows the relative importance statistics calculated for each of the attributes, with higher numbers indicating a greater influence on the stated preferences for efficiency programs. From these results, monthly energy bill savings were again the most important (Relative Importance = 60 percent) followed by home comfort (Relative Importance = 25 percent). Income verification (Relative Importance = 6 percent) and the number of home visits (Relative Importance = 5 percent) were of approximately equal importance, and the timing of home visits had the least influence (Relative Importance = 2 percent).

Table 48: Conjoint Results – ESA Program Option For California LI Population 2

Attribute	Estimate	Standard Error	Significance	Relative Importance
Monthly Energy Savings	0.04003287	3.48E-03	< 1%	60%
Number of Home Visits	-0.08662811	0.06026407	15%	5%
Income Verification	0.21521317	0.12772561	9%	6%
Comfort	0.84530115	0.13143862	< 1%	25%
Timing of Home Visits	0.08033601	0.12185039	51%	2%

Source: 2013 CARE Participant Telephone Survey.

5.4.7 In-Home Visits

Willingness to participate in ESA among the non-participants we interviewed appeared to be high. But we remind the reader that the sample of in-home interview respondents is biased towards those willing to respond to a telephone survey and participate in an in-home interview. These customers lack major outreach barriers. We judged around two-thirds of the households we visited to be open to participate in ESA and likely to do so if the opportunity availed itself. In fact, 16 of them appeared to have already participated in their present home, mostly in the few months preceding our visit.

Drivers behind people's interest appeared to be the combination of:

- reducing energy costs through efficiency
- upgrading their appliances or home at no cost

- improving comfort by the increasing the affordability of heating or cooling their home.

These results are consistent with the conjoint results (obtained from ESA non-participants that responded to the telephone survey, so a similar bias issue is present, where the sample lacks major outreach barriers) that were discussed below in Section 5.4.5.1.

Interestingly, willingness to participate was evenly distributed among those in high, "normal," and low levels of apparent financial distress. Interest in the program was higher in primarily or exclusively Spanish-speaking households than those in which we conducted the interview in English. These results are consistent with the ESA modeling results discussed above in Section 5.4.5, where Spanish-speaking households are more likely to participate in ESA.

Among those households we identified as unlikely to participate in ESA, we encountered three distinct barriers.

5.4.7.1 Program Awareness

The most pervasive barrier was lack of program awareness. We classified 61 households as likely to participate.[49] As noted, sixteen of them appeared to have already participated. Of the remaining likely participants, most (33 of 45) did not seem to be aware of the program until we described it to them. (We discuss information sources and opportunities for outreach below.) Interestingly, those who seemed uninterested in the program were aware of it at similar rates.

As mentioned above in Section 2.1.2, the program recently changed its name to the Energy Savings Assistance program, whereas in prior years the program was branded differently by each IOU. (The program was referred to consistently as the Low Income Energy Efficiency Program or "LIEE" in regulatory reports.) The IOUs have not had much time to build awareness of the new program name.

Moreover, the IOUs have responded to household goals and budget constraints, and have not lacked sufficient customer leads (usually from CARE enrollees) to market ESA. This situation may change in the coming years as the program reaches higher penetration rates. At that time, program awareness and branding may become more important.

5.4.7.2 Lack of Perceived Opportunity

Among those we classified as unwilling or uninterested in participating, we heard two key themes. Nine households didn't think there was much the program would be able to do for them. These respondents tended to explain that they did not use much energy or

[49] Of the remaining households, we thought 22 were unlikely to participate and received inconsistent information from five.

that their homes and appliances were already as efficient as they could be. In some cases, this appeared to be correct, or the opportunities were not measures that ESA would be likely to address under current program rules. Some of these homes had primarily electric opportunities, but were served by municipal providers and would qualify for ESA only for natural gas measures. One of the households appeared to spend substantial amounts of energy to pump well water for irrigation of vegetation around the house in an area prone to wildfires.

5.4.7.3 Renter-Specific Barriers

Eleven of the households we classified as unwilling were renters who described renter-specific barriers to participation. These barriers comprised:

- uncooperative landlords (6);
- the belief that the program is not for renters (3); and
- thinking that addressing building and appliance issues is the landlord's responsibility (2).

These results complement the ESA modeling results, discussed previously in Section 5.4.5. Renting a home was not a significant variable in the model, but renters who felt that getting their landlord's approval was found to be a significant factor for ESA participation. Being a renter was a barrier for CARE participation, from the CARE model.

As a result of these barriers, several renters dismissed thoughts of participation upon hearing of the program. Hence, obtaining participation among willing renters will take more effort than just increasing awareness. IOUs will need to clearly specify that renters are eligible too when marketing the program or reaching out in a targeted way to renters. One other option would be to work through property managers of rental units with high concentrations of eligible households as well as Section 8 housing offices.

As noted, landlord participation stood out as one of the main barriers for renters. We heard about a range of perceived landlord willingness to participate in ESA. Some renters thought their landlords would be cooperative and foresee no issues with obtaining landlord approval, while others commented that their landlords do the minimum needed and worried that it may be difficult to get their approval or involvement.

Even among cooperative landlords, renters described barriers and potential obstacles. One highly motivated apartment renter was familiar with ESA and had made efforts in recent years to obtain ESA treatment for a prior apartment. She said that her efforts failed after the property manager was unable to provide a copy of the deed, which the ESA contractor was requiring before the unit could be treated. The customer said that the property managers at both that apartment and her current home would have been happy to provide approval for treatment, but are not in a position to offer copies of deeds. As a result, she has given up on ESA participation and is concentrating on other

sources of assistance to help meet her expenses while she finishes her education and raises her two children.

It wasn't clear to us whether copies of deeds are required by the program or just part of that particular contractor's process. Either way, keeping requirements for property managers to a minimum would facilitate renters' ability to participate.

One other renter described her landlord as struggling financially to keep the Section 8 qualified property. (The property was in some disrepair.) She described the landlord in positive terms, saying that he does what he can to address issues. However, she was very sensitive to initiating anything that would cost her landlord any funds or that has the potential to cause any problems for him.

5.4.7.4 Miscellaneous Other Barriers

Other reasons provided included dislike of social programs that redistribute wealth, not thinking of oneself as LI, and not wanting to give up the household's refrigerator.

5.4.7.5 Participation Requirements

Other than getting landlord approval and cooperation, none of the program requirements appeared to be a substantial barrier to participation. Households told us that providing proof of income eligibility would not be a major barrier. In fact, the substantial share of households that have participated in other income-qualified programs are used to these requirements. Homeowners said they could provide proof of ownership.

Being home for a series of contractor visits is a bit more challenging for those households that don't consistently have an adult home during regular working hours, but most households we visited—including those that opted for evening and weekend appointments for the in-home visit—indicated that they would be able to accommodate such visits. Flexibility by program contractors would help these customers participate, however.

The conjoint analysis, discussed in Section 5.4.5.1, indicated fairly complementary results. Providing income documents was not a significant barrier. The total time required for contractors to be in the home was a slight barrier, while the number of home visits was the lowest barrier.

The conjoint and in-home interviews were conducted with telephone survey respondents, which lack major outreach barriers. They are able to find time to talk to a telephone surveyor and/or to be available for an in-home visit lasting more than an hour. These respondents are also probably more likely to be income-eligible for the CARE program, since those that are not income-eligible would be less likely to talk to a surveyor.

5.4.8 LI Program Review

Even though all these programs are offered to LI households as a free service, there are still non-financial barriers that prevent households from participating. These barriers are varied in nature but can include a lack of knowledge of the program, a distrust of utility companies or general apathy towards social service programs. Some people would prefer not to have a stranger come into their home; our contact at the Massachusetts WAP program likened some people's perception of the audit as a "benevolent invasion" of a household that may deter some people from participation. The contractor visit may be perceived as an intrusion into their space. These barriers are consistent with the barriers we noted from our research of California's ESA program.

The community agencies that administer the programs can often work to allay concerns about such an "invasion" of the home. Effective agency outreach can inform future participants to the benefits of the energy efficiency work on their home and be an advocate in the process. Some energy efficiency programs work with other kinds of community agencies, such as elderly assistance organizations, to reach out and work with populations that may be most wary of a home audit and energy efficiency work. These strategies are currently being used by the ESA program.

As mentioned above, some utilities like the Ohio EPP require customers who receive bill-pay assistance to also participate in energy-efficiency programs, which results in high participation rates.

5.5 Energy Needs and LI Program Benefits

This subsection describes study results related to energy insecurity, energy burden and energy needs among the eligible population. We drew upon all the study primary and secondary research sources for this subsection.

5.5.1 Energy Insecurity

We asked telephone survey respondents a series of questions that we used to determine their level of self-reported energy insecurity. This measure is designed to make it as objective as possible, based on self-reported behaviors that indicate difficulty managing energy bills. In the next subsection, we present results on energy burden, which is based on self-reported household income and energy bill cost based on IOU billing data. In the following subsection, we present study results related to non-energy benefits, which include health, comfort and safety, which are additional aspects of the impact that energy bills and home energy equipment has on LI households.

5.5.1.1 Customer Telephone Survey

We asked survey respondents how often they or others in their home do the following – a lot, sometimes or never:

- Cut back on food or medicine in order to pay utility bill

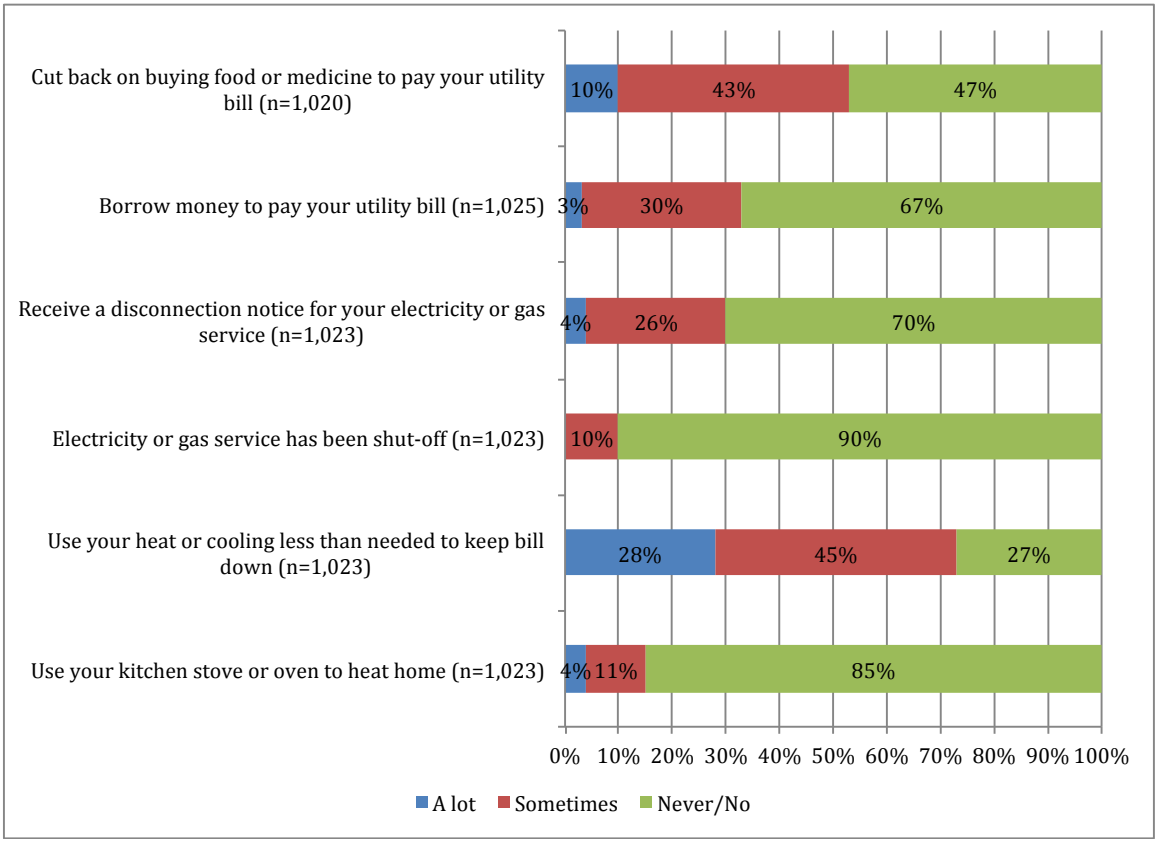
- Borrow money to pay utility bill
- Receive a disconnection notice for utility service
- Had utility service shut off
- Use heat or cooling less than needed to keep utility bill lower
- Use kitchen stove or oven to heat home

Below, we report the frequency with which respondents self-report that they take these measures, and an "energy insecurity" summary based on all of their responses.

As shown in Figure 41 below, the most common measure that respondents take is using heating or cooling less than needed (with 28% of the total reporting they do that "A lot" and 45% "Sometimes"), accounting for half of all the energy insecurity reported by respondents.

The second most commonly-cited measure is cutting back on food or medicine to pay the utility bill, with 10 percent saying they do this "A lot" and 43 percent saying they do this "Sometimes". 4 percent or fewer respondents reported that they took any of the other energy insecurity measures "A lot".

Figure 41: Energy Insecurity Measures (I1e, I1f, I1g, I1h, I1j) for California LI Population

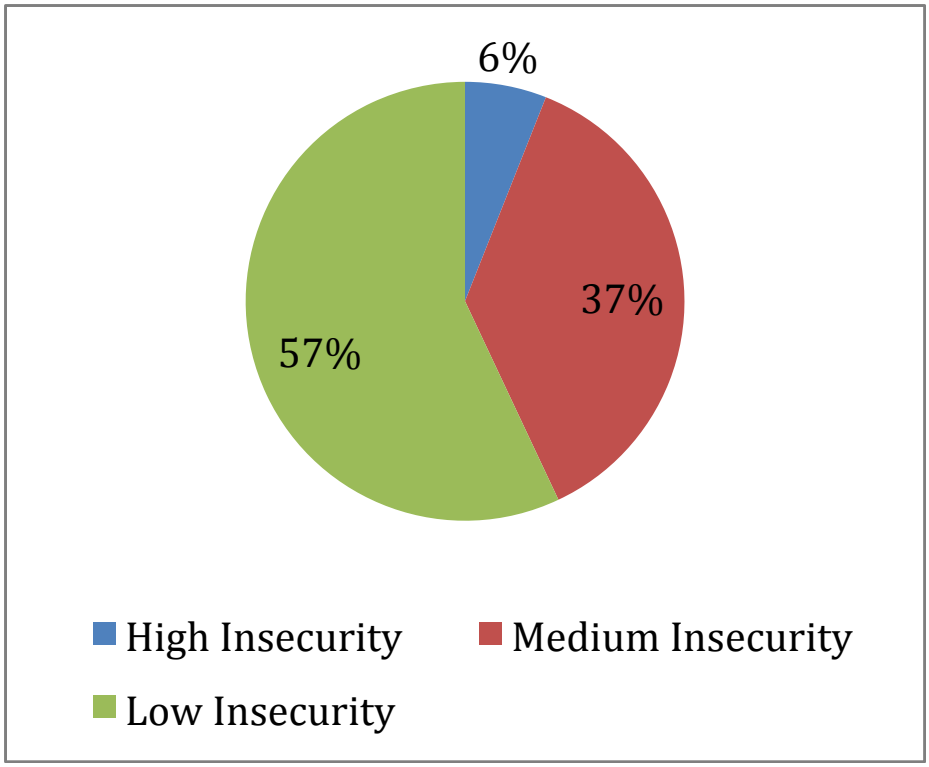


Source: 2013 CARE participant telephone survey data.

We created a summary variable based on responses to the set of six insecurity questions. We categorized respondents as having a high level of energy insecurity if they responded "A lot" to two of the questions and responded "Never" no more than twice. We categorized respondents as having a low level of energy insecurity if they answered "Never" to at least three of the questions, and never answered "A lot." We categorized the remaining respondents as having a medium level of insecurity.

Figure 42 shows the results of this summary of energy insecurity variable. 6 percent of LI households are highly energy insecure, 37 percent have medium energy insecurity and 57 percent have low energy insecurity.

Figure 42: Energy Insecurity Summary Variable for California LI Population (n=1,020)

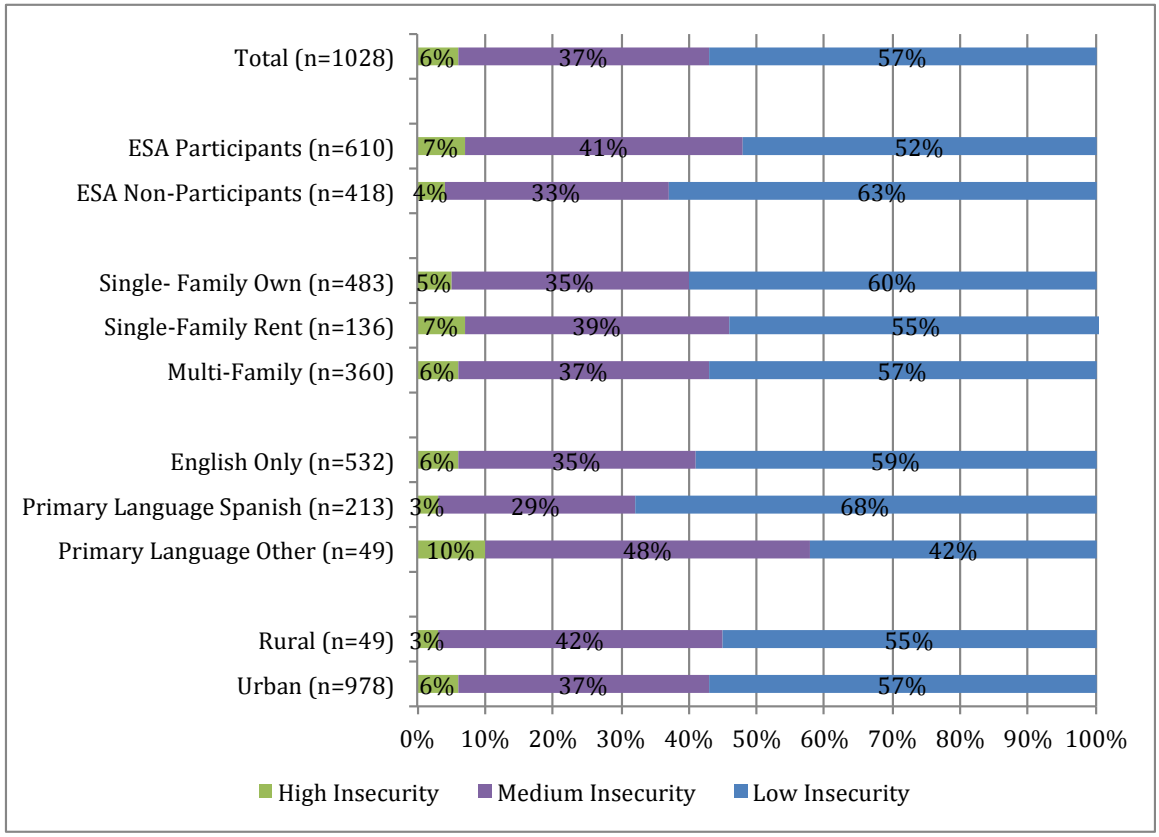


Source: 2013 CARE participant telephone survey data.

Figure 43 shows the results of the summary energy insecurity variable. Single-family renters and households whose primary language is not English or Spanish[50] are more energy insecure than other home types and households that speak English or Spanish primarily. 7 percent of ESA participants have high insecurity as compared to 4 percent of non-participants. (As reported in Section 5.1, 95 percent of multi-family homes are occupied by renters, so we do not break out that home type by home ownership.)

[50] We remind the reader that the sample of "other" language households is not representative of the populations since we only conducted surveys in English and Spanish.

Figure 43: Summary Measure of Energy Insecurity by Home Type, Language, and Rural/Urban (I1e, I1f, I1g, I1h, I1j) for California LI Population



Source: 2013 CARE participant telephone survey data.

Table 49 shows the more detailed energy insecurity survey responses by LI population segment. Single-family renters are most likely to have to cut back on food or medicine, borrow money to pay bills and to receive a notice of disconnection. Multi-family households are more likely to borrow money to pay bills. Non-English speaking households are more likely to cut back on buying food or medicine and borrow money to pay bills.

