

# CONSULTANT REPORT

## 2009 CALIFORNIA RESIDENTIAL APPLIANCE SATURATION STUDY

### Volume 2: Results

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## ABSTRACT

In 2009, the California Energy Commission funded and administered a Residential Appliance Saturation Study that serves as an update to the 2003 RASS, with the same utilities participating – Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), San Diego Gas & Electric Company (SDG&E), Southern California Gas Company (SoCal Gas), and Los Angeles Department of Water and Power (LADWP). KEMA was the prime consultant.

The study was implemented as a mail survey with an option for respondents to complete it online. The survey requested households to provide information on appliances, equipment, and general consumption patterns. Data collection was completed in early 2010.

The study yielded energy consumption estimates for 27 electric and 10 natural gas residential end-uses and appliance saturations for households. These consumption estimates were developed using a conditional demand analysis, an approach that applied statistical methods to combine survey data, household energy consumption data and weather information to calculate average annual consumption estimates per appliance. The 2009 RASS resulted in end-use saturations for 24,464 individually metered and 1,257 master-metered households. Survey and conditional demand analysis results were weighted to provide population level estimates representative of the participating utilities that allow comparison across utility service territories, forecast climate zones and other variables of interest- dwelling type, dwelling age group, and income.

**Keywords:** California Energy Commission, conditional demand analysis, CDA, unit energy consumption, UEC, residential, appliance, saturations, degree day normalization, energy survey, data collection

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# CHAPTER 1:

## RASS Results Introduction

In 2009, the California Energy Commission funded and administered a Residential Appliance Saturation Study (RASS) that was implemented across the territories of the large investor-owned utilities (IOUs). The 2009 study served as an update to the 2003 RASS, with the same utilities participating—Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas & Electric Company (SDG&E), Southern California Gas Company (SoCal Gas), and Los Angeles Department of Water and Power (LADWP). KEMA was the prime consultant.

The research team initiated the study in 2008, with the sampling plans and implementation beginning in the spring of 2009. Data were collected using a two-stage direct mail approach to a representative sample of California households. The survey requested households to provide information on appliances, equipment, and general usage patterns. The 2003 RASS survey instrument was updated to reflect changes in available energy-consuming technologies in households. An online version of the survey was also developed. A non-response follow-up was implemented after the initial double mailing stage to a sample of the non-respondents. The non-response effort consisted of telephone calls and in-person assistance with completing the survey. Data collection was completed in early 2010.

Survey results were combined with electric and gas billing data provided by each of the participating utilities to model end uses and to calculate estimates of unit energy consumption (UECs) for each electric and natural gas end use. The combined database was used to develop the conditional demand analysis (CDA) using a statistically adjusted engineering model (SAE) approach. The SAE model applied the 2003 RASS CDA formulas to the current survey data, which provided initial engineering estimates for each end use. Normalized annual consumption (NAC) estimates were developed from billing data using a degree-day normalization (DDN) technique. The engineering estimates from each household were regressed against the respective NAC estimates to provide scalar adjustments to the engineering estimates, which were used to estimate new UECs.

The 2009 RASS resulted in end-use saturations for 24,464 individually metered and 1,257 master-metered households. UEC estimates were provided for individually metered households only, while end-use saturations reflected both individually and master-metered households. Survey and CDA results were weighted to provide population-level estimates representative of the participating utilities that allow comparison across utility service territories, climate zones, and other variables of interest - dwelling type, dwelling age-group, and income level, for example.

By using a statewide survey instrument, the Energy Commission and other parties were provided with a consistent set of questions and study results to use for statewide planning and cross-utility comparisons. The Commission-funded sample included sufficient data for utility specific analyses, but SCE and SDG&E each sponsored the sampling of additional households

within their respective service areas that provided them with supplemental data. The project required a joint effort among the study partners, as they collaborated on a research plan, program materials, and implementation strategy. Each utility provided the data necessary to create a unified sampling plan, as well as household-specific information for households that were selected for the sample. Anonymity to survey participants was provided by assigning a generic identification code that represented the sampling stratification variables. Each participating utility was provided a key to the identification code that allowed the utilities to link survey respondents to a specific account.