Table 49: Energy Insecurity by Home Type, Language, and Rural/Urban (I1e, I1f, I1g, I1h, I1j) for California LI Population

	LI Eligible Population							
	Single-Family Own	Single-Family Rent	Multi-Family	English Only	Primary Language Spanish	Primary Language Other	Rural	Urban
Cut back on buying food or medicine to pay your utility bill								
A lot	10%	8%	11%	11%	9%	16%	11%	10%
Sometimes	37%	53%	42%	37%	47%	40%	39%	43%
Never/No	53%	38%	48%	51%	44%	43%	51%	47%
Total (n)	480	134	357	528	210	49	49	970
Borrow money to pay utility bill								
A lot	4%	2%	2%	3%	2%	3%	0%	3%
Sometimes	24%	35%	34%	23%	40%	32%	17%	31%
Never/No	72%	63%	64%	74%	59%	65%	83%	66%
Total (n)	482	136	358	531	213	48	49	975
Receive a disconnection notice for your electricity or gas service								
A lot	5%	3%	4%	5%	3%	5%	5%	4%
Sometimes	21%	33%	26%	25%	32%	16%	26%	26%
Never/No	74%	64%	70%	70%	66%	79%	69%	70%
Total (n)	482	136	357	528	213	48	49	973
Electricity or Gas service has been shut off								
A lot	1%	0%	0%	0%	1%	1%	0%	0%
Sometimes	8%	13%	10%	8%	9%	3%	10%	10%
Never/No	92%	87%	90%	92%	91%	96%	90%	90%
Total (n)	481	135	358	529	213	48	48	974
Use heat or cooling less than needed to keep bill down								
A lot	27%	31%	27%	27%	15%	42%	37%	28%
Sometimes	42%	43%	48%	43%	53%	43%	26%	45%
Never/No	32%	26%	26%	29%	31%	15%	37%	27%
Total (n)	478	134	356	526	212	48	49	966
Use kitchen stove or oven to heat home								
A lot	2%	4%	6%	4%	2%	10%	0%	4%
Sometimes	11%	13%	11%	9%	10%	19%	14%	11%
Never/No	88%	83%	84%	87%	88%	71%	86%	85%
Total (n)	483	136	360	532	213	49	49	978
Energy Insecurity Summary Variable								
High	5%	7%	6%	6%	3%	10%	3%	6%
Medium	35%	39%	37%	35%	29%	48%	42%	37%
Low	60%	55%	57%	59%	68%	42%	55%	57%
Total (n)	483	136	360	532	213	49	49	978

Source: 2013 CARE participant telephone survey data.

5.5.1.2 In-Home Visits

The self-reported incomes of the households ranged from less than $5,000 to the $50,000-$60,000 range with a correspondingly wide range of household sizes of one to nine people, although the median household size was three. Some households live on their incomes and accumulated resources—including the equity in their homes—while others draw upon various forms of formal and informal assistance.

Assistance some people mentioned included Medi-Cal, Section 8 housing, food stamps, food pantries, scholarships to offset expenses for children's activities, and informal support from other family members. For example, one single mother who had been suffering an extended period of underemployment prided herself on being resourceful to ensure her daughter has a full childhood. She manages to pull together many different forms of assistance and cost management strategies that enable her to let her daughter participate in Girl Scouts and soccer. One elderly woman simply commented that she has children that "love their mama."

Others focus on keeping costs very low, citing a variety of strategies to make ends meet. Watching expenses closely was a very common theme, while for others timing their expenditures is a key strategy to make ends meet.

Some households live from check to check, while others have more steady access to resources. Among those that live check to check, some phase their expenses in order to pay bills, sometimes deferring purchases of basic necessities like food and living instead on what they have accumulated in their pantries. Others allow bills to accumulate, but make arrangements to pay them off over time.

We classified the degree of overall financial distress the households appeared to be in based on our observations at the interview and customer descriptions of their situation. Factors we considered included the kinds of tradeoffs they make to pay bills, the difficulty they said they have in paying bills, the condition of their home and appliances (if owner-occupied), and occasionally other clues we could observe such as the car(s) they own and the food (or absence thereof) in the refrigerator.

The apparent degree of financial distress is more complicated than just a function of their income and income stream. Some households with low levels of income are managing reasonably well, while other households are clearly struggling. Based on our observation and interview responses, we classified a slim majority of households as facing the sort of elevated financial constraints one might expect among LI households, we found that about a fifth of the homes we visited communicated a substantially elevated level of financial distress,[51] and about a quarter seemed to be managing their financial constraints in a way that made them appear more like a middle class household than a low income one.

[51] See the customer profile for "Sharon" below.

Households that appeared to face greater levels of financial distress included:

- Households in which a medical condition or disability is affecting costs or income;
- Households caring for a larger number of dependents, including those with adult children or parents in the home;
- Those in multi-family and mobile homes; and
- Seniors and households managed by young adults (below), although seniors were also disproportionately represented among those with no obvious level of distress.

Households that tended to be less financially distressed included:

- Households whose LI status was recent and perhaps temporary, such as those who experienced a recent job loss;
- Seniors living on fixed incomes, but who were living simple lifestyles by choice with modest expenses or had savings to draw upon; and
- Households that managed to draw upon formal or informal sources of assistance, be it aid programs or help from family members.

Refer to Section 10 for more descriptions of characteristics of the in-home ESA non-participant sample including illustrative profiles of some of the respondents.

5.5.2 Energy Burden

This section presents an analysis of energy burden, which is defined as the portion of total household income that goes toward paying utility bills. Specific questions addressed in this section include:

- What portion of annual household income is used to cover energy bills among California's LI population?
- How does the LI energy burden compare with that of the general population?
- What are the characteristics of the LI population that have the highest energy burden?
- How is energy burden related to energy insecurity?

The telephone survey (discussed in Section 8) serves as the primary source for the LI population data used to calculate energy burden and includes information on annual household income along with the other demographic information. Income was collected in the telephone survey in ranges,[52] (e.g. Is your total household income less than $5,000, between $5,000 and $10,000, etc.)

[52] See telephone survey in Volume 3 Section 13, Question D12 for question wording and response categories.

5.5.2.1 A Methodological Note on the Energy Burden Calculation

We examined two approaches for calculating average energy burden, each of which can produce substantially different results. For convenience, we define these two metrics as "overall energy burden" and "customer energy burden". The calculation method used for each is defined as follows:

- "Customer Energy Burden" is calculated by dividing the customer energy bill amount by annual income to get an energy burden ratio for each customer. The mean of these customer ratios is taken to get an overall average energy burden number.
- "Overall Energy Burden" is calculated by taking the overall average annual bill amount and dividing by the overall average income. That is, the average of the bill amount and income is calculated first, and then the ratio is calculated.

Note that household size is not explicitly factored into either estimation method.[53]

The "overall energy burden" approach was used in the 2007 LINA and is the only method available to estimate burden for the general population. We use the "overall energy burden" approach in order to make comparisons to the prior 2007 estimate and to the general population. However, we believe that the "Customer Energy Burden" provides a better estimate of average energy burden. The intent of energy burden is to understand portion of income spent on energy by individual households. This is best represented by the ratio of household-specific income to household-specific energy expense. This ratio and its distribution in the low income population represents the energy burden as experienced by member households, rendering it more accurate than metrics reflecting the ration of mean income and mean energy bill. Consequently, we use that metric to present the LI population's energy burden results. The other method is used only for comparison purposes, to show relative differences over time and with the general population.

[53] Though it is implicitly factored into the average income, since CARE-eligibility is based on the household size.

When interpreting either the overall energy burden or the customer energy burden, we caution the reader to bear in mind the following important caveats:

- Income comes in more forms than simply dollars. There are food stamps, family services and other forms of assistance, directed largely at the lowest dollar income groups;
- Income is self-reported and may contain errors; and
- Poverty and qualification for the CARE and ESA LI programs are a function of both income and size of household.

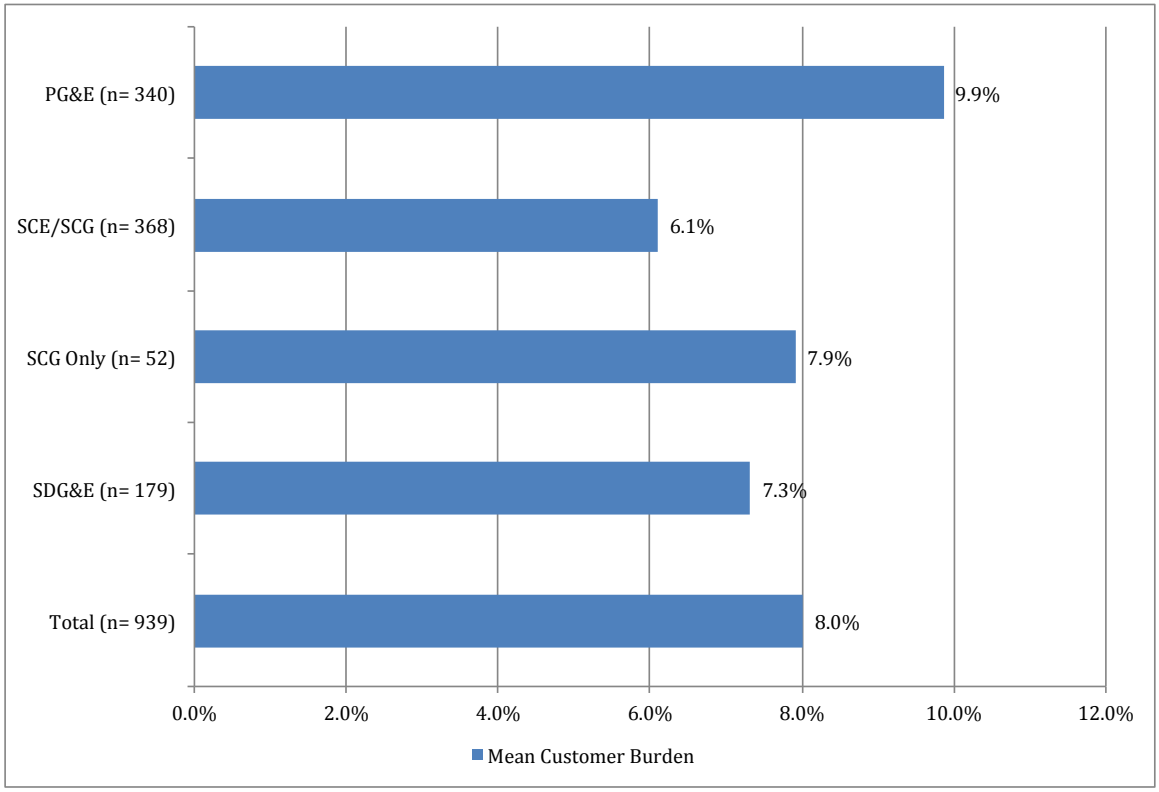
5.5.2.2 Customer Energy Burden

In this section, we present the customer energy burden results. As discussed previously, the "customer burden" is calculated differently from the "overall energy" burden. Customer burden is calculated by first taking the ratio of annual energy bills to household income for each customer, and then, in a second step, calculating an average of this ratio across all customers.

Since this calculation is different from the overall energy burden calculation used in the 2007 LINA study, the results presented below are not directly comparable with the previous research. However, while the previous LINA was published in 2007 the data was collected in 2005, so is more reflective of 2005 conditions than 2007.

Figure 44 presents the mean customer burden for the California LI population, for each IOU service territory and for the state as a whole. PG&E has the highest mean customer burden at 9.9 percent. The lowest is found within the SCE/SoCalGas territory, 6.1 percent. The result for the entire state is 8.0 percent.

Figure 44: Mean Customer Burden, 2013 California LI Population, by IOU Service Territory



Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data, 2012 Athens data, and 2011 PUMS data.

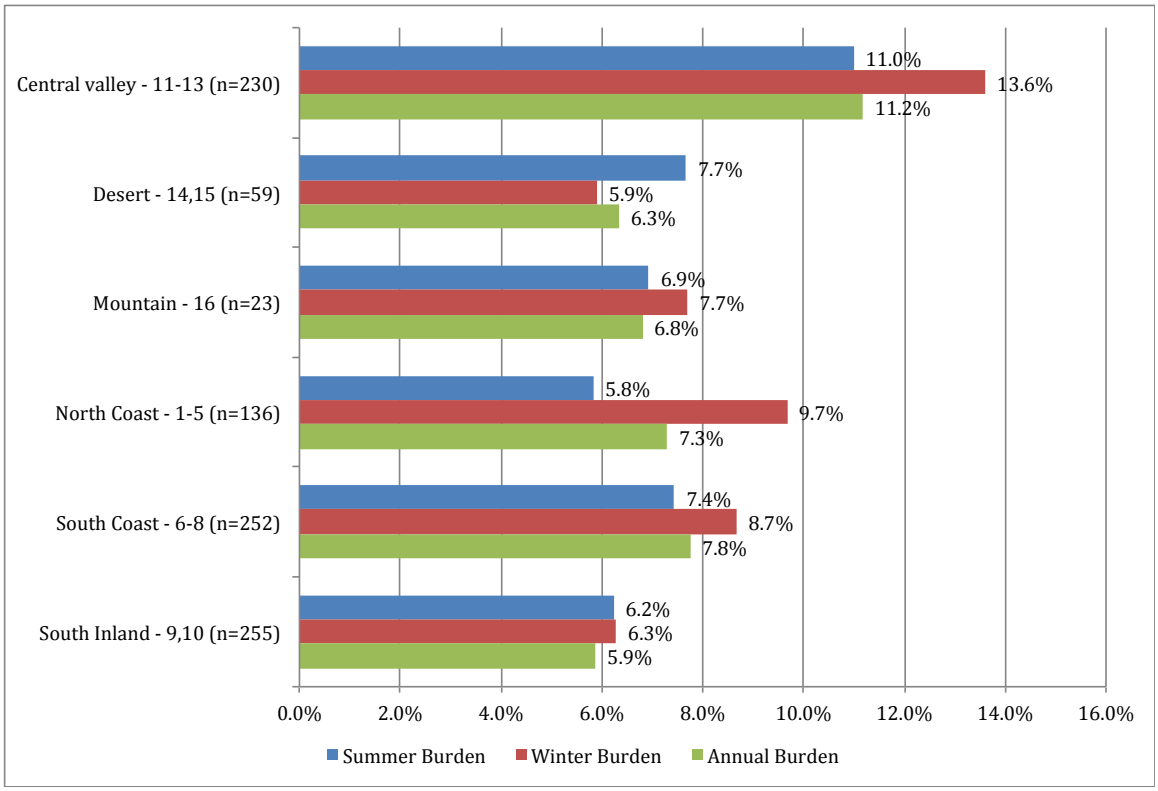
5.5.2.2.1 Differences in Customer Energy Burden by Climate

In this section, we explore differences in customer energy burden by climate. Climate areas in California differ dramatically in their cooling and heating needs, with coastal areas generally providing more temperate variations, and the inland, northern and mountain areas experiencing more heat in summer and cold in winter; and southern areas generally experiencing higher temperatures year round versus northern areas.

Figure 45 below presents mean customer burden by climate zone region, annually and for summer and winter seasons (note that the seasonal burdens are annualized for ease of comparison). The Central Valley (11.2%) has substantially higher customer burden than any other region—at 1.4 times its runner up, the South Coast (7.8%). For all regions except the Desert, winter burden exceeds summer burden. The difference is pronounced

for the North Coast where winter burden is nearly 1.7 times the summer burden. The South Inland and Mountain climates have fairly equivalent winter and summer energy burdens.

Figure 45: Mean Energy Burden by Climate Zone Region and Season



Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data, 2012 Athens data, and 2011 PUMS data.

5.5.2.2.2 High Energy Burden Segment Characterization

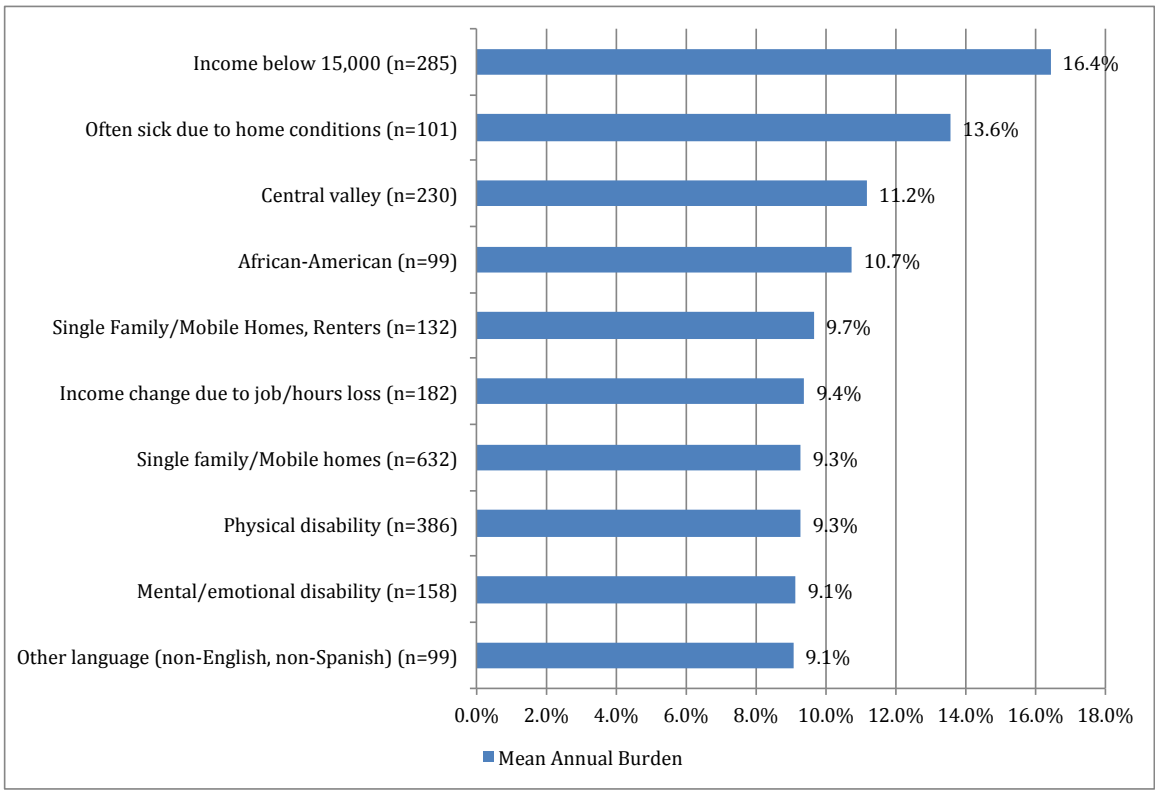
This section presents the characteristics of the highest energy burden households. The process of identifying high burden customer segments began by creating 20 ways to differentiate the population, using demographic, geographic household and home characteristics collected via the telephone survey or present in IOU databases. This resulted in 80 segment-specific annual customer energy burden values, which were ranked from highest to lowest with the top ten selected for further examination. This section presents characteristics of these high burden segments. The intent of this section is to offer information that lends insight to high burden customers, which may allow for better program customization for these segments.

Figure 46 below presents the mean customer burden for the highest burden segments of the LI population. Six of the ten segments shown below have a mean customer burden

between 9 percent and 10 percent. The remaining four segments have the highest burdens, ranging from 10 percent to 16 percent.

- The highest burden is measured for households with annual household income of $15,000 or less. As detailed later in this section, these households make up more than one-third of the LI population.
- Households that report members are often sick due to home conditions have the second highest customer burden, 13.6 percent, and comprise 11 percent of the LI population. The high burden observed in this sector is related to the use of electrically powered medical equipment. About one-third (35%) of those customers also report using electrically powered medical equipment daily to manage illness or disability. In contrast, 17 percent of those reporting they are 'sometimes' or 'never sick due to home conditions report using electric medical equipment daily.

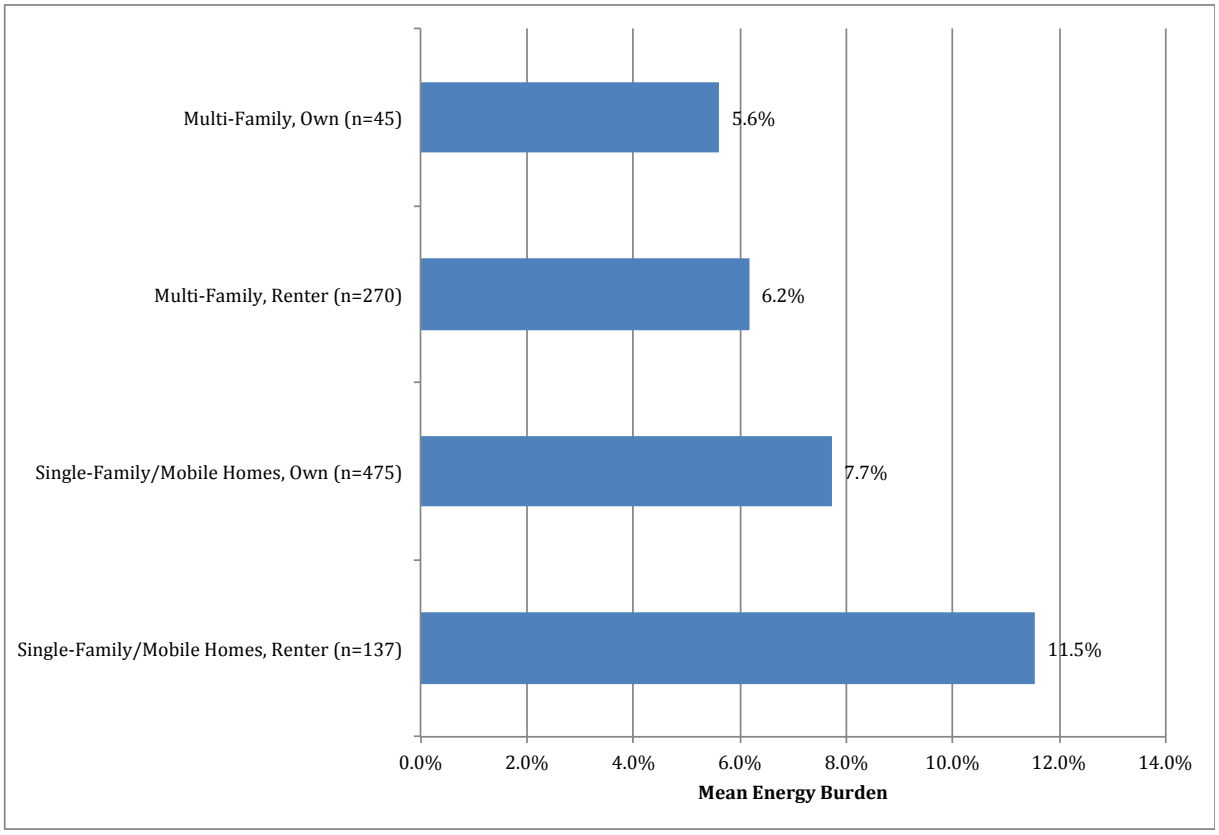
Figure 46: High Energy Burden Households, Mean Customer Energy Burden for Highest Burden Segments



Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data (D12, PB10, D8, S6, S5, D13, D13a, D11-D15, D5), 2012 Athens data, and 2011 PUMS data.

Home type and home ownership are associated with energy burden levels, with renters and single-family homes showing higher mean burden. Figure 47 below shows mean customer energy burden by home type and home ownership, illustrating this relationship. We find that single-family and mobile home renters have a relatively high mean energy burden of 9.7 percent. For comparison purposes, single-family mean energy burden is 9.4 percent and multi-family mean energy burden is 6.1 percent.

Figure 47: Mean Customer Energy Burden by Home Type and Home Ownership



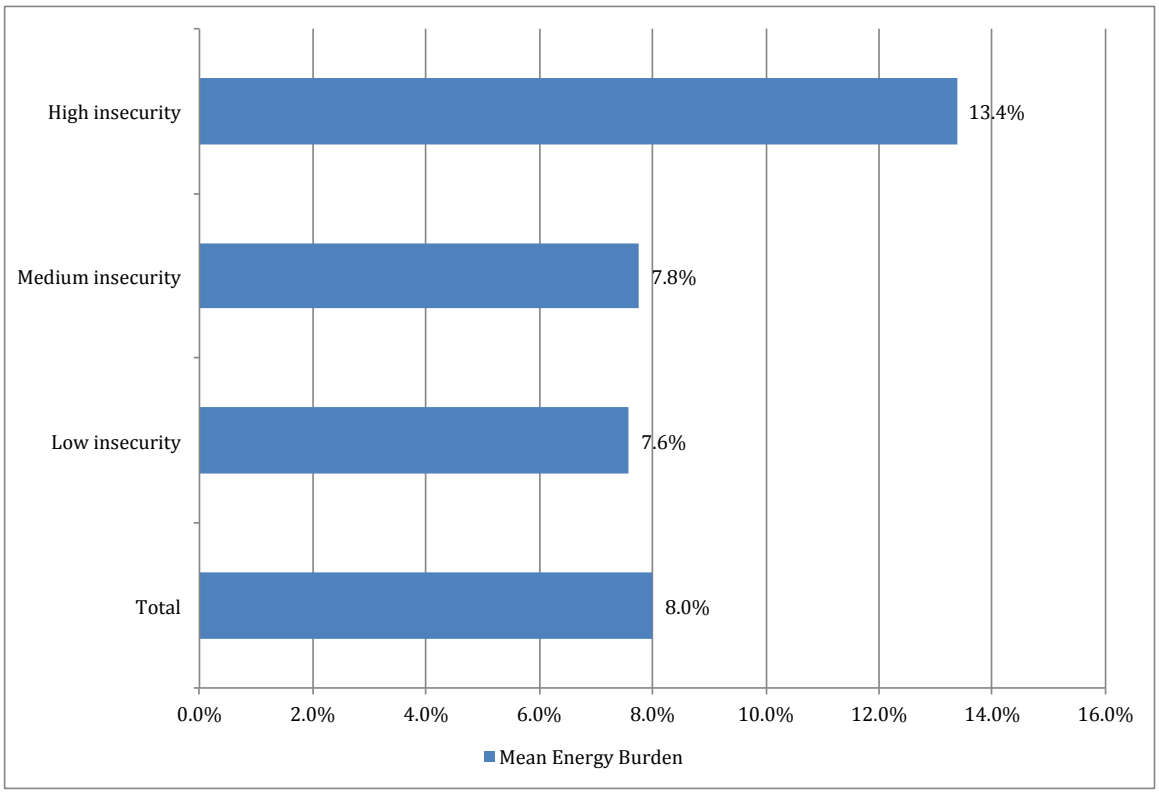
Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data (S6, S5), 2012 Athens data, and 2011 PUMS data.

5.5.2.2.3 Energy Burden and Energy Insecurity

This section presents the results of an examination of customer energy burden by level of energy insecurity. The energy insecurity level is determined by responses to survey questions that probe various areas of vulnerability, such as having power disconnected for not paying bills, or using a stove for heat. Insecurity is categorized into three levels, high, medium and low, which represent the frequency at which the vulnerabilities arise. A more detailed discussion of energy insecurity is presented in the section preceding this one, Section 5.5.1.

As shown in Figure 48 below, there is little difference in the burden of those with 'medium' or 'low' insecurity, at 7.8 percent and 7.6 percent, respectively. Those with 'high' insecurity make up 5.7 percent of the LI population and have a notably higher mean customer burden, at 13.4 percent.

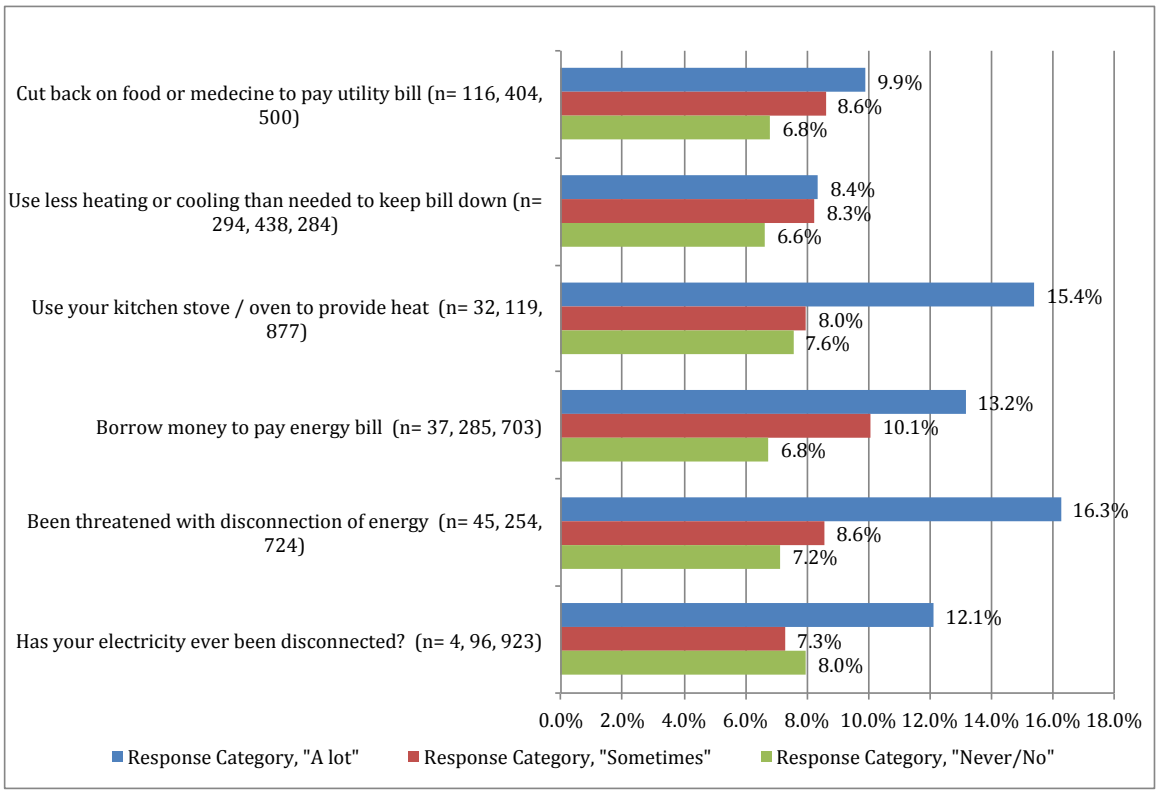
Figure 48: Mean Customer Energy Burden by Level of Energy Insecurity, Annual for California LI Population



Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data (I1e-I1j), 2012 Athens data, and 2011 PUMS data.

Figure 49 below summarizes the annual energy burden across the insecurity survey questions. The figure shows the mean customer burden for each question and response category. The questions with the greatest correlation to high energy burden are also those with the lowest rate of occurrence: whether the respondent borrows money to pay the bill, uses kitchen stove for heat, or has often been threatened with power disconnection. The mean burden for those that experience these events 'a lot' is between 13 percent and 16 percent.

Figure 49: Mean Customer Energy Burden By Insecurity Question and Response Category



Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data (I1e-I1j), 2012 Athens data, and 2011 PUMS data.

5.5.2.3 Comparison of 2013 Study Results to 2007

These results are intended to provide a comparison to the prior LINA study only. The customer energy burden presented above provides our estimates of the LI population mean energy burden.

In the 2007 LINA, the "overall energy burden" approach was used. The 2007 study measured the average bill to be about $950 per year and average income to be $23,000, yielding an overall burden of 4.2 percent. In comparison, the current study finds average income to be $23,721 and the average bill to be $970, yielding an overall burden of 4.1 percent, down slightly from figures reported in 2007. Note that the 2007 study reflects data collected in 2005, so should be considered reflective of 2005 conditions rather than 2007.

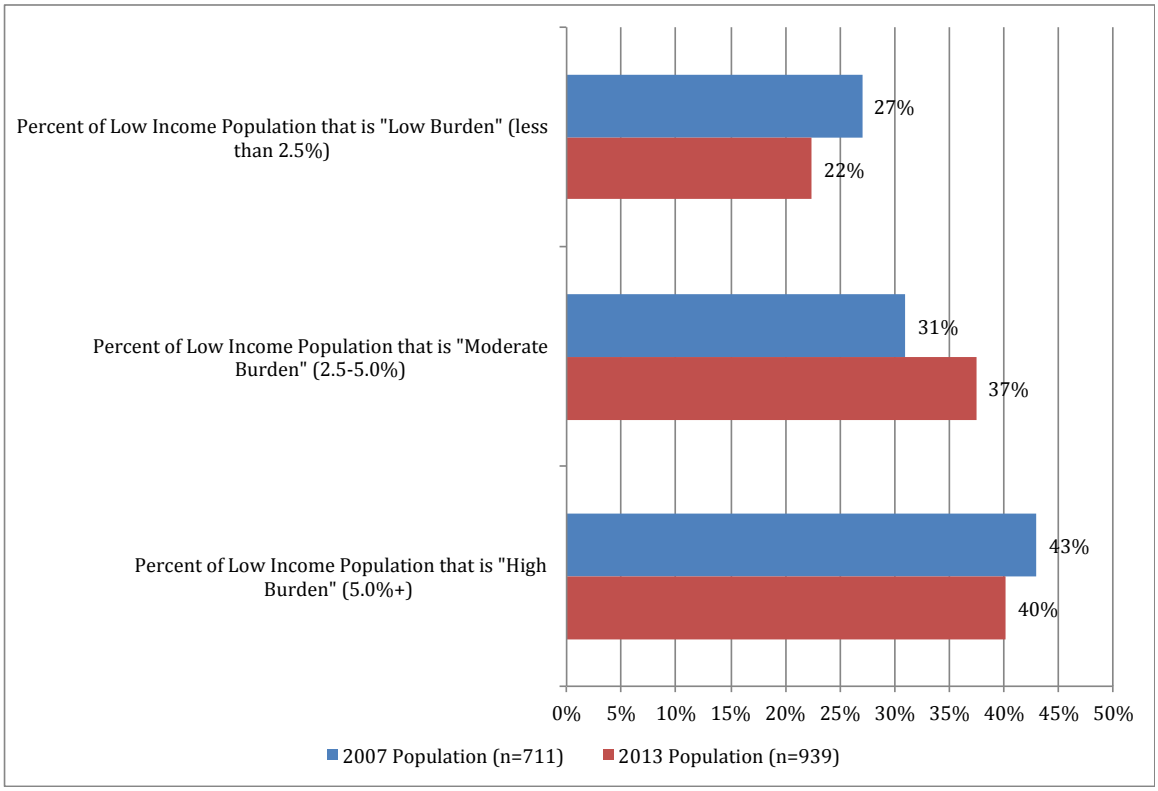
Our current energy burden analysis indicates that 80 percent of LI households spend less than 7 percent of their annual income on energy, and 60 percent of LI households spend 5 percent or less on their energy bill. Similar to the approach taken in the 2007

LINA, we classify the LI population into three burden categories, based on annual household income and energy expenditures:

- High Burden customers are those that spend 5 percent or more of their household income on energy, on an annual basis.
- Moderate Burden customers are those that spend between 2.5 and 5 percent of income on energy.
- Low Burden customers spend less than 2.5 percent of income on energy.

Figure 50 below shows the distribution of the LI population across the three burden classifications and compares current results to those presented in the 2007 LINA. Relative to the 2007 study findings, there are slightly fewer customers in the low burden segment (22% versus 27%) and also fewer customers in the high burden segment (40% versus 43%).

Figure 50: Energy Burden Classification and Overall Burden by Classification, 2013 versus 2007 for California LI Population – for Comparison Purposes Only

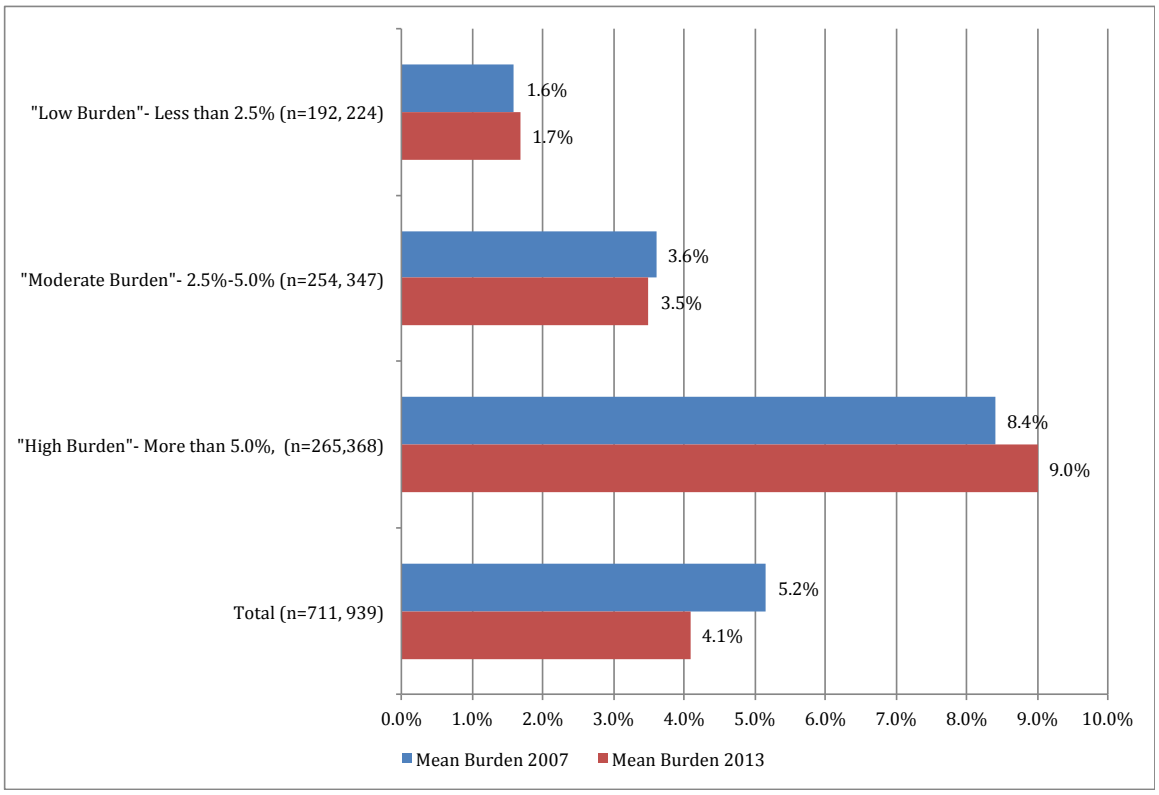


Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data, 2012 Athens data, and 2011 PUMS data.

The mean burden within each burden classification and for the total LI population is shown in below, for both 2007[54] and 2013. The mean burdens within the low and moderate classifications are similar to 2007; the mean burden within the high burden classification rose moderately, from 8.4 percent to 9.0 percent. Overall, the mean LI energy burden in 2013 is very similar to results published in the 2007 study (4.1% versus 4.2%, respectively).

[54] Although the previous LINA was published in 2007, the data were collected in 2005 and should be interpreted as reflective of 2005 conditions.

Figure 51: Overall Energy Burden by Classification, 2007 Versus 2013 – for Comparison Purposes Only

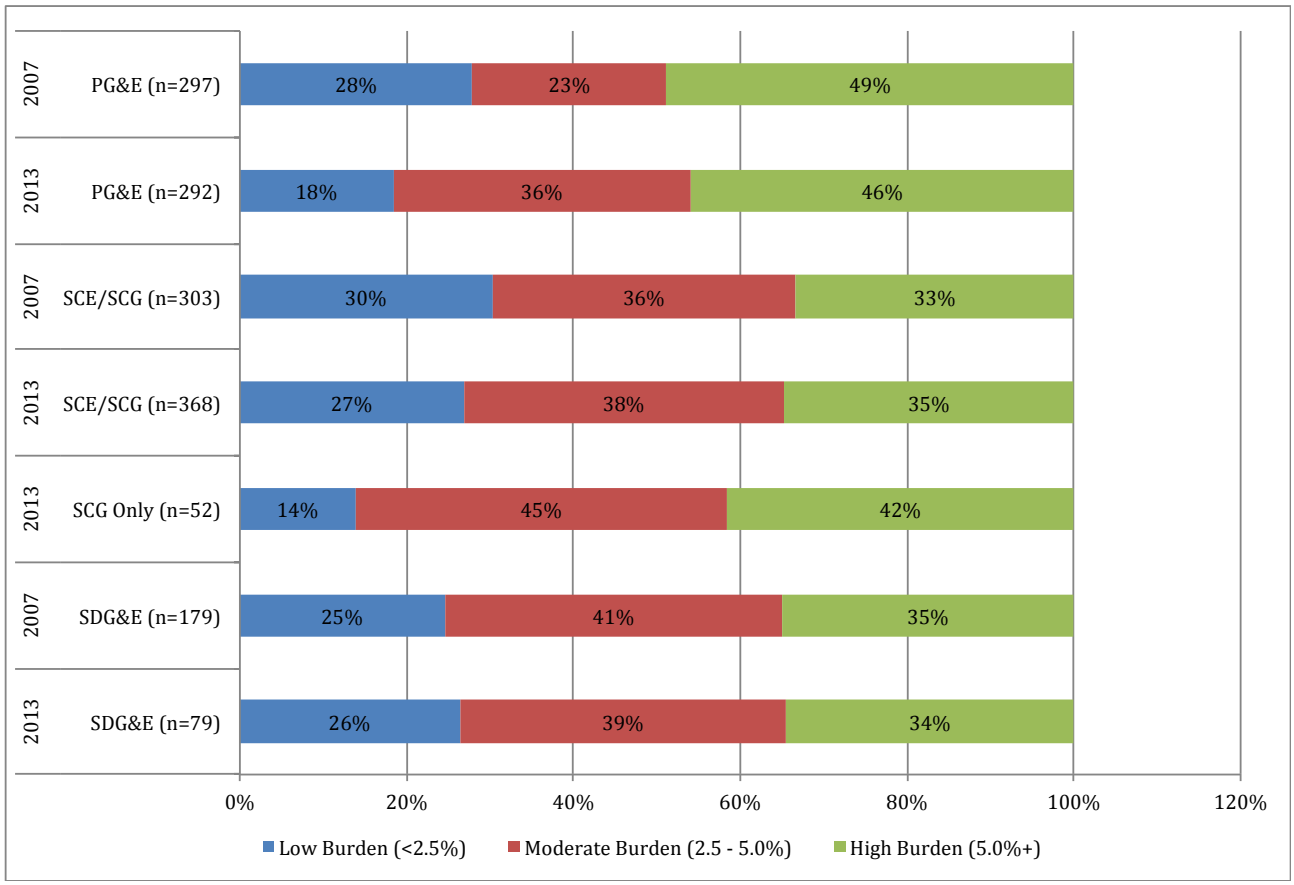


Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data, 2012 Athens data, and 2011 PUMS data.