Because the study was designed to support interests of a variety of users, the final report included a collection of research products:

- Executive Summary – Presents a summary of key findings.
- Volume One – Describes the study design and implementation methods, along with a detailed description of the data cleaning process and CDA methodology.
- Volume Two – Provides a brief description of the CDA along with tabulated results for end-use UECs and saturations.
- Appendices – All referenced appendices have been compiled into one document for convenience.
- RASS Website – Updated version of the 2003 internet tool that supports customized queries of the survey data, including the ability to compare 2009 results to 2003 results.

Volume Two provides a description of the CDA and detailed UEC tables for 27 electric and 10 natural gas end uses, followed by a series of cross tabulations presenting results for all of the survey questions. The tabulations were weighted to the population of the participating utilities. The numbers displayed on the cross tabs are the counts divided by 1,000 to conserve space on the page. For example, the study population is displayed as 11,087, which represents 11.087 million households. The cross tabs contain responses to all of the survey questions as well as some final plugged/cleaned values as noted in the survey documentation, presented by group. The cross tabs (or banners) were created as individual sets for each participating utility. The banners were constructed in four different column display designs:

- Design 1 is by dwelling type, ownership, residence occupancy (full year or partial year), dwelling age, and gas utility.
- Design 2 is by square footage, type of occupant, primary heating fuel, type of air conditioning, and water heating fuel.
- Design 3 is by education, primary language, ethnicity, and income.
- Climate Design banners are by a combination of Energy Commission forecast climate zone and a condensed dwelling type (single family, multi family, and mobile home).

## CHAPTER 2: Conditional Demand Analysis Results

The CDA analysis used a SAE model to produce UEC estimates for electric and natural gas end uses. The parameter estimates from the SAE model provided scalar adjustments to engineering estimates. The SAE model was estimated using only individually metered households with 12 months of energy usage and significant DDN weather normalization models. However, the model was fit to all individually metered households, regardless of whether normalized billing data were available, by multiplying the scalar adjustments for each end use by their respective engineering estimates.

The estimated UECs were calibrated to electric and gas consumption data at the sampling stratum level, for all individually metered survey respondents, regardless of whether normalized consumption data were available. The following steps were used in the calibration process.

- UECs were estimated for all individually metered households. The individual end-use UECs within a household were combined to provide an estimated total UEC for that household.
- Energy consumption was defined for each household as follows:
- Where an estimated DDN model was available, the annual consumption from the DDN model was used to represent the actual consumption.
  - In cases where a DDN model was not available but limited billing data were available, an average use per day from the available billing series was calculated and used to estimate 12-month consumption.
  - For cases where average use per day could not be constructed from the available billing data then the stratum level mean annual consumption was used.
- Sampling stratum-level calibration factors were calculated by dividing stratum-level Normalized Annual Consumption (NAC) by the stratum-level predicted household UEC. This was done for electric and gas separately. The calibration factors were only calculated for households that had electric or gas NAC estimates.
- The stratum-level calibration factors were multiplied by each of the respective UECs to provide calibrated UEC estimates. Seven households did not have electric billing data and were excluded from the final UEC estimates; however, all individually metered gas households were included in the UEC estimates, regardless of whether billing data were available.
- Once UECs were calibrated, the weighted average UECs were determined for various household segments using case weights.

Tables 2-1 through 2-4 present the electric and gas calibration ratios by sampling stratum for each electric utility. Also included in the tables are the number of records included in the calculation of each of the respective electric and gas calibration factors and the total number of households for which UECs were calculated. A calibration ratio of one would indicate that the estimated household UEC provides a perfect estimate for actual household consumption. Deviations from one result from survey response bias, but the proximity of the calibration ratios to one indicates that such bias was limited.

**Table 2-1: PG&E Calibration Ratios**

Strata				Electric			Natural Gas		
Code	Electric Utility	Electric Heat Presence	Home Type	Calibration Factor	Responses used in calibration factor	Total Responses	Calibration Factor	Responses used in calibration factor	Total Responses
P01	PGE	No Elec Heat	SF High	1.18	140	141	1.36	54	58
P02	PGE	No Elec Heat	SF High	1.11	208	210	1.05	185	186
P03	PGE	No Elec Heat	SF High	1.11	434	438	1.15	359	365
P04	PGE	No Elec Heat	SF High	1.08	999	1,011	1.08	965	980
P05	PGE	No Elec Heat	SF High	1.06	472	479	0.88	465	469
P06	PGE	No Elec Heat	SF Low	0.62	107	111	1.52	48	58
P07	PGE	No Elec Heat	SF Low	0.65	80	82	0.92	66	70
P08	PGE	No Elec Heat	SF Low	0.77	175	184	1.14	153	159
P09	PGE	No Elec Heat	SF Low	0.76	602	614	0.92	572	593
P10	PGE	No Elec Heat	SF Low	0.72	569	581	0.84	568	571
P11	PGE	No Elec Heat	MF	1.09	116	117	1.35	109	113
P12	PGE	No Elec Heat	MF	0.95	485	489	1.10	447	474
P13	PGE	No Elec Heat	MF	0.78	608	614	1.00	544	586
P14	PGE	No Elec Heat	MF	0.93	99	100	1.36	78	83
P15	PGE	Elec Heat	SF High	1.23	186	189	1.19	11	19
P16	PGE	Elec Heat	SF High	1.21	65	66	1.43	3	5
P17	PGE	Elec Heat	SF High	1.11	130	132	1.10	15	19
P18	PGE	Elec Heat	SF High	1.23	98	100	0.73	25	30
P19	PGE	Elec Heat	SF High	1.10	64	65	0.84	18	19
P20	PGE	Elec Heat	SF Low	0.49	77	83	1.09	7	22
P21	PGE	Elec Heat	SF Low	0.66	39	41	0.91	13	19
P22	PGE	Elec Heat	SF Low	0.61	47	49	0.73	19	26
P23	PGE	Elec Heat	SF Low	0.45	55	58	0.78	4	14
P24	PGE	Elec Heat	MF	1.10	190	192	1.13	29	51
P25	PGE	Elec Heat	MF	0.80	220	223	0.66	47	73
P26	PGE	Elec Heat	MF	1.12	61	61	1.27	10	15
P27	PGE	No Elec Heat	SF High	1.04	43	43	0.95	42	42
P28	PGE	No Elec Heat	SF High	1.01	54	55	1.18	50	50
P29	PGE	No Elec Heat	SF High	1.01	54	54	1.11	52	52
P30	PGE	No Elec Heat	SF High	1.10	57	58	1.04	42	48
P31	PGE	No Elec Heat	SF Low	0.83	118	119	0.96	104	108
P32	PGE	No Elec Heat	MF	0.92	106	107	0.99	86	95
P33	PGE	Elec Heat	All	0.73	43	43	0.84	6	12
P34	PGE	No Elec Heat	SF High	1.09	61	61	1.14	60	60
P35	PGE	No Elec Heat	SF High	1.14	179	179	1.09	167	174
P36	PGE	No Elec Heat	SF High	1.07	54	54	0.75	53	53
P37	PGE	No Elec Heat	SF Low	0.81	107	107	0.97	104	106
P38	PGE	No Elec Heat	MF	1.16	47	48	1.11	42	46
P39	PGE	Elec Heat	All	1.27	32	32	1.08	15	19

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-2: SDG&E Calibration Ratios**

Strata				Electric			Natural Gas		
Code	Electric Utility	Electric Heat Presence	Home Type	Calibration Factor	Responses used in calibration factor	Total Responses	Calibration Factor	Responses used in calibration factor	Total Responses
G01	SDG&E	No Elec Heat	Low	0.62	954	988	0.95	712	800
G02	SDG&E	No Elec Heat	Med	0.92	1,424	1,442	0.96	1,197	1,288
G03	SDG&E	No Elec Heat	High	1.16	984	1,000	1.00	846	916
G04	SDG&E	Elec Heat	Low	0.53	64	70	0.96	5	15
G05	SDG&E	Elec Heat	Med	0.97	65	66	1.27	9	18
G06	SDG&E	Elec Heat	High	1.32	85	91	1.31	2	9
G07	SDG&E	No Elec Heat	Med	0.78	77	79	0.85	62	70
G08	SDG&E	No Elec Heat	High	1.17	74	77	1.22	56	62
G09	SDG&E	All Other	All	0.63	63	70	0.73	40	51

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-3: LADWP Calibration Ratios**