Figure 52 below shows the distribution of high, moderate, and low energy burden classifications within each IOU service territory, and compares the current findings to those of the 2007 LINA.

- Overall, PG&E has the highest portion of customers in the high burden segment at 46 percent. PG&E also had the highest portion in 2007, when it was measured to be 49 percent. A more significant change for PG&E relative to 2007 is the reduction (by 10%) of low burden customers. Both of these changes are reflected in a 13 percent increase in the moderate burden category.
- The SoCalGas-only territory (i.e. SoCalGas territory that does not overlap with SCE) has the second-highest portion of high burden households, 42 percent.
- The distribution for SDG&E is stable over the period, showing no changes in excess of 2 percent in the size of each burden category. The SCE/SoCalGas territory has made small adjustments over the period toward higher burden levels, including a slightly larger high burden segment (35% versus 33%) and a slightly smaller low burden segment (27% versus 30%).

Figure 52: Overall Energy Burden Classification Distribution by IOU, 2013 versus 2007 for California LI Population – for Comparison Purposes Only



Source: 2013 Analysis of IOU customer billing data, CARE participant telephone survey data, 2012 Athens data, and 2011 PUMS data.

5.5.2.4 Energy Burden of LI Versus General Population

Table 50 compares the overall energy burden of the LI population to the general population (which includes the LI population). This comparison provides greater context for interpreting the magnitude and the patterns of the LI population energy burden. These results are intended to provide a comparison to the general population only. The customer energy burden presented previously provides our estimates of the LI population mean energy burden.

In the table below, the left most column includes (a) the general population overall burden, the next column is (b) the LI population overall burden and the final column is (c) the ratio of the two results. The first two columns (a) and (b) are interim calculations only (providing "relative" estimates of burden) to produce the ratios shown in the (c) results. The previous subsections presented the LI customer energy burden results. We are unable to produce absolute customer energy burden results for the general population given the data constraints described herein.

As shown below, the ratio of LI to general population burden is 1.8 (the ratio of 2.3% to 4.1%).

Table 50: Energy Burden for IOU Customers by Population and IOU

	General Population (a) ^					Low Income (b) ^^					Ratio of LI to GenPop (c=b/a)				
	PG&E	SCG	SCE	SDG&E	Total	PG&E	SCG	SCE	SDG&E	Total	PG&E	SCG	SCE	SDG&E	Total
Annual Burden	2.6%	2.2%	2.2%	1.8%	2.3%	4.7%	3.6%	3.5%	3.8%	4.1%	1.8	1.6	1.6	2.1	1.8
Sample Size (n)	178*	704*	187*	64*	1,132*	340	420	368	179	939					

* Thousands of records

^Source: 2013 IOU customer billing data, 2012 Athens data, and 2011 PUMS data.

^^Source IOU Customer billing data, CARE/ESA tracking databases, LINA telephone survey data.

5.5.3 Non-Energy Benefits

5.5.3.1 Contractor Interviews

Not surprising, most of the respondents noted that energy/bill savings was a primary benefit of the program; according to one, "even $10 per month is a big deal for LI homes." The respondents also described a wide range of other benefits that customers receive in different combinations depending on their personal circumstances:

- Home safety – Seniors in particular value fixed natural gas leaks and electric fire hazards, carbon monoxide testing and information on how to respond to gas leaks (i.e., education).
- New appliances and equipment – Customers benefit from reduced capital costs and higher quality of life. Older homes benefit most from weatherization and generally get the largest energy savings. Mobile homes with combustion ventilation air can also get more measures than other mobile homes. New refrigerators confer health benefits via better-preserved food.
- Improved indoor comfort.
- Helping the environment - some customers are glad "to help the environment".
- Energy efficiency education – many customers are not aware of the potential for energy efficiency in their home and contractors leave various educational materials with them. One contractor said they spend 30 minutes with each participant covering an energy guide that teaches multiple energy saving techniques (e.g., placing different wattages in areas).
- Awareness of other IOU programs – ESA customers often learn about CARE and debt payment plans, particularly in rural areas where the IOUs may have historically done less marketing.

5.5.3.2 Customer Telephone Survey

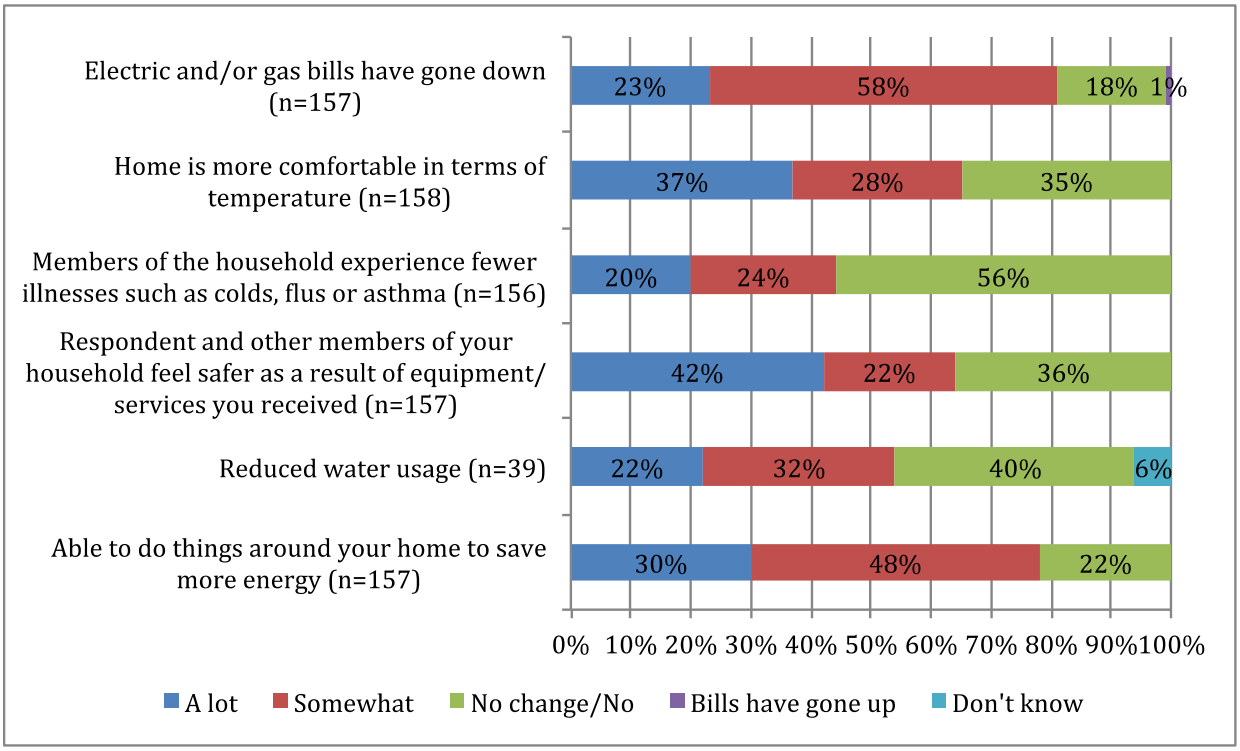
We asked participants what type of health, comfort and safety changes they noticed as a result of their participation in ESA. We also asked non-participants about their current levels of health, comfort and safety (reported after the participant results).

As shown in Figure 53 below, participants report substantial benefits from participating in ESA. Note that we asked these questions only of recent participants (2010-2012)[55]

[55] We did not ask prior participants (2002-2009) about their ESA participation experience. We based participation on the home, not the household, so not only would it be difficult for prior participants to recall participating since four or more years has passed, but they may not be the same household that participated.

that could recall participating, about half the recent participants. More than half and up to 81 percent of participants said they noticed “a lot” or “somewhat” of a change in comfort (65%), bill reduction (81%), a reduction in water usage (54%) and ability to save energy around the home (78%). Just under half (44%) reported reduced illnesses. These results tend to vary somewhat based on measures received, with those receiving HVAC measures more likely to report reductions in bills and increases in comfort and health.

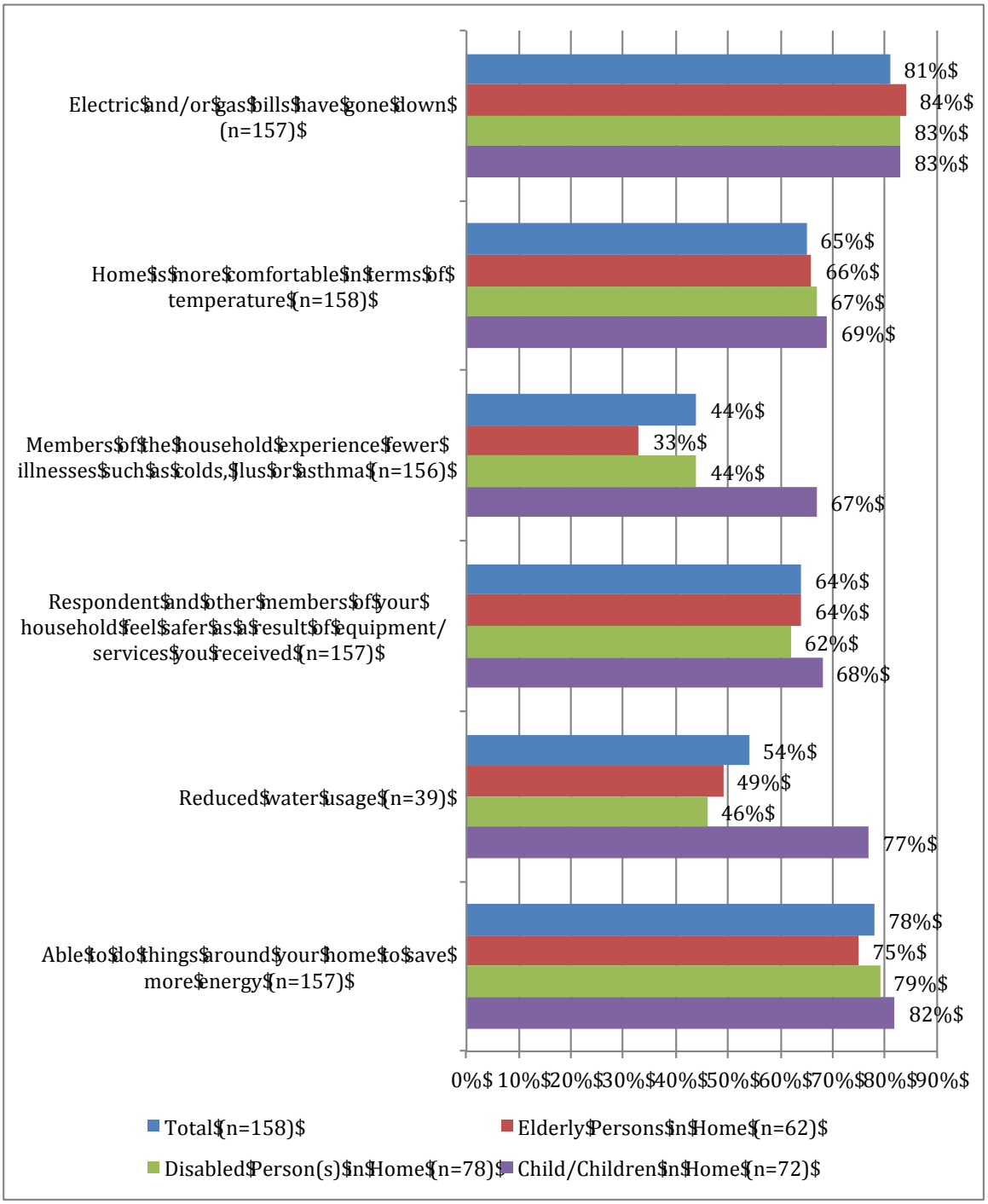
Figure 53: Health, Comfort and Safety Changes Noticed by Recent ESA Participants (PB8a-g) for California LI Population



Note: water usage question only asked of those that received water saving measure(s).
Source: 2013 CARE participant telephone survey data.

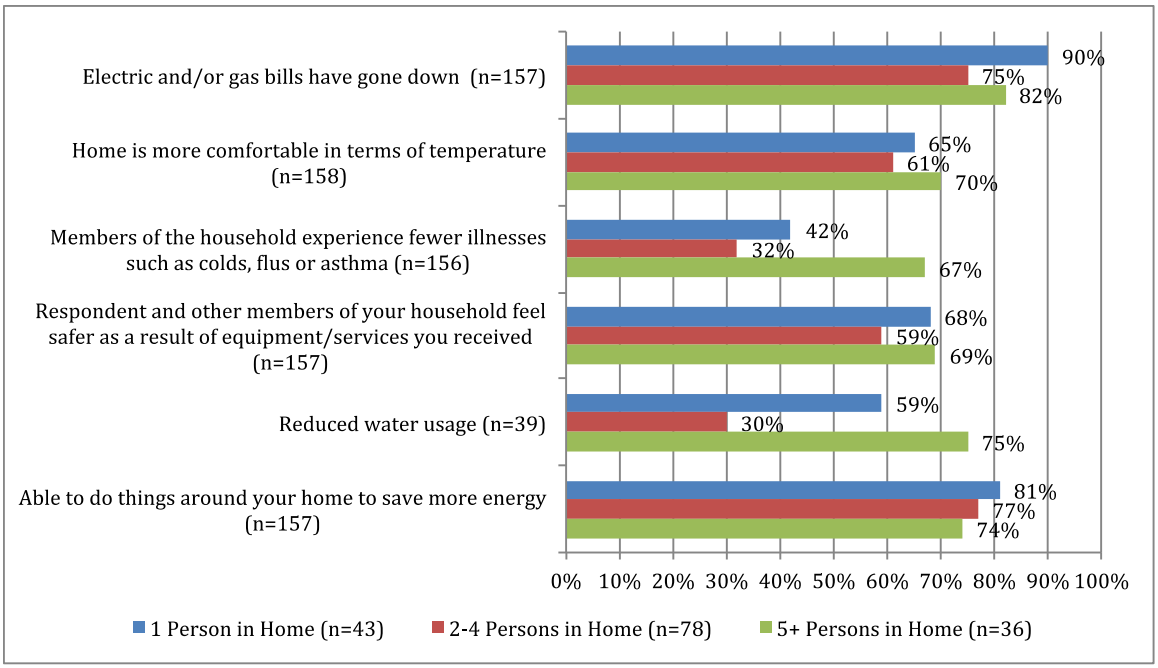
There are some differences in participant benefits based on the household composition and size, with homes with children and larger households more likely to notice fewer illnesses and reduced water usage. Households with elderly member(s) were less likely to notice fewer illnesses. This difference may be based on expectations with younger respondents expecting to be healthy and older respondents being more used to health issues. Figure 54 below shows ESA participation benefits (the percentage that said they noticed "a lot" or "somewhat" of a change) by household composition, and Figure 55 by household size.

Figure 54: Health, Comfort and Safety Changes Noticed by Recent ESA Participants, by Household Composition (PB8a-g) for California LI Population



Source: 2013 CARE participant telephone survey data.

Figure 55: Health, Comfort and Safety Changes Noticed by Recent ESA Participants, by Household Size (PB8a-g) for California LI Population



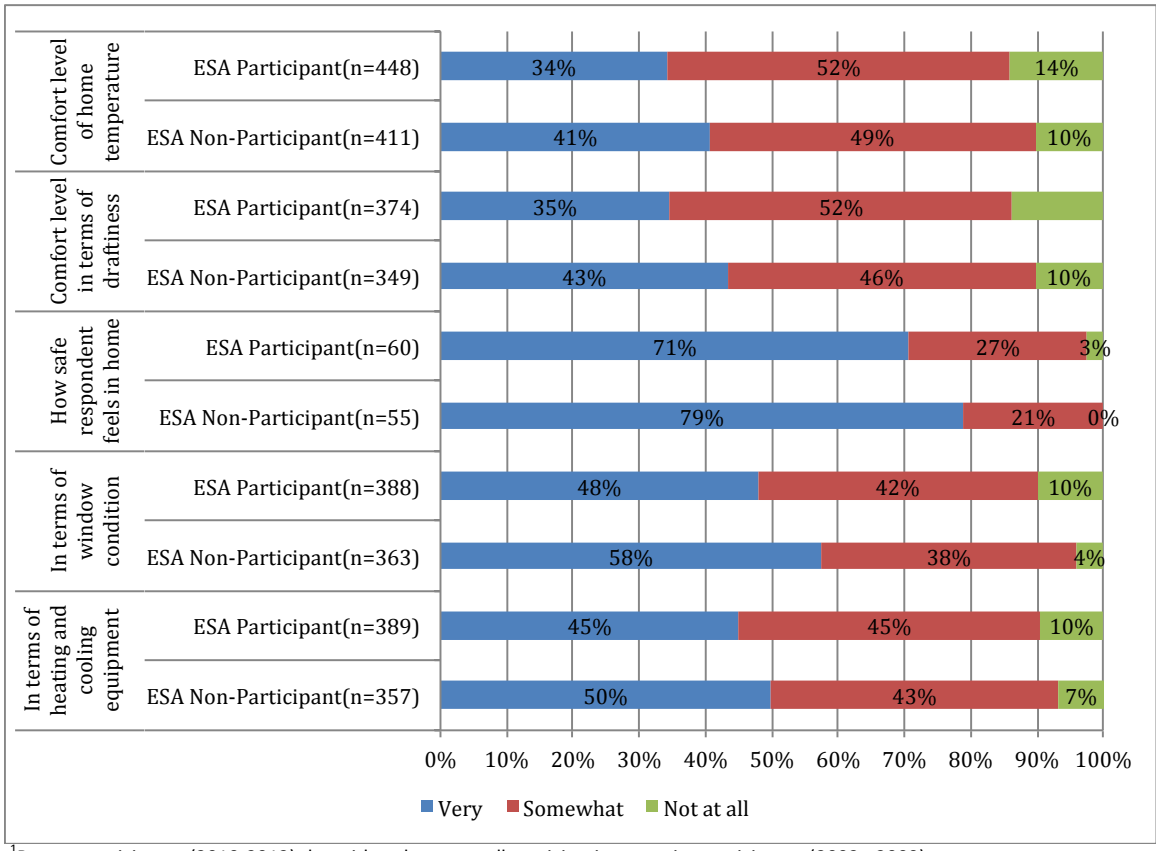
Source: 2013 CARE participant telephone survey data.

Next, we present current levels of health, comfort and safety for non-participants, prior participants (2002-2009) and recent participants (2010-2012) who did not recall participating. We remind the reader that we determined participation based on the home, so the participants who were asked this sequence of questions may not have participated themselves (or recall participating if they were the household in the home at the time of participating). Even though we did not ask this subset of participants (who make up about half of all participant survey respondents) directly about changes in health, safety and comfort, we could ask them about current levels and compare them to non-participants. This sequence does not measure immediate health, comfort and safety benefits, but instead sustained benefits combined with underlying differences between participants and non-participants.

As shown in Figure 56 below, upwards of 87 percent of survey respondents report that their homes are very or somewhat comfortable and safe. Very few non-participants indicate they have substantial comfort and safety needs. There are few differences in report comfort and safety levels across LI segments. Households with elderly member(s) and of a relatively smaller size were more likely to say they are “somewhat” or “very” comfortable with the temperature in their home, and households with elderly member(s) were also more likely to say they are comfortable with the (lack of) draftiness of their homes.

There are some differences between participants and non-participants as shown, with participants generally reporting slightly lower levels of comfort and safety. This could be because they (participants where the household was in the home during treatment) self-selected themselves into the program because they either had greater comfort and safety issues or that they are more perceptive to comfort and safety issues. However, the differences are slight and only the difference in safety associated with the condition of their windows is a statistically significant result.