Strata				Electric			Natural Gas		
Code	Electric Utility	Electric Heat Presence	Home Type	Calibration Factor	Responses used in calibration factor	Total Responses	Calibration Factor	Responses used in calibration factor	Total Responses
L01	LADWP	No Elec Heat	Low	0.68	434	628	1.17	472	577
L02	LADWP	No Elec Heat	Low	0.69	127	192	0.92	152	185
L03	LADWP	No Elec Heat	Med	1.04	357	438	1.29	352	410
L04	LADWP	No Elec Heat	Med	0.98	237	276	1.00	229	265
L05	LADWP	No Elec Heat	High	1.45	222	247	1.57	212	234
L06	LADWP	No Elec Heat	High	1.33	350	392	1.23	360	388
L07	LADWP	No Elec Heat	Low	0.56	54	124	1.08	86	111
L08	LADWP	No Elec Heat	Low	0.71	17	52	1.14	35	46
L09	LADWP	No Elec Heat	Med	1.06	32	55	1.31	44	51
L10	LADWP	No Elec Heat	Med	0.99	50	81	0.83	71	77
L11	LADWP	No Elec Heat	High	1.70	45	59	1.77	42	56
L12	LADWP	No Elec Heat	High	1.36	59	84	1.18	71	83
L13	LADWP	Elec Heat	All	1.28	29	42	1.13	1	24

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-4: SCE Calibration Ratios**

Strata				Electric			Natural Gas		
Code	Electric Utility	Electric Heat Presence	Home Type	Calibration Factor	Responses used in calibration factor	Total Responses	Calibration Factor	Responses used in calibration factor	Total Responses
S01	SCE	No Elec Heat	SF High	1.15	293	298	1.09	199	253
S02	SCE	No Elec Heat	SF High	1.12	1,090	1,099	1.05	1,056	1,069
S03	SCE	No Elec Heat	SF High	1.12	934	943	1.13	817	909
S04	SCE	No Elec Heat	SF High	1.05	1,088	1,125	1.01	925	1,053
S05	SCE	No Elec Heat	SF High	1.21	87	87	0.99	81	84
S06	SCE	No Elec Heat	SF Low	0.66	235	245	1.11	157	190
S07	SCE	No Elec Heat	SF Low	0.80	769	785	0.95	729	758
S08	SCE	No Elec Heat	SF Low	0.78	605	615	1.08	484	577
S09	SCE	No Elec Heat	SF Low	0.60	641	674	0.91	451	611
S10	SCE	No Elec Heat	SF Low	0.81	68	69	0.75	65	67
S11	SCE	No Elec Heat	MF	1.12	360	365	1.31	161	269
S12	SCE	No Elec Heat	MF	0.89	640	645	1.15	492	615
S13	SCE	No Elec Heat	MF	0.93	465	473	1.08	262	425
S14	SCE	No Elec Heat	MF	0.99	657	690	1.03	411	622
S15	SCE	No Elec Heat	MF	1.09	55	56	1.15	44	51
S16	SCE	Elec Heat	SF High	1.30	88	90	1.20	29	38
S17	SCE	Elec Heat	SF High	1.19	88	88	1.09	30	50
S18	SCE	Elec Heat	SF High	1.15	102	104	0.99	31	42
S19	SCE	Elec Heat	SF High	1.26	144	145	1.23	10	20
S20	SCE	Elec Heat	SF Low	0.64	151	158	0.92	43	90
S21	SCE	Elec Heat	MF	1.13	284	287	1.04	33	138
S22	SCE	Elec Heat	MF	1.21	153	158	1.33	18	67
S23	SCE	Elec Heat	MF	1.09	135	139	0.86	29	92
S24	SCE	Elec Heat	MF	1.22	312	323	10.84	4	23
S25	SCE	No Elec Heat	SF High	1.15	52	52	1.19	50	51
S26	SCE	No Elec Heat	SF High	1.00	50	50	1.21	40	44
S27	SCE	No Elec Heat	SF High	0.96	216	224	0.89	166	205
S28	SCE	No Elec Heat	SF High	1.20	70	72	1.06	51	58
S29	SCE	No Elec Heat	SF Low	0.91	38	39	0.90	35	39
S30	SCE	No Elec Heat	SF Low	0.64	107	112	1.11	66	98
S31	SCE	No Elec Heat	SF Low	0.70	75	76	0.84	46	63
S32	SCE	No Elec Heat	MF	1.01	149	152	1.05	90	135
S33	SCE	Elec Heat	All	0.92	74	76	0.85	22	43

Source: 2010 California Residential Appliance Saturation Survey

## Estimated UECs

This section presents electric and natural gas UEC estimates by household segment. Saturations presented in each of the tables below were divided by 1,000. While UEC estimates were provided for the following segmentation variables, the discussion that follows focuses primarily on segmentation by residence type.

- Residence type – Single-family homes, townhomes, 2–4 unit apartments, 5+ unit apartments, and mobile homes
- New and existing homes
- Utility service area
- Weather-sensitive end uses only



- Energy Commission forecasting climate zones along with residence type

UEC estimates based on low saturations and/or ones that are reported for small segments may not accurately reflect the actual energy usage for the end use. The authors recommend that caution is used when examining UECs from end uses that are the result of fewer than 25 observations and that extreme care is employed if fewer than 10 observations were used to calculate the segment's end-use UEC. The number of observations needed to accurately determine a segment's end-use UEC will be larger for non-weather sensitive end uses than for space conditioning and weather-sensitive end uses.

### Estimated Electric UECs

The average annual household electricity consumption was estimated as 6,296 kWh for individually-metered households in the study population, based on 2009 RASS billing data for 24,457 households. This section contains 16 tables that present the calibrated electric UECs, segment frequencies, and the associated saturations.

- Table 2-5 shows estimated UECs by residence type.
- Tables 2-6 and 2-7 present estimated UECs by age of dwelling.
- Table 2-8 presents estimated UECs by electric utility service area.
- Tables 2-9 and 2-10 show weather-sensitive end-use estimated UECs by Energy Commission forecasting climate zone.
- Tables 2-11 through 2-20 present estimated UECs for space conditioning end uses by Energy Commission forecasting climate zone and residence type.

### *Space Heating*

Separate electric space heating UECs were estimated for conventional (resistance) electric space heating and heat-pump space heating. In general, electric heating UECs were lower than 2003 estimates for a number of reasons. First, the use of DDN weather-normalized consumption adjusted consumption estimates for extreme weather events. In addition, the use of DDN allowed the identification of households that have electric heat but seldom use it. Finally, the SAE model was based on using annualized data in the model, which eliminated monthly weather variations.

As presented in Table 2-5, conventional space heating UECs varied from 1,171 kWh (kilowatt hours) for single-family homes to 501 kWh for townhomes. Heat-pump UECs showed similar variation ranging from 994 kWh for single-family homes to 320 kWh for townhomes. Auxiliary heating UECs varied from 382 kWh for single-family homes to 62 kWh for apartments in buildings with two to four units.

### *Ventilation*

Furnace fans, used to blow forced hot air from a gas heating system, had estimated UECs that ranged from 216 kWh for single-family home to 64 kWh for apartments in buildings with 5 or more units. Table 2-8 shows that UECs were the highest for PG&E territory.

### *Air Conditioning*

Air conditioning UECs were estimated separately for central air conditioning (CAC), room air conditioning (RAC), and evaporative coolers. Key findings included the following:

Central air conditioning – UECs were lower than the 2003 RASS, ranging from 894 kWh for single-family homes to 324 kWh for apartments in buildings with five or more units. A number of factors may have contributed to the lower CAC UECs. First, the use of DDN allowed for the SAE model to include a term that identified households with no cooling load. In addition, the billing series used for the SAE and weather normalization was from 2008 and 2009, a period with significant economic decline.

Room air conditioning – Conversely, room air conditioners showed slightly higher estimated UECs than the 2003 RASS. The average room air conditioning UEC for single-family homes was 293 kWh, and mobile homes were 423 kWh.

Evaporative cooling – UECs ranged from 650 kWh for single-family homes to 266 kWh for apartments in buildings with five or more units. However, due to relatively low sample sizes, these estimates should be treated with caution.

### *Water Heating*

Water heating UECs were estimated for both conventional electric water heating and solar water heat with electric backup. For conventional water heat, UECs ranged from a high of 3,169 kWh for single-family homes to 1,301 kWh for apartments in buildings with two to four units.