Figure 56: Level of Health, Comfort and Safety, by ESA Non-Participants and Participants[1] (PB9a-d) for California LI Population

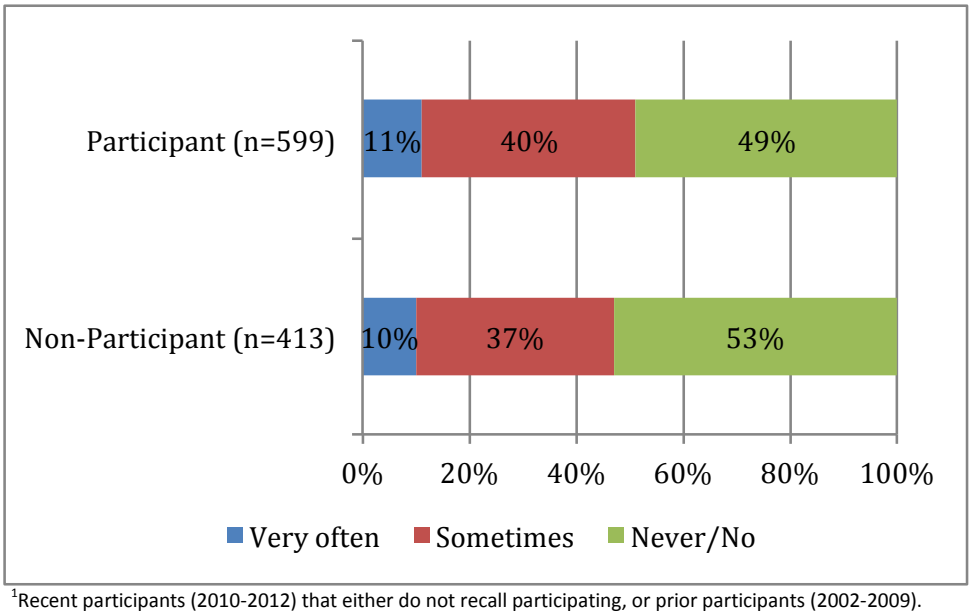


[1]Recent participants (2010-2012) that either do not recall participating, or prior participants (2002 - 2009).
Source: 2013 CARE participant telephone survey data.

We asked the same set of non-participants and participants about how often their household members get sick or have asthma due to their home's condition or the home's temperature when trying to keep costs down, as reported in Figure 57 below. Based on this self-reported assessment, few households have these issues "very often", but around half report their household "sometimes" or "very often" has these issues. Similar to the comfort and safety results, more participants are reporting health issues than non-participants, but this difference is not statistically significant.

There are some differences in the self-reporting of energy-related health issues across LI population segments; households with non-English as a primary language, elderly, no children, no disabled, relatively more members and homes located in the mountain climate zone are more likely to cite these issues. As mentioned above, this difference may be based on expectations with younger respondents expecting to be healthy and older respondents being more used to health issues.

Figure 57: How Often Members of Household Get Sick/Asthma Due to Home's Condition or Temperature When Trying to Keep Costs Down, by ESA Non-Participants and Participants[1] (PB10) for California LI Population



[1]Recent participants (2010-2012) that either do not recall participating, or prior participants (2002-2009).
Source: 2013 CARE participant telephone survey data.

5.5.3.3 In-Home Visits

We specifically sought to understand the degree to which non-participants are maintaining comfort or sacrificing comfort for cost savings (see Table 51 below). We found this analysis to be challenging to do because comfort is a highly person-specific characteristic and the threshold at which someone will think of himself as uncomfortable varies greatly. Some people self-reported discomfort at temperatures that are within the ranges typically recommended for energy savings by IOUs and the Department of Energy (68 degrees Fahrenheit in winter and 78 degrees in summer when home and awake). Others did not complain of comfort at substantially higher or lower interior temperatures. When asked about that, one respondent who happened to be an immigrant simply said "it's good enough" while another said that her family's living conditions are much better than those of people in developing countries.

That said, a third of the homes we visited either complained of comfort issues or described conditions that the interviewer identified as a comfort issue. The bulk of these

comfort issues are based on self-reports. The presence of comfort issues were evenly distributed among the service territories of the IOUs that provide ESA, across all housing types, and among home owners and renters. Not surprisingly, those households we had identified as being particularly stressed financially were much more likely to have comfort issues; nearly all of them did. Conversely, households that are predominately Spanish-speaking and those who identified themselves as immigrants spoke of comfort problems less frequently, which may be the result of differing expectations between cultural groups or foreign- and U.S.-born individuals.

Hence, it may not be surprising that the degree to which households use their heating and cooling system varied, even within the same climate zones. Some people in temperate climates were comfortable in their homes with minimal heating and cooling. Others (in temperate coastal climates and those inland) need more substantial heating and cooling to be comfortable. Whether or not they actually heat and cool to comfortable conditions depends on the equipment available to them, the cost trade-offs they choose to make, and their perception of what is the most cost-effective way to heat and cool their home.

Table 51: Number of Households Experiencing Comfort Issues for California LI Population

Comfort issue	Who identified	Reason for comfort issue		
		Cost constraints	Equipment/ Structural Issues	Both
Identified	self-reported	11	4	8
	interviewer-identified	3	0	0
	both	1	1	4
None identified	n/a	56		

Source: 2013 CARE participant telephone survey data.

5.5.4 Energy Efficiency Measures

The program offers weatherization, water savings measures, lighting, new appliances and appliance repairs or tune-up. Section 4.4 provides a summary of measure eligibility. Overall lighting, weatherization and water savings measures are most common, but many customers receive new clothes washers, refrigerators, air conditioners and/or furnace repairs and replacements as well.

Cost-effectiveness issues are considered when adding or removing a measure or establishing or updating measure eligibility. For example, SCE is no longer able to

replace old, inefficient Central ACs in climate zone 13 due to lower energy savings. Whether installation procedures may be standardized and deployed on a large-scale are also considered for ESA measures. For example, solar water heaters are not offered due to the customized nature of the installation. However, the state of Hawaii installs solar water heaters for LI customers.

5.5.4.1 Measure Eligibility for Programs Nationwide

The mix of measures for each program researched here depends on whether the program is a utility-specific or statewide program. For those utilities that provide both natural gas and electric service, a comprehensive set of measures is typically offered which include both weatherization-based measures and electric reduction measures. The Ohio EPP only includes electric base load measures, such as lighting and refrigeration, since the program was established during the statewide electric restructuring; gas energy efficiency measures are administered through utility programs or WAP.

The program staff of the New Jersey Comfort Partners believe that a reason behind their program's success is the cooperation among all utilities throughout the state to make the same measures eligible, even though each utility administers the program within its territory. This provides consistency throughout the state.

Some programs, like NJ Comfort Partners and WI WAP, include health and safety measures in addition to weatherization or electric reduction measures. These health and safety measures can include such measures as adding ventilation to kitchens and bathrooms to manage moisture and other indoor pollutants, checking water heaters for incomplete combustion, and installing smoke/CO detectors. They do not necessarily have an energy impact but do increase the well-being of the household residents.

5.5.4.2 Weatherization Assistance Program (WAP) Relationships

Utility-based programs can operate together with—or independently from—the federal Weatherization Assistance Program. For those states we researched that have independent LI energy efficiency programs (Ohio, New York, New Jersey, and Pennsylvania), the interaction between the program and WAP is a defining characteristic. The Ohio EPP program only targets electricity-using equipment and electrically heated homes. This way, the program complements the WAP program, which targets natural gas heated homes. The NYSERDA program operates in parallel to the WAP effort; sometimes the WAP agencies refer homes to the NYSERDA program and other times there are duplicative efforts, where the NYSERDA program auditors arrive at a home where there are no opportunities due to WAP implementation.

The Massachusetts WAP program is implemented by local weatherization agencies that also take advantage of additional funding by utility companies. This appears to be an effective way to leverage funding to maximize energy savings opportunities. For example, while the Massachusetts WAP program only funds base load-heating measures,

households can take advantage of utility programs for electric base load opportunities such as lighting and refrigeration.

5.5.4.3 In-home Audits and Education Offered by Programs Nationwide

All the LI weatherization programs that we examined conduct free in-home audits to identify energy savings opportunities and determine the measures that would be implemented on a household level. The auditors generally take advantage of their time at the household for some direct installs, such as changing out light bulbs and replacing showerheads with low-flow versions. Installation crews implement more complex energy efficiency measures, such as insulation and air sealing.

Participant education is another integral component of the in-home audits. The auditors often request that the resident accompany them on the walk-through so that they become familiar with the energy-consuming equipment in their home. One program, PECO's LIURP, provides a personalized educational leave-behind that describes the resident's current energy use and energy costs and provides a detailed explanation of energy efficiency measures the program will implement; they also set a realistic energy savings goal that the residents need to meet. The goal is aligned with the household's current energy use and the measures to be implemented. Our contact at LIURP stated that evaluation results show energy consumption usage for those customers who were audited but found not to have energy saving opportunities and thus were simply provided an educational packet of information; simply providing participant education had an effect on energy consumption. After repeated requests for documentation of this evaluation result, we have not been able to secure the report demonstrating these results.

5.5.4.4 Program Staff Interviews

We talked to IOU program staff about the measures that ESA offers, including customer dissatisfaction with measures. They reported that some customers complain about the white freezer on top refrigerator (either at the enrollment or assessment phase, or occasionally when the truck rolls up), preferring their old style/color or saying that it doesn't match the rest of their appliances. Some customers are dissatisfied with the low flow showerheads, and some have complained about evaporative coolers – stating that they are ugly or they don't understand how they work.

Some customers don't like the doors that the program installs – maybe they had a decorative door that was no longer safe/tight, or had the metal door shoes. Also, if the program replaces one or a few windows but often not all, a customer may not like that they don't all match or they don't like the newer window materials.

Program staff say that measures being considered for the program must have a standard specification for the equipment and the installation. The equipment cannot require customization for the home– e.g., solar thermal water heating is rejected due to the complexity of installation.

Some measures that would provide benefit to the customer but program staff say are too expensive and don't pass a cost-effectiveness screen are LED big screen TVs, double-pane windows and stoves.

Some new measures that have been added by one or more IOU(s) recently include the following:

- PG&E and SDG&E offer microwaves to customers that do not already have one, as a relatively less energy consumptive cooking technique. The measure offers a relatively high-energy savings per unit, particularly when supplementing electric cooking equipment.
- SDG&E is offering LED nightlights – 58,000 were installed in 2012
- SoCalGas and SDG&E are offering energy efficient clothes washers (about 6,000 in 2012 altogether).
- Thermostatic shower valves and occupancy sensors have also gained some traction in PG&E service territory.

CAC replacement for Climate Zone 13

SCE is no longer able to replace old, inefficient Central ACs in climate zone 13 (as of the last program cycle), even though it contends that that area is hotter than some areas of climate zone 14, which is eligible for this measure; it contends that this is a case where customer's needs are not being met. Staff report that some customers complain because their friend, family or neighbor got a new AC through the program when it was still allowed, or the customer calls in on a really hot day for help and they are told they cannot have that measure. The measure was disallowed due to cost-effectiveness (it is very expensive), though SCE contends it provides a real health/comfort/safety benefit for the customer.

5.5.4.5 Contractor Interviews

Greatest Customer Needs

Over half of the respondents reported that LI homes' greatest needs are for fixed/replaced doors and windows, and new weather stripping. Furnace and AC tune-ups and replacements are also a common need. Some of the less commonly mentioned needs were:

- Ductwork leak repairs in manufactured homes;
- (Enhanced) Energy education;
- Attic insulation in older homes; and
- New, larger refrigerators for larger families.

ESA Effectiveness

The respondents described only a few gaps in program services, with most noting that the program is very comprehensive. Most think ESA is an excellent program, and acknowledge that the IOUs need to balance program costs, critical needs and the large population needing services. Following are some desired program changes:

- Two respondents would like to do projects with "no material changes" (e.g., water heater insulation) that are currently disallowed.
- One would like to allow more attic insulation, "above the bare minimum," which would still yield benefits.
- One emphasized that the program needs to retain window ACs in Climate zones 13 and 14 for comfort and safety, or there will be a critical gap.
- One stated that the CPUC and IOUs should allow contractors to still deliver the education component even if homes do not have the required three measures needed to qualify. The contractor could still tell them about low-cost measures (e.g., faucet aerators, low flow shower heads) and affect long-term behavior change (e.g., turning off lights).
- One would like to see SCE allow clothes washer and dryer upgrades.

5.5.4.6 Customer Telephone Survey

We asked telephone survey respondents a series of questions about the energy efficiency equipment they either received from the program (ESA participants[56]) or might receive (ESA non-participants) to find out how helpful those were (or would be) to helping them control their energy bills and improve the comfort and safety of their home. First we asked the question unprompted, followed by a prompted series of questions asking about the helpfulness (or potential helpfulness) of each measure they received or might receive.

Figure 58 below shows the measures that survey respondents told us (unprompted, one response allowed) either were the most helpful (participants who recalled participating) or would be the most helpful (for all other respondents). ESA participants were most likely to mention weatherization measures (23%), followed by a new refrigerator (15%) and then generally helping them to lower their bill (9%). Few mentioned windows/doors (which not all receive) and CFLs—though each respondent was only allowed to mention one measure—the one that was the most helpful.

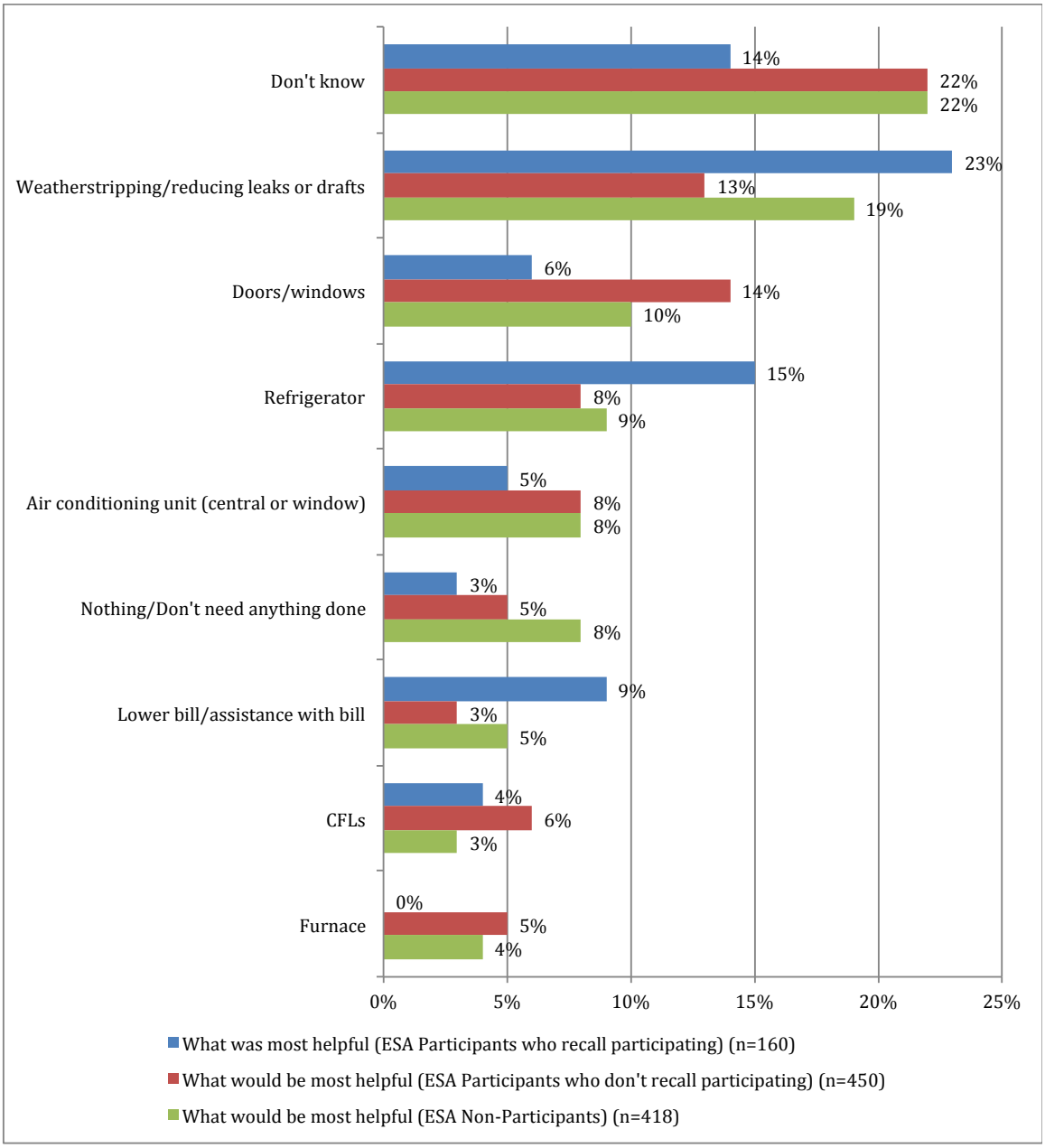
ESA participants who did not recall participating were asked what would be most helpful, so their responses should reflect what measure they think they need most. Non-participants were asked the question the same way. ESA participants who didn't recall

[56] Technically, we only prompted participants who recalled participating (about half of participants) with the list of measures they had received.

participating were significantly less likely to say they need some type of weatherization measure than non-participants, likely reflecting the program's impact on addressing that potential need at least among a subset of prior participants since many receive weatherization. ESA participants who did not recall participating were most likely to say they "didn't know" what would be most helpful (22%), followed by doors/windows (14%), weatherization measures (13%) and refrigerators (8%).

Non-participants were also most likely to say they "didn't know" what would be most helpful (22%), and 19 percent said that weatherization measures would be most helpful. Another 10 percent mentioned windows/doors, and 9 percent mentioned a refrigerator.

Figure 58: Most Useful Items by ESA Participants for California LI Population (EN1)



Source: 2013 CARE Participant Telephone Survey.

The next series of figures (Figure 59, Figure 60 and Figure 61) show the prompted responses to a series of measures that we asked respondents whether they were helpful (for ESA participants who recalled participating and received a given measure) and would be helpful (for ESA participants who did not recall participating and non-participants). The first figure covers HVAC and weatherization measures; the second, appliances; and the third, water-related and other measures. There is a second set of figures showing the same results but by home type instead of participation category.

As shown in Figure 59 below, almost all participants said that the measures they received were very or somewhat helpful. The sample sizes are too small for any differences across participants to be statistically significant (though as indicated below, there are significant differences across participant categories). The participants who could not recall participating and the non-participants who were asked whether the measures would be helpful were less likely to report they would be very or somewhat helpful as participants (but due to small sample sizes, these differences are not significant). This could be because either the measures are not needed as often among prior participants and/or the measures are perceived as more helpful once they are actually in place.

Non-participants were most likely to say that repairs to windows/doors, walls or floors would be very helpful (53%), followed by sealing leaks to reduce drafts (48%). 25 percent or fewer non-participants said that any of the HVAC or weatherization measures would not be helpful at all.

The participants who did not recall participating were more likely to say that measures would be helpful than the non-participants, possibly because participating households have more needs than non-participants and/or they may have received some of these measures and valued them.

These general trends across participant groups, and the magnitude of "very and somewhat helpful" responses, hold true for the other measures shown in Figure 60 and Figure 61 below, with the exception of efficient light bulbs and fixtures and energy information. (Across all the measures, 65 percent of participants who recalled participating said measures were "very helpful", compared to 57 percent of participants who did not recall and 45 percent of non-participants. The difference between the latter two estimates is statistically significant.)

Participants who do not recall participating were more likely to say that both efficient lighting and energy information would be helpful than the other participant categories. It is difficult to know if these participants value these measures more because they likely received them, or if they have a greater current need for them.

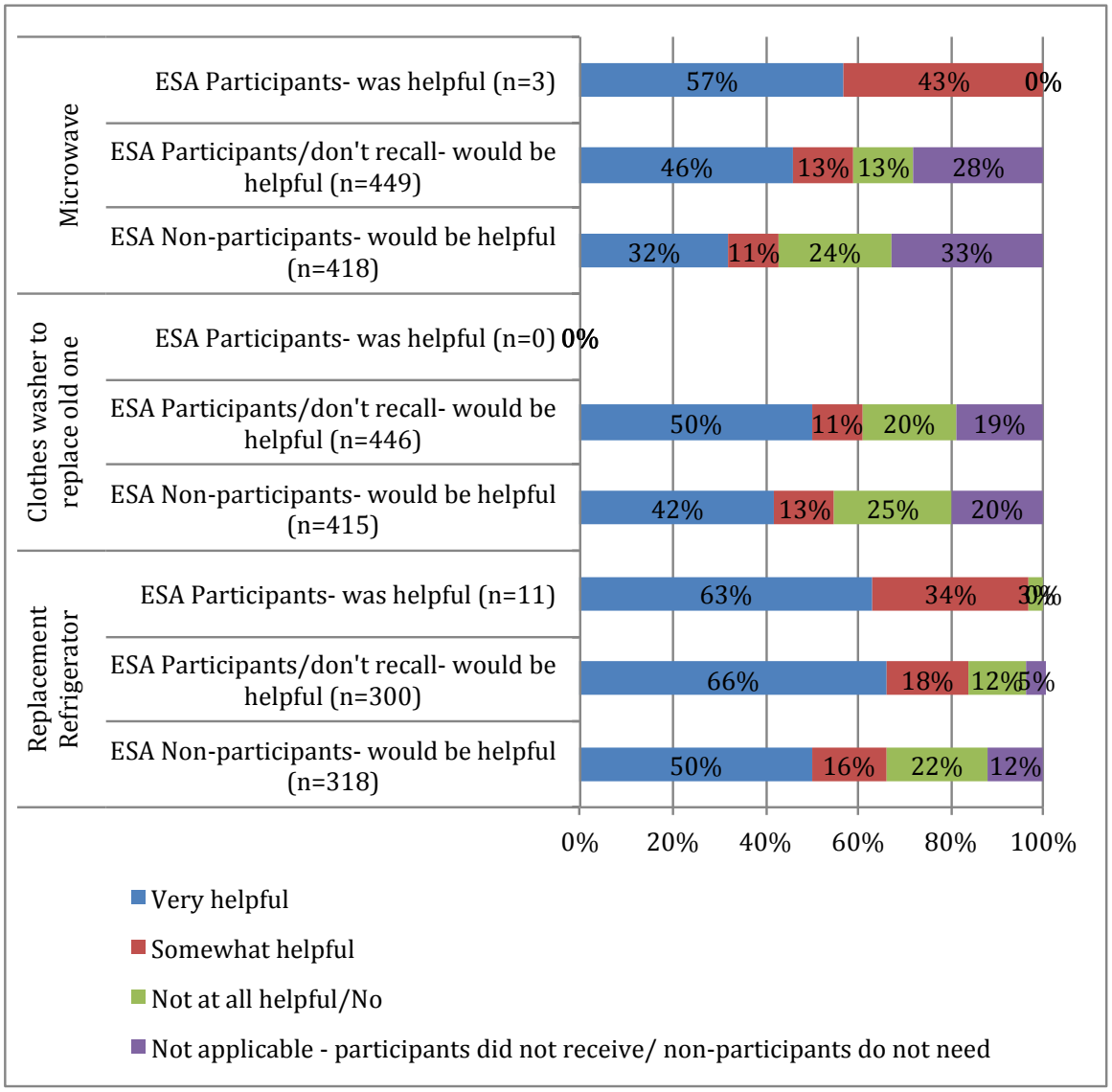
We looked at the self-reported helpfulness of measures across home types, and found that for all the measures, single-family renters were more likely to find them "very helpful" than multi-family dwellers and single-family homeowners.[57] (Across all the measures, 60 percent of single-family renters said measures were "very helpful", compared to 52 percent of multi-family dwellers and 44 percent of non-participants. The difference between the first two estimates is statistically significant.)

[57] As reported in Section 5.1, 95 percent of multi-family homes are occupied by renters, so we do not break out that home type by home ownership.

Figure 59: Helpfulness of HVAC and Weatherization Measures for California LI Population (EN2)

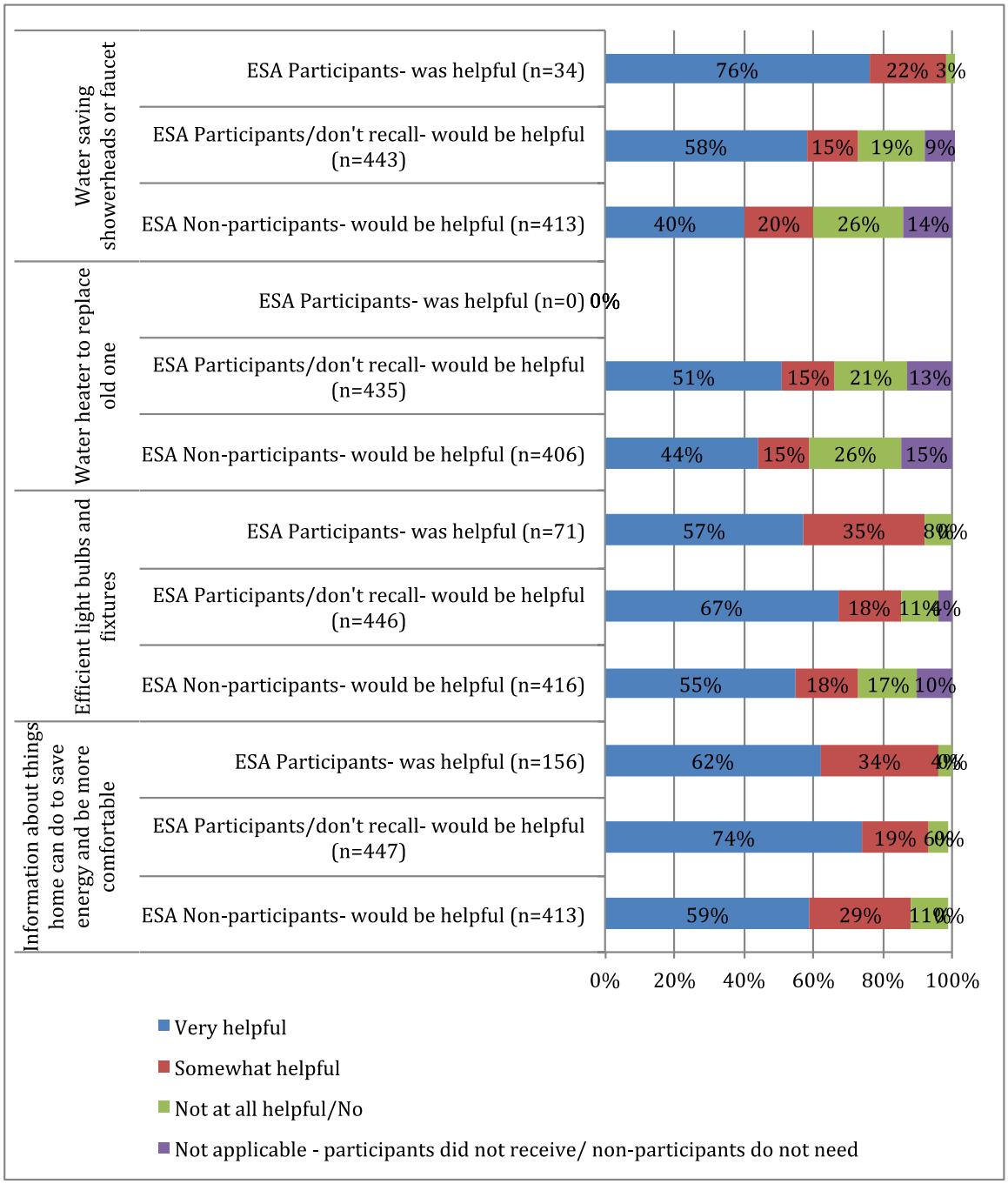
Source: 2013 CARE Participant Telephone Survey.

Figure 60: Helpfulness of Appliance Measures for California LI Population (EN2)



Source: 2013 CARE Participant Telephone Survey.

Figure 61: Helpfulness of Water and Other Measures for California LI Population (EN2)



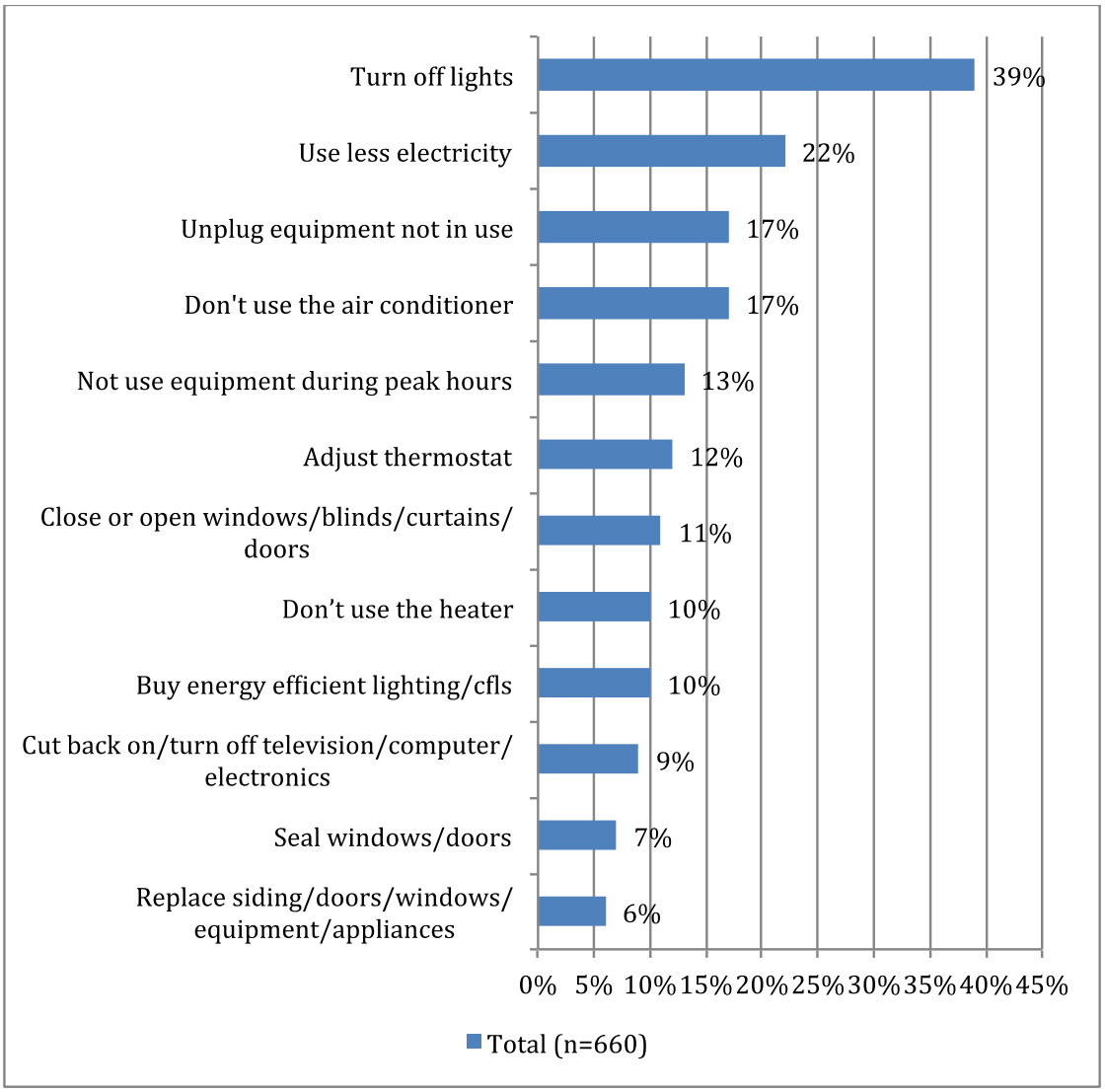
Source: 2013 CARE Participant Telephone Survey.

Next, we asked telephone survey respondents questions about their energy efficiency knowledge, actions and attitudes. We asked respondents if they wanted to lower their

energy bill, would they know what to do? For those that said yes or that they were not sure, we asked them what would they do (unprompted).

62 percent of respondents said they would know what to do to save energy, a percentage that is not statistically significant by participation category. As shown in Figure 62 below, the most commonly cited energy efficiency action that respondents would take is turning off lights (cited by 39% of those who say they know how to save energy), followed by generally using less electricity and unplugging equipment.

Figure 62: Ways California LI Households Try to Reduce Their Energy Bill (Self-Reported), of Those That Say They Know How (EN5)



Source: 2013 CARE Participant Telephone Survey.
Note: Responses greater than five percent presented here. In the appendix we show all responses.

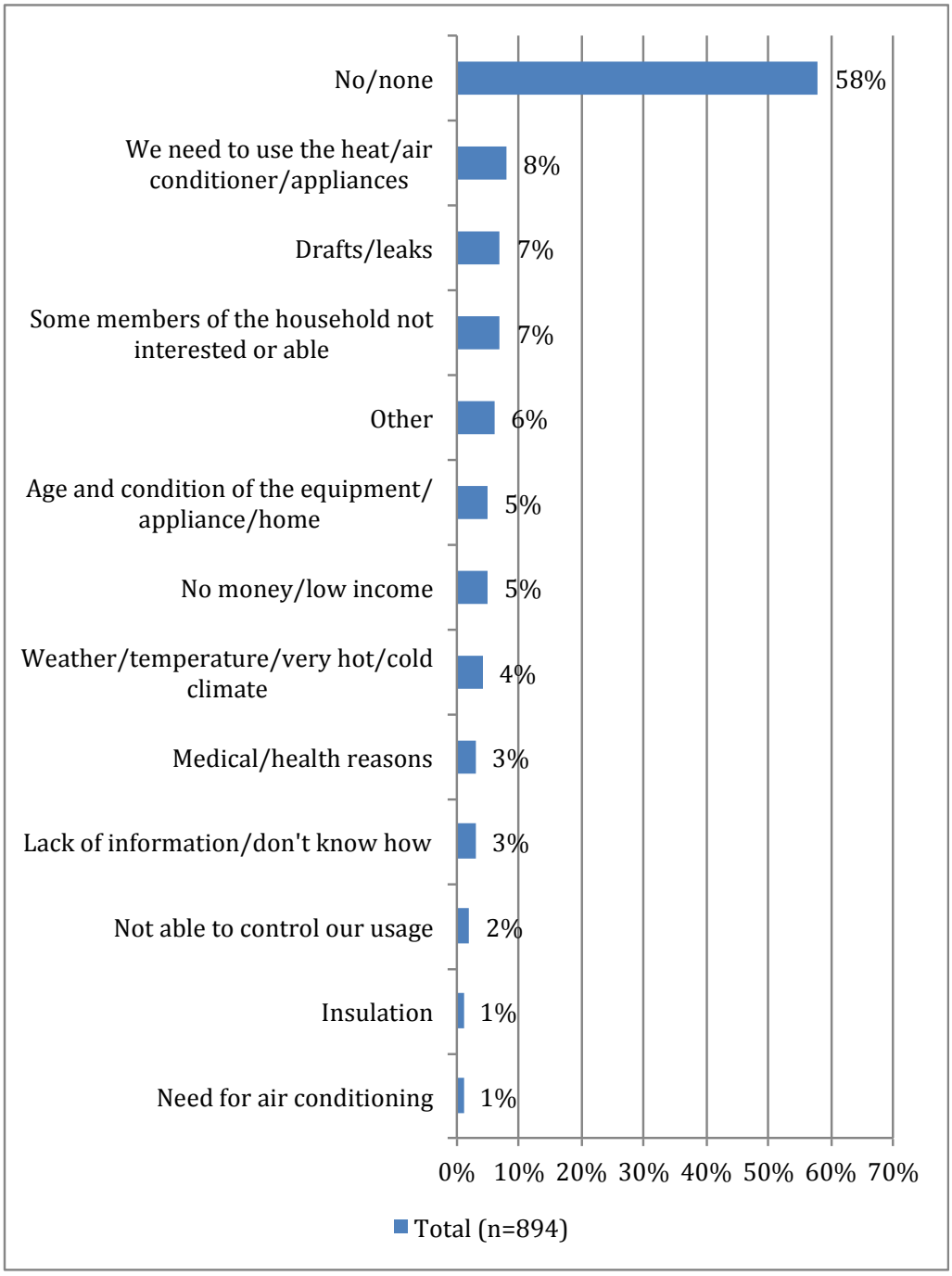
We followed up by asking respondents how often they try to save energy (survey question EN6), with 77 percent saying they try to save energy most or all of the time, and 20 percent saying sometimes. These self-reported results are not significantly different by participation category. Note that we examined the mean energy burden by responses to survey question EN6, and found that the average ratio of energy cost to income for those that said they try to save "most or all of the time" is 7.7 percent versus 9.1 percent for those that try to save "sometimes".

We then asked respondents if there was anything making it hard for them to try to save energy (unprompted, allowing multiple mentions). As shown in Figure 63 below, about half said nothing kept them from trying to save energy. We believe this high percentage is because most respondents were thinking about behavioral things, not all the possible energy equipment and retrofit options they could do. This question followed other questions that elicited behavioral responses, such as the responses to question EN5, where respondents reported turning off lights and not using equipment during peak hours to reduce energy.

42 percent of respondents said there was something making it hard for them, with most of the reasons related to home conditions or need to use energy-using equipment to maintain comfort or health: presence of drafts/leaks, older equipment, outside temperature, need to use air conditioning, or medical or health reasons. Less commonly cited reasons were attitude/knowledge barriers including members of the household not interested or able, and inability to control usage and lack of information. While this result could be taken to mean that households do not need energy education to be able to save energy in their home, some may not know that such education is available and may not be aware that there are actions they are not aware of (e.g., hard to say you need something if you don't know you need it.) These results do not differ significantly by participation category or other segment.

The mean energy burden of households that said that weather/climate was a barrier to saving energy is 13.9 percent, compared to the average mean burden of 8 percent.

Figure 63: Things That Make it Hard to Try to Save Energy (Unprompted), for California LI Population (EN8)



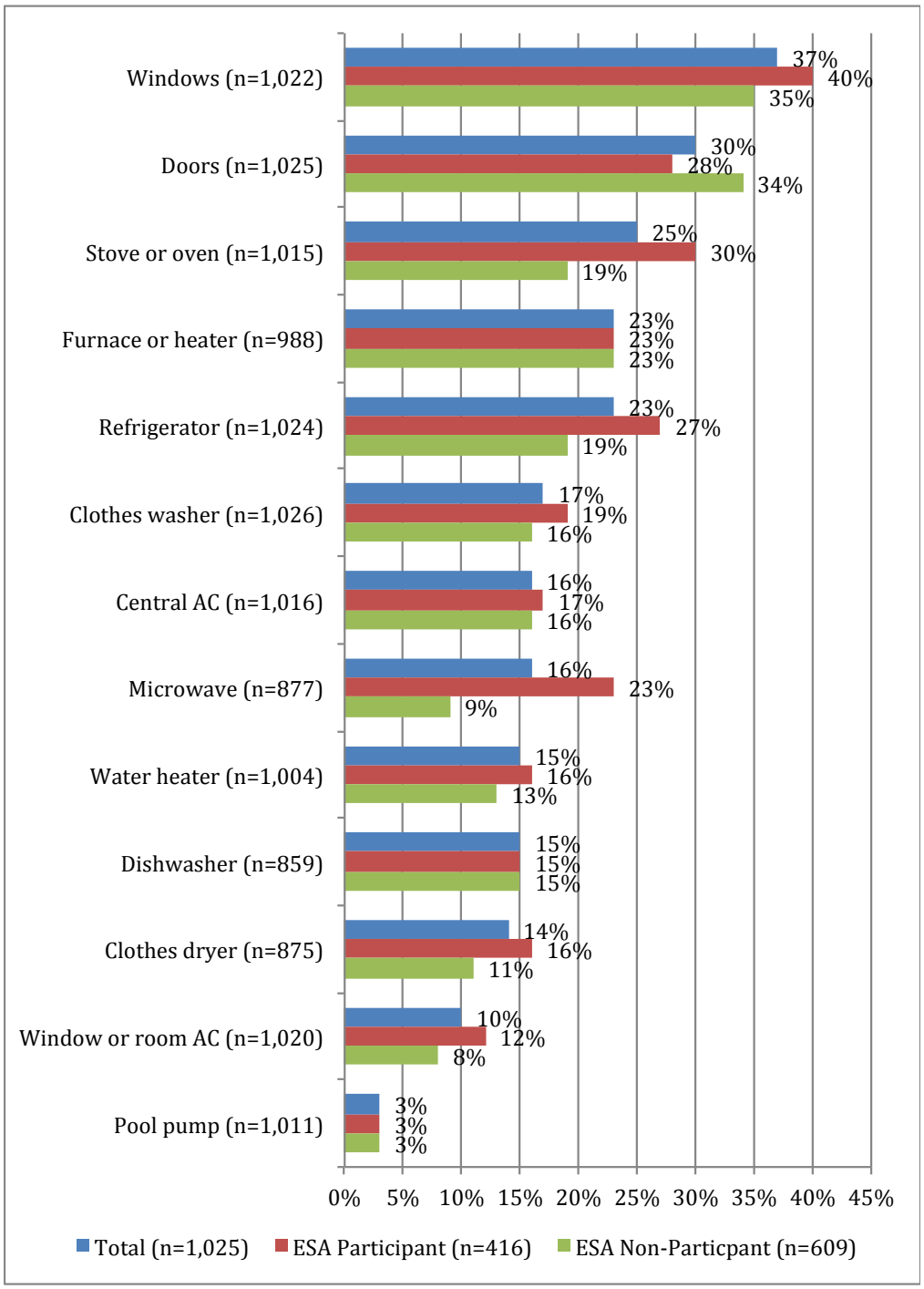
Source: 2013 CARE Participant Telephone Survey.
Notes: this question was added after the survey was already in the field, and has a slightly lower sample size as a result – though it was asked of all respondents once it was added; multiple mentions allowed.

The final series of questions in this section asked about the condition of energy-using equipment in the home, identifying (based on self-report) old, broken and not working equipment. Note that we did not ask respondents about equipment that was recently provided by the ESA program, but we did include those respondents in the base of responses in the exhibits below. The intent is to show the fraction of equipment that might have energy-savings potential among the full LI population. (Note that in Volume 3, Section 7, we provide a second set of results where we exclude respondents that are "not applicable", e.g., those who do not have a pool.) We ended with a question about how many light bulbs in their home are compact fluorescent lights or CFLs to complete the assessment of home equipment.

Figure 64 below shows a summary table of equipment that respondents reported is either not working or in need of repair. The most commonly cited equipment was windows (37%), followed by doors (30%), stove or oven (25%), refrigerator (23%) and furnace/heater (23%). Note that this is self-reported, so there is likely a range of equipment conditions included in these results, since respondents may use different criteria to report that certain equipment is broken or not working, especially equipment like windows and doors.

ESA participants are more likely than non-participants to say their refrigerator, stove/oven or microwave is not working (a reminder that this excludes participants who received a refrigerator or microwave from the ESA program).

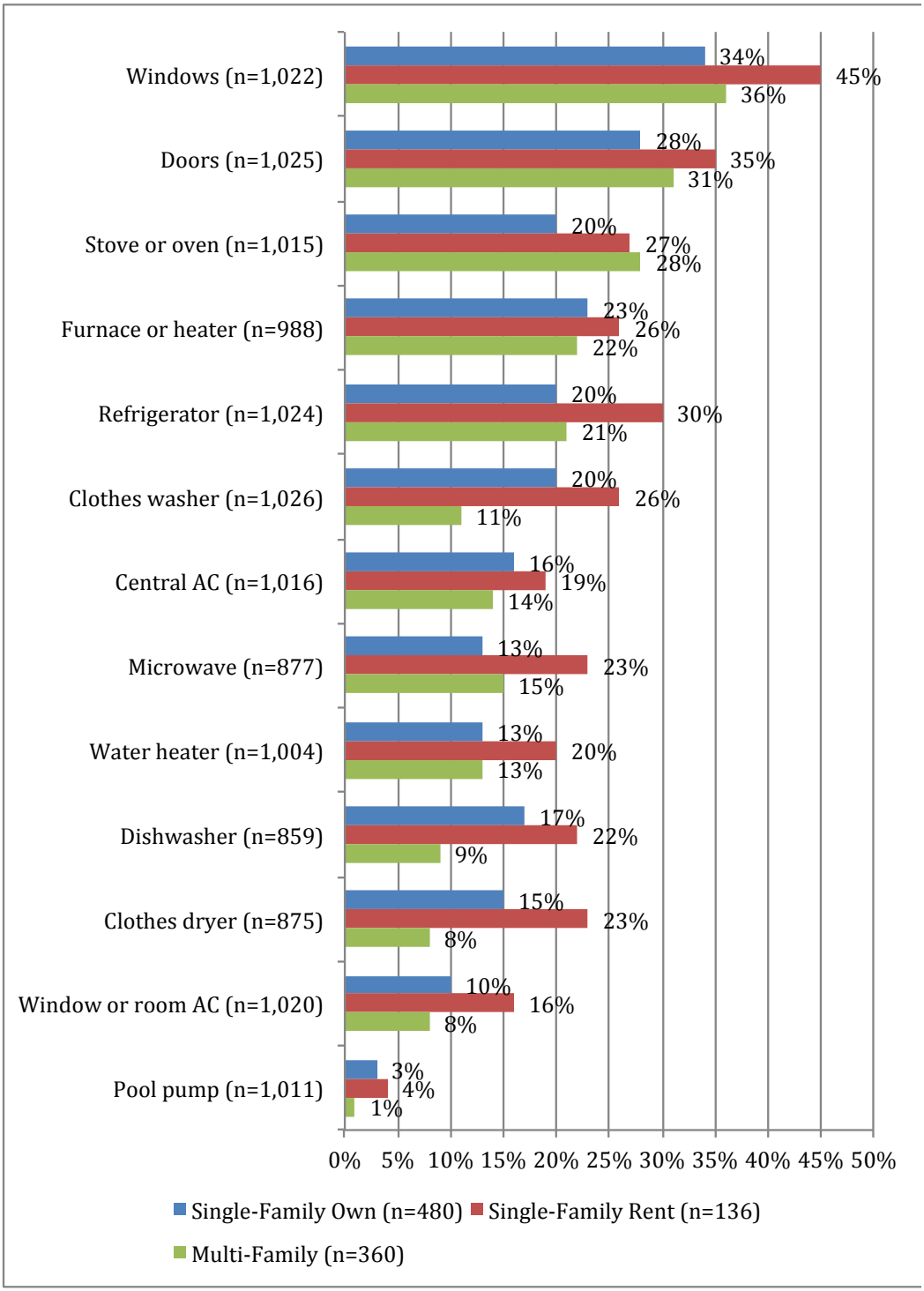
Figure 64: Percent of Measures in Household That are Either Not Working or Need Repair (Self-Reported), for California LI Population (EN11)



Source: 2013 CARE Participant Telephone Survey.
Note: we added additional equipment to this survey battery after the survey was in the field (after pre-test results), which is why some of the sample sizes are relatively low. This figure is intended to represent the LI population.

There are also differences in the condition of energy-using equipment across home types, as shown in Figure 65. Single-family renters are more likely to report their equipment is not working or needs repair, with higher rates of need for a new window/room AC, refrigerator and microwave. Single-family owners are more likely to need a clothes washer and dryer, which is probably only because they are more likely to own their own laundry equipment.

Figure 65: Percent of Measures in Household that are Either Not Working or Need Repair (Self-reported), for California LI Population by Home Type (EN11)



Source: 2013 CARE Participant Telephone Survey.

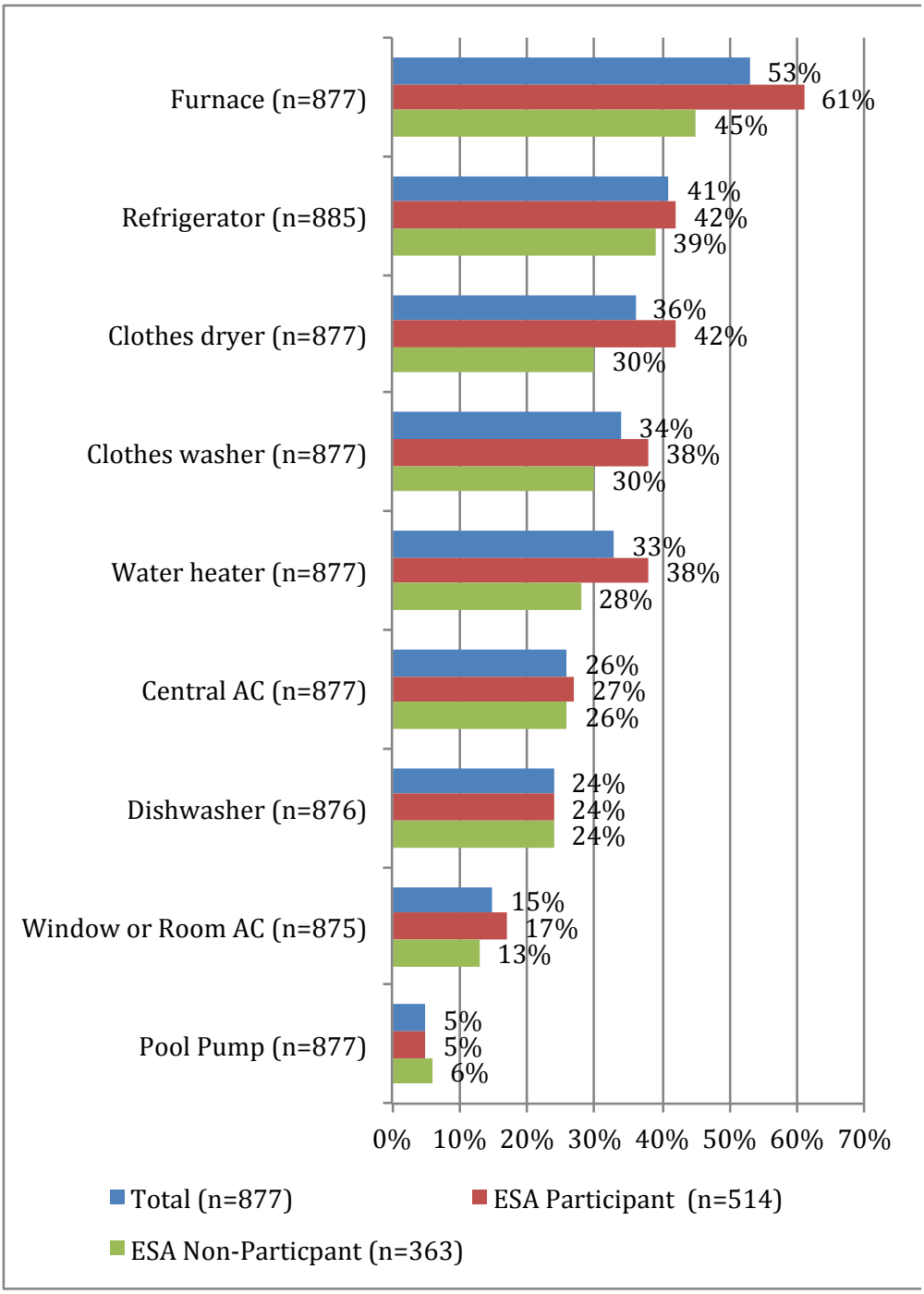
Note: we added additional equipment to this survey battery after the survey was in the field (after pre-test results), which is why some of the sample sizes are relatively low. This figure is intended to represent the LI population.

Figure 66 below presents the percent of equipment in LI households that is greater than 10 years of age, based on telephone survey respondents' self-report.[58] According to respondents, about half of LI households have a furnace that is more than 10 years old, and one-third or more have 10-year old refrigerators, clothes dryers, clothes washers or water heaters. There are fewer 10-year old or more central ACs, dishwashers and pool pumps in LI households. Note that these percentages are for the weighted LI population, not just those that have the equipment. These data provide rough estimates for determining the potential for early replacement of major energy-using equipment. However, the data are not verified by an auditor. We rely mostly on the CLASS data to determine age of equipment for our study conclusions, but where there are gaps in the CLASS data we use these data to provide general ballpark estimates.

ESA participants are more likely to have 10-year or older furnaces, windows, clothes washers and dryers than non-participants.

[58] We used 10 years as a category of equipment age to report, even though the effective useful life of most equipment is longer. This is because many decisions that are made about measures do not impact programs right away, so we wanted to include all the potential equipment that could be considered for replacement over the mid- to long-term. The more detailed results on energy-using equipment from the CLASS data provide the distribution of equipment ages (see Section 4.3.2).

Figure 66: Percent of Measures in Household That are More than 10 Years Old (Self-reported), for California LI Population (EN11)

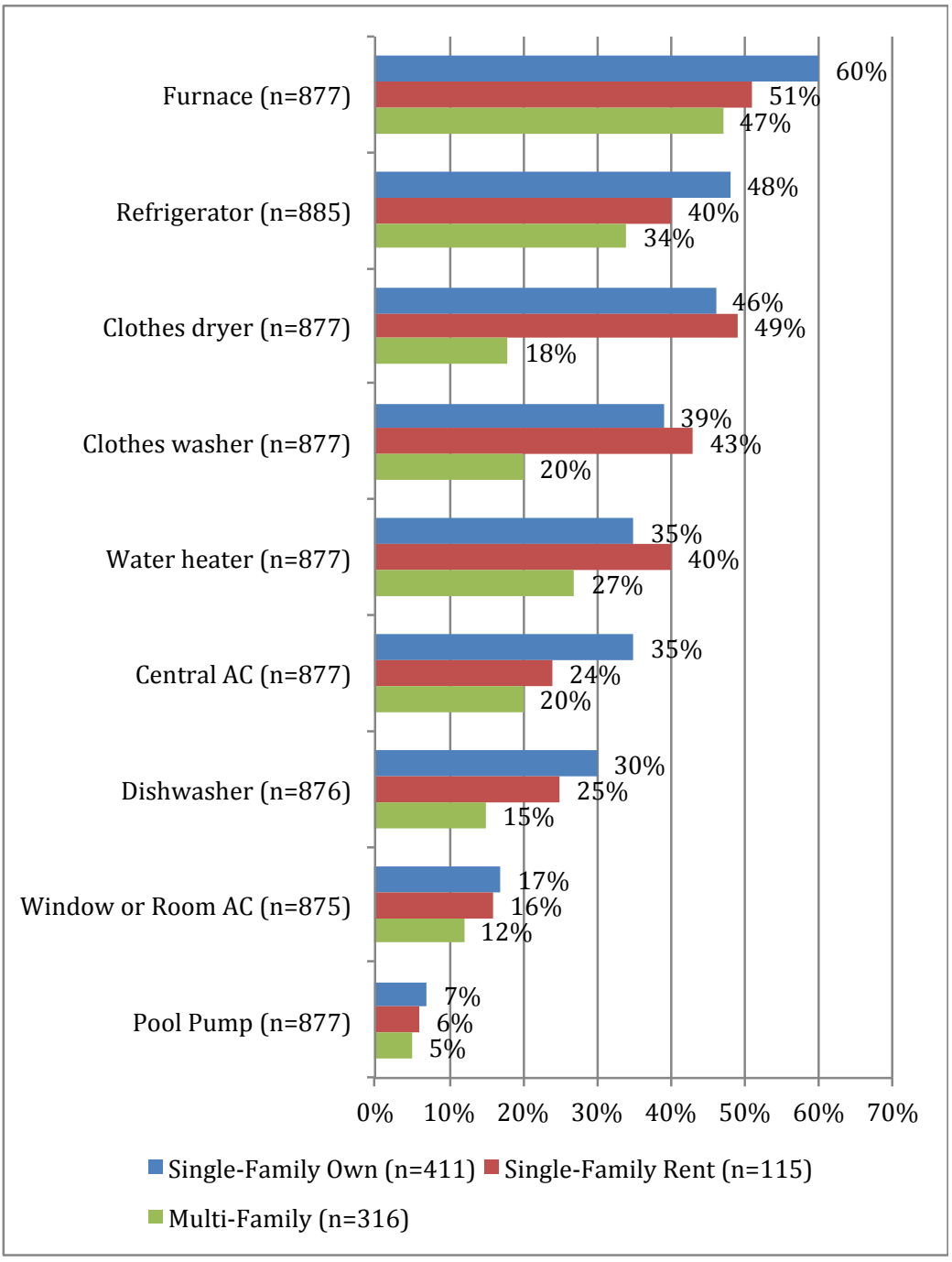


Source: 2013 CARE Participant Telephone Survey.
Note: we added this survey battery after the survey was in the field (after pre-test results), which is why the sample sizes are relatively low. This figure is intended to represent the LI population.

Figure 67 shows the same results but by home type, illustrating that multi-family LI homes have less old equipment compared to single-family LI homes.[59] These results are consistent with the CLASS data presented in Section 4. This is likely because the average age of multi-family LI homes is younger than single-family homes (37 versus 45 years) and that multi-family LI homes have less equipment in general.

[59] As reported in Section 5.1, 95 percent of multi-family homes are occupied by renters, so we do not break out that home type by home ownership.

Figure 67: Percent of Measures That are More Than 10 Years Old, for California LI Population by Home Type (EN11)



Source: 2013 CARE Participant Telephone Survey.

10 percent of respondents said that they could think of some other type of equipment that we had not asked them about that needs repair or replacement. Table 52 below shows the responses. As shown, 16 percent (or 1.6 percent of the LI population) said they needed a new tub or toilet (which do not use energy), followed by 14 percent that mentioned an electrical problem and 13 percent a plumbing problem. Please note that most of the measures identified below are not covered and offered through the ESA program; and not all of these measures are energy efficiency-related.

Table 52: Equipment That Needs to be Repaired or Replaced, of Ten Percent of California LI Population Who Mentioned Other Equipment (EN12b)

	Low Income Eligible Population
Toilet or bathtub	16%
Electrical	14%
Plumbing	13%
Ceiling fan(s)	8%
Flooring	6%
Lighting	6%
Infiltration	5%
Ceiling	4%
Freezer	4%
Roof	4%
Showerhead	4%
Stove fan / hood	4%
Fireplace issues	3%
Garbage disposal	3%
Gate / Fence	3%
Kitchen appliance	3%
Screens	3%
Swamp cooler	3%
Weather-strip	3%
Carpet	2%
Faucet(s)	2%
Garage door	2%
Hot tub	2%
Insulation	2%
Kitchen cabinets	2%
Sprinkler system	2%
Thermostat	2%
Lighting (exterior)	1%
N/A	1%
Water cooler	1%
Yard / Driveway	1%

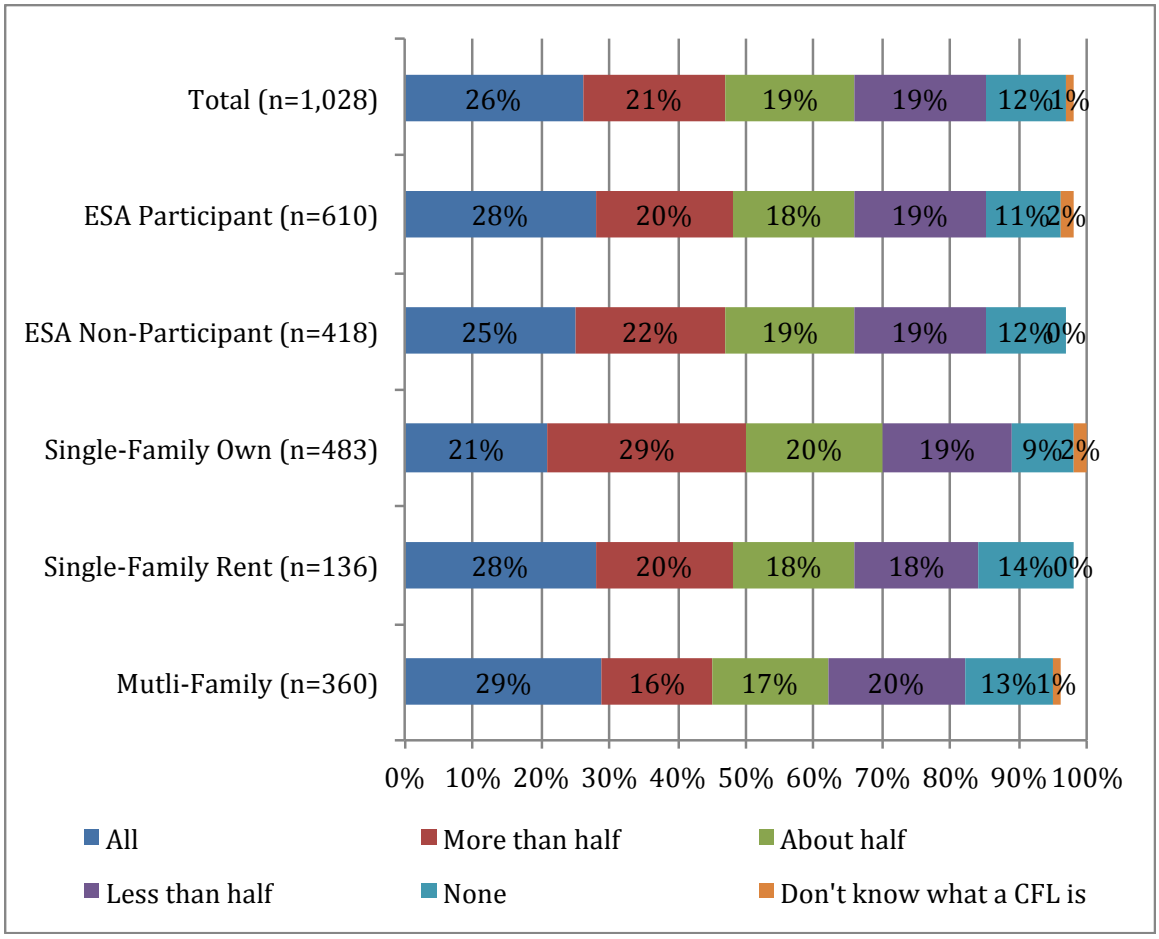
	Low Income Eligible Population
Other	<1%

Source: 2013 CARE Participant Telephone Survey.

The final question in this survey battery was for respondents to estimate how many bulbs in their home are compact fluorescent bulbs. As shown in Figure 68 below, 26 percent of LI households report that "all" of their bulbs are CFLs, 21 percent said "more than half" and 19 percent said "about half". These estimates are not statistically different across participation categories, but they are across home type. Single-family renters and multi-family households report having more CFLs than single-family homeowners.[60] This may be due to IOU CFL programs that targeted multi-family properties and hard-to-reach segments such as renters through giveaways at events and deeply discounted CFLs at discount stores. It may also reflect the different demographics of LI single-family homeowners that may not accept CFLs as much, such as having a greater proportion of homes with seniors and disabled members.

[60] As reported in Section 5.1, 95 percent of multi-family homes are occupied by renters, so we do not break out that home type by home ownership.

Figure 68: Amount of Bulbs in Household That are CFLs (Self-Reported), for California LI Population (EN14)



Source: 2013 CARE Participant Telephone Survey.

5.5.4.7 In-Home Visits

Households' energy practices varied, but our visits were notable for the frugality with which most households addressed the energy consumption over which they feel that they have control. Median monthly average electrical usage among the households for which we have actual billing data was 300 kWh for those in multi-family units and 570 kWh for those in single-family homes with usage as low as 112 and 202 kWh, respectively. For those who use natural gas, median monthly usage was 20 therms in multi-family units and 33 therms in single-family homes. (Note that these estimates of average usage are consistent with the 2012 IOU Annual Report estimates of the average CARE customer's monthly bill: 547 kWh and 31 therms.)

When we arrived for our in-home visits, we found that lights were turned off universally, and the unattended operation of televisions, radios, and other electronic devices was

relatively uncommon. (Unattended operation of devices tended to coincide with the presence of children, but then too was moderate in frequency.)

While most households try to use only what they need, some do go further and sacrifice on home comfort for the sake of cost savings or defer other needs to pay energy bills, as we described in separate discussions above on comfort (Section 5.5.3.3) and deferring necessities (Section 5.5.1.2).

We did encounter a few high-energy users too. Four households averaged monthly electricity consumption above 1,000 kWh. Three of these households live in large single-family homes that they bought or had built when they were better off financially, which may have locked them into above average consumption. Two of these homes are in the foothills of the Sierra Nevada Mountains and address perennial fire danger by operating water pumps to keep the vegetation on their properties well hydrated. Both of these households also comprise a large number of dependents, which contributes to higher usage as well. The third single-family home with high usage was a large home in which an elderly woman was taking care of her retirement age son with Alzheimer's. This was a large, newly remodeled home with many energy saving measures installed. All three of these homes have already undergone homeowner-initiated efficiency efforts. The lone multi-family unit with average usage above 1,000 kWh had no natural gas service. They used electric water heat and stove, and the husband also ran multiple Internet servers in the home that he kept running constantly.

Using the information gathered during the walk-throughs of the home and the characterization of the major energy-using systems, we analyzed potential energy saving measures in light of the ESA program requirements. We looked at both measures included in the program as well as unconstrained measures that are not part of the ESA program but may offer additional potential opportunities.

Current Measures

We assessed each site for a number of ESA measures. The measures selected were those that were amenable to assessment from information collected by non-technical interviewers, and included:

- Furnace repair/replacement;
- Furnace clean & tune;
- Central AC repair/replacement;
- Central AC tune-up;
- Room AC replacement;
- Evaporator cooler installation;
- Programmable thermostat;[61]

[61] Assessed in conjunction with furnace replacement, and as a non-ESA opportunity for households with evidence of relatively high heating or central cooling usage.

- Water heater repair/replacement;
- Water heater wrap;
- Water heating pipe insulation;
- Low-flow showerhead;
- Faucet aerators;
- Primary refrigerator replacement;[62]
- Microwave oven installation;
- Clothes washer replacement;
- CFL installation;
- Torchiere replacement;
- Weatherstripping;
- Door/window repairs; and
- Pool pump replacement (for SCE only).

Our assessments of measure opportunities accounted for the fact that some measures are not offered by some IOUs or in some climate zones. We separately tallied opportunities that would not qualify under current ESA IOU and/or climate-zone restrictions, but might nonetheless provide meaningful savings; for example, an air conditioning tune-up for a heavily-used air conditioner in a coastal climate zone.

Our assessments of individual opportunities took into account major non-feasibility criteria that would preclude an apparent measure opportunity from being implemented, but not what we considered to be minor ones. For example, we considered clothes washer replacement only for households with four or more household members in a building with non-central hot-water service, but we did not assess the site for non-feasibility criteria such as suitable water supply and drain lines or presence of a grounded outlet. As such, our estimates of incidence rates for ESA measure opportunities are likely somewhat on the high side.

The results of the exercise are summarized in Table 53. The left-hand columns in this table show the incidence of ESA measure opportunities under current program rules and utility- and climate zone-specific variations in what measures are available to individual households. The right-hand columns show the incidence of additional cases where there appeared to be an opportunity to implement measures, but either the household is not served by an IOU, the utility does not offer the measure, or the utility does not allow the measure in that climate zone. In each case we show both the overall incidence and the incidence among households where the measure might conceivably be applicable; for example, while the ESA central AC tune-up measure has an 11 percent incidence among all households, not all household have central AC. Among those that do, the incidence of a tune-up opportunity is 25 percent.

[62] Based on the program's current policy of allowing replacement for units manufactured on or before 1998.

The results show that nearly all (93%) of households had at least one identified ESA opportunity, and more than two-thirds (70%) had at least three. Six in ten households in the sample had at least three measure opportunities that would provide savings for the same utility—a prerequisite when ESA eligibility is not assessed across fuels. High incidence opportunities included water heater wrap, pipe insulation, CFLs and faucet aerators.

Table 53: ESA Measure Opportunities Among Visited Households for California LI Population

Measure	ESA Opportunity		Opportunity, but not under current ESA IOU and climate zone eligibility	
	% of all households	% of households where measure is applicable	% of all households	% of households where measure is applicable
Furnace repair/replacement	6%	7%	0%	0%
Furnace Clean & Tune	28%	29%	6%	7%
CAC replacement	2%	5%	2%	5%
CAC repair	1%	2%	0%	0%
Central AC tune-up	11%	23%	4%	8%
Room AC replacement	2%	11%	2%	11%
Evaporative cooler installation	24%	28%	9%	11%
Programmable t-stat	4%	4%	5%	6%
Water heater replacement/repair	0%	0%	0%	0%
Water heater wrap	68%	79%	3%	3%
Water heater pipe insulation	70%	77%	3%	3%
Showerhead	13%	14%	0%	0%
Aerators	60%	60%	0%	0%
Refrigerator replacement	16%	16%	2%	2%
Microwave oven	6%	6%	0%	0%
Clothes washer replacement	21%	22%	5%	5%
CFLs	55%	55%	2%	2%
Torchiere replacement	5%	5%	0%	0%
Caulking and weatherstripping	38%	38%	1%	1%
Window repair or replacement	16%	16%	0%	0%
Door repair or replacement	20%	20%	0%	0%
Structural repairs	1%	1%	0%	0%
Pool pump replacement	0%	0%	0%	0%
Any three measures providing savings for the same utility	60%			
Any three measures (all utilities)	70%			
Any single measure	93%			

Source: 2013 CARE participant telephone survey data.
Note: multiple mentions allowed.

Thinking Beyond the Current Program Measures and Approach

The variation in how households address their energy issues and usage highlighted for us the fact that program rules and procedures can sometimes result in missed opportunities and mismatches between measures and household practices. Program assumptions do not always match in-home realities, creating situations where participants are not served optimally. We do not know to what extent this is the case with ESA necessarily because we did not directly assess how flexibly ESA can or does tailor measures to a household's unique circumstances. We are aware that the IOUs implement their programs in response to budget constraints and household penetration goals, and they likely take advantage of the implicit relative flexibility in their measure offerings. However, to help California's IOUs consider whether current program rules strike the proper balance between flexibility and consistency, we are highlighting some of the circumstances below in which we saw the need for household specific situations to be taken into account by ESA or any other efficiency program.

Actual Use (and Non-Use) of Heating and Cooling Equipment

As noted earlier, the use of heating and cooling systems varied, even within the same climate zones. The degree to which households use their heating and cooling systems may be a factor worth incorporating into the solutions offered to treated households. We even encountered homes with natural gas heating systems they did not use at all, often using electric space heaters or living in cooler environments—either out of choice or economic necessity. Hence, changes in energy consumption derived from equipment upgrades or replacements may not result in high savings if the baseline use of that equipment is low or would be low after the measure is implemented.

Exploring these factors with the household could lead to more tailored (and effective) solutions than merely following a standard protocol, if that is currently done for some measures. Sometimes, the solution may be heating or cooling measures that are not currently prescribed by the program, and other times the most effective assistance for a home might be to provide education and advice on the most cost-effective way to keep warm or cool on a highly constrained budget.

Ineffective Cooling

A few households—particularly those in the eastern Los Angeles suburbs near the beginning of the high desert—wondered whether their cooling systems were working correctly. They said that their electric bills increase substantially in summer and fall, but their cooling systems didn't produce air that was as cold as they would expect and didn't cool the home as much as they would like. The majority of these households appeared to have evaporative coolers. Check-ups of their cooling systems and feedback on what they should expect from their cooling systems would provide valuable information to them that they are unlikely to get on their own.

Refrigeration Equipment and Practices

Households' refrigeration needs vary greatly, which means the best refrigeration solution will vary as well, ranging from energy education to replacement. The range of refrigeration issues we encountered included:

- Old primary and secondary refrigerators where standard replacement would help the household save on their energy usage and costs;
- Older refrigerators that appear not to qualify for ESA standards, but whose usage is likely to afford substantial savings potential;
- Partially used—and even completely empty—second refrigerators that were plugged in and one home with *two* secondary refrigerators that were partially empty;[63]
- Second refrigerators located on porches and exposed to direct sunlight, including one in the high desert that received direct sunlight until midday and did not cool properly in the summer months (yet was plugged in year-round);[64]
- One refrigerator with a broken gasket that could warrant a repair; and
- Two households that would not want their old refrigerators to be replaced with a different style (i.e. a side-by-side or bottom freezer refrigerator) because what they had was high quality when they initially purchased it and they are accustomed to that style.

Compact Fluorescent Light Bulbs

A few interviewees indicated that they knew about CFLs—and sometimes even already have CFLs—but are replacing light bulbs with incandescent light bulbs upon burn-out because they can't afford CFLs. For these homes, the installation of CFLs would be a good measure that will have a temporary effect unless the program can continue to provide replacements or convince the household that the added cost of CFLs is worth the energy savings. (Installing fixtures that only accept CFLs are another option, but one that could cause participant frustration at being forced to purchase light bulbs they consider to be too expensive.)

ESA Measures That Are Reversed (or Carried Forward)

The limited number of homes we visited that appear to have just participated in ESA also suggested that measures are occasionally reversed or not used by the household. For example, we heard of participants who:

- Replaced the microwave given to them by the program because it was of poor quality;

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[63] About a quarter of the homes we visited had a second refrigerator plugged in. Most were used, but as noted, a few were either entirely or mostly empty on our visit.

[64] This same refrigerator served as a depot only for nonperishables, possibly because the owner cannot rely on it in summer. Hence, it is an opportunity for refrigerator consolidation as well.

- Switched to heating with space heaters after the program installed a programmable thermostat that neither the occupant nor her landlord could figure out how to operate;
- Replaced the showerhead installed by the program because the preexisting showerhead had a feature that helped relieved some minor physiological issues; and
- Were not able to use lights given to them because they lacked the space for the particular standing lamps provided.

Conversely, one household had participated in ESA in a previous apartment and, took the ESA-supplied showerhead with them when they moved to another apartment.

See Section 10 in Volume 3 for information about the energy-using equipment we observed in in-home interview respondents' homes.

5.5.5 CARE Program Benefits

We asked survey respondents who knew they were on the CARE rate whether their energy bills are now a lot less, somewhat less, somewhat more, a lot more or about the same as before they were on the CARE rate.

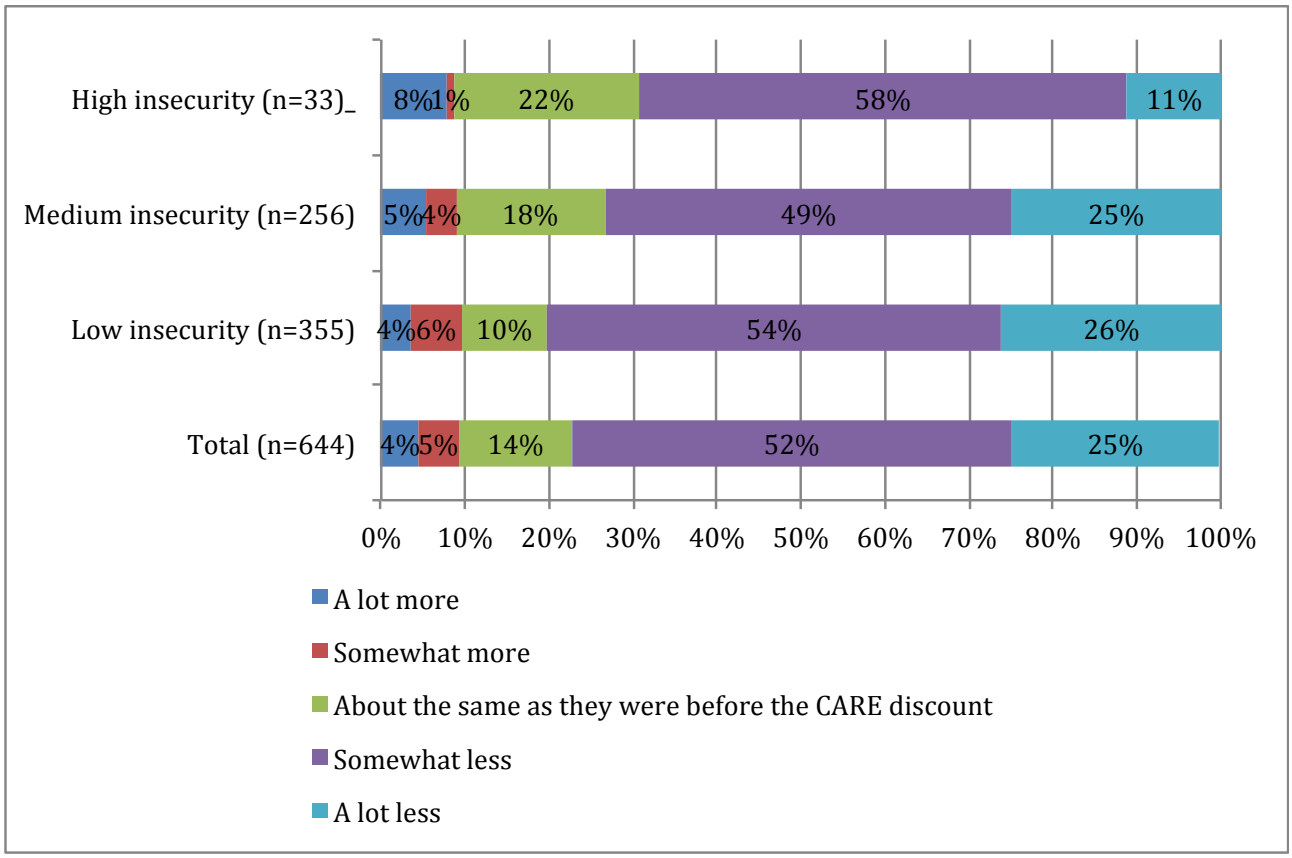
As shown in Figure 69 below (refer to the total row), 25 percent said their bill is "a lot less" and another 52 percent say it is "somewhat less". 14 percent say it is "about the same", while 9 percent say it is more than before they were on the CARE rate. Bills fluctuate over time due to seasonality, changes in electricity and gas prices and household usage. These self-reported results reflect all of those changes including the impact the CARE rate has had on the household, as interpreted by the respondent during a telephone survey (i.e., without having the time and information available to actually compare their bills.)

While these data do not directly reflect satisfaction with the CARE rate, recent research indicates that CARE customers overall are more satisfied with their rate options and rate communications than are the general population of IOU customers.[65]

The figure below shows changes in the energy bill based on energy insecurity categories, with the high energy insecurity segment being less likely to notice that their bill is "a lot less" now that they are on the CARE rate. This result might be because being on the CARE rate has made an impact on the household and moved them to a lower energy insecurity segment. Respondents with higher insecurity levels also have higher energy usage on average.

[65] Residential Rate OIR Customer Survey Research, June 21, 2013 Prepared for the California electric IOUs, Prepared by HINER & Partners, Inc., Page 44.

Figure 69: Change in Energy Bill Since on CARE, by Energy Insecurity Segments (E22a) for California LI Population

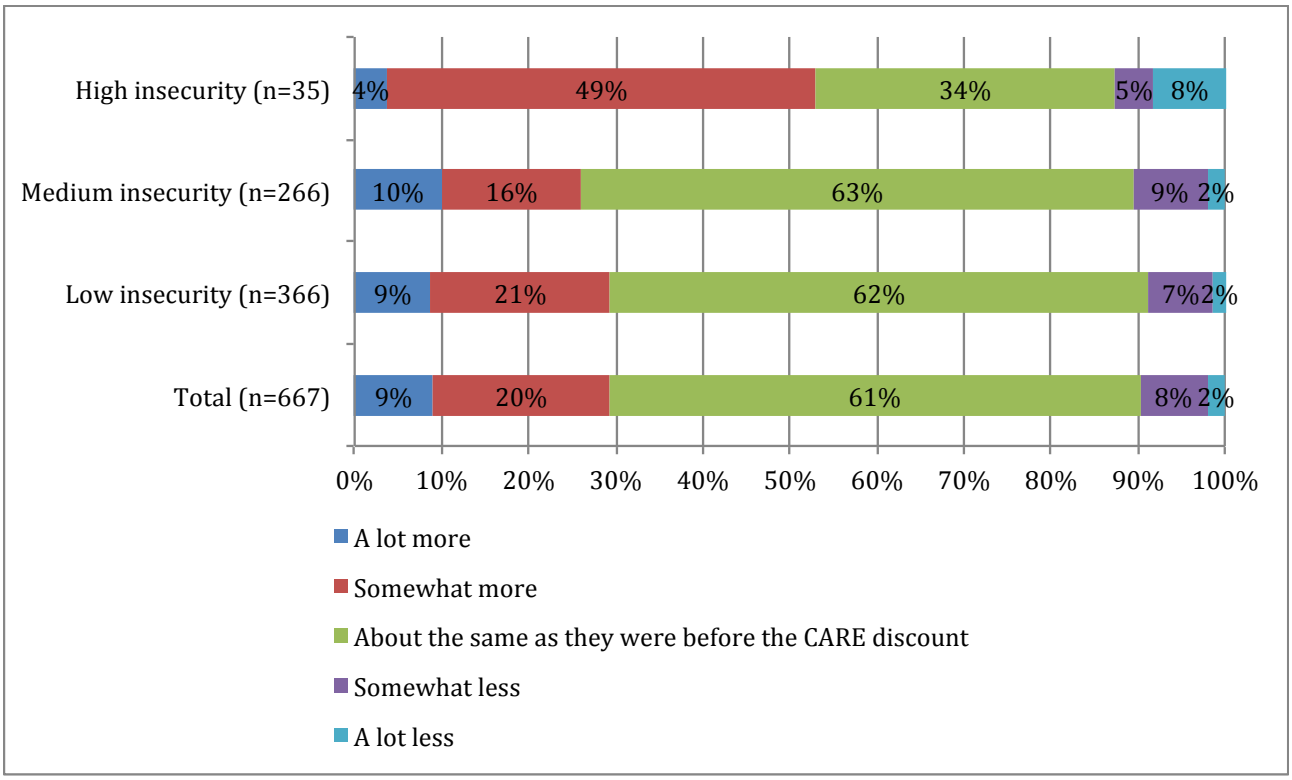


Source: 2013 CARE participant telephone survey data.

Next, we asked those same survey respondents whether they use a lot more, somewhat more, somewhat less, a lot less or about the same amount of energy as before they were on the CARE rate.

As shown in Figure 70 below (refer to the total row), 2 percent said they use "a lot less" energy and another 8 percent say they use "somewhat less". 20 percent say they use somewhat more and another 9 percent say they use "a lot more". Most (61%) say they use about the same. The figure below shows the high energy insecurity segment being more likely to notice that they use energy "somewhat more" and less likely to notice that they use energy "about the same" now that they are on the CARE rate. As noted above, these self-reported results reflect all of those changes including the impact the CARE rate has had on the household, as interpreted by the respondent during a telephone survey (i.e., without having the time and information available to actually compare their bills during the survey.) As mentioned above, respondents with higher insecurity levels also have higher energy usage on average.

Figure 70: Change in Energy Use since on CARE, by Energy Insecurity Segments (E22b) For California LI Population



Source: 2013 CARE participant telephone survey data.