The UEC for solar water heating with electric backup for single-family homes was roughly half of conventional water heating at 1,877 kWh. Solar water heating was also estimated for townhomes, but not for either type of apartment buildings or mobile-home residence types. Solar water heat UECs were reported with caution, due to the relatively low saturations.

### *Dishwashers, Clothes Washers, and Dryers*

Dishwasher UECs range from 83 kWh for single-family homes to 50 kWh for apartments in buildings with five or more units. Clothes washer UECs reflected only the consumption attributed to the motor loads, as water heating for clothes washers was captured by the water heating UECs. The estimated UECs for clothes washers ranged from 121 kWh for single-family homes to 7 kWh for mobile homes. Electric dryer UECs ranged from 719 kWh to 480 kWh across residence types.

### *Refrigerators and Freezers*

UECs for first refrigerators ranged from 827 kWh for single-family homes to 643 kWh for apartments in buildings with two to four units. Meanwhile, UEC estimates for second refrigerators (which reflect the usage of all secondary units) showed considerable variation by residence type. Estimates for second refrigerators for single-family and mobile homes were

1,286 kWh and 1,123 kWh, respectively. Townhomes and apartments in buildings with five or more units had estimated UECs for second refrigerators of 665 kWh and 635 kWh, respectively. Freezer UECs ranged between 968 and 742 kWh.

### *Pools and Spas*

The estimated pool pump UEC was 3,502 kWh for single-family homes, with substantial variation by utility. Pool pumps reported the highest UEC for LADWP territory at 4,360 kWh, followed by SDG&E at 3,794 kWh. For PG&E territory, the estimated pool pump UEC was over 1,000 kWh less than LADWP at 3,250 kWh.

Spa UECs were estimated separately for filter pumps and spa heat. The estimated UEC for spa filter pumps ranged from 293 kWh for single-family homes to 134 for townhomes. Spa heating UECs were much higher, ranging from 1,013 kWh for single-family homes, 764 kWh for townhomes, and 981 kWh for mobile homes. However, both spa UECs for mobile homes were estimated using a sample of 25. Therefore, caution should be used when interpreting this UECs estimate.

### *Outdoor Lighting*

The estimated UECs for outdoor lighting for single-family homes was 388 kWh, which was higher compared to an estimate of 284 kWh from the 2003 RASS. The estimated outdoor lighting UEC for townhomes of 210 kWh was also higher than the 2003 estimate of 173 kWh. Meanwhile, the outdoor lighting UEC estimates for the remaining three residence types were all lower than the 2003 estimates at 168 kWh, 196 kWh, and 204 kWh for small and larger apartment buildings and mobile homes, respectively. The 2003 estimates for these residence types were 228 kWh, 206 kWh, and 232 kWh, respectively.

### *Cooking*

The electric range/oven UECs varied from 310 kWh for single-family homes to 165 kWh for larger apartment buildings. Comparing the results to those found in the 2003 RASS, only the estimated range/oven UECs for small apartment buildings varied much. The current study found the average range/oven UEC for apartments in buildings with two to four units to be 218 kWh, while the 2003 RASS reported 191 kWh. This difference is most likely due to differences in the reported number of households in the small apartment building residence type between the two studies.

### *Televisions*

Television UECs were higher than in the 2003 RASS, which were reported to be low. Estimates presented in Table 2-5 show that television UECs ranged from 738 kWh for single-family homes to 574 kWh for apartments in buildings with two to four units. These estimates compare to 2003 estimates of 519 kWh and 536 kWh, respectively.

Changes to the survey may provide one potential explanation for the difference. The 2009 RASS specifically asked for information regarding the number of hours spent viewing small and large screen TVs separately. The 2003 study asked for total hours viewing all TVs, then the total hours viewing were split during the analysis based on the proportion of small and large screen TVs.

Requiring responses for each size TV separately may have resulted in more accurate estimates of hours viewed by forcing people to think about other members in their family's viewing habits. In addition, the current survey included questions on large and small LCD and plasma TVs, while the 2003 RASS did not.

#### *Personal Computers and Home Offices*

Personal computer (PC) UECs increased from the 2003 RASS for all residence types except for townhomes, which decreased slightly. The average UEC for PCs in the current study ranged from 673 kWh for single-family homes to 437 kWh for mobile homes. However, home-office UECs actually decreased across all residence types. The combined home PC and home-office UECs were comparable to estimates from the 2003 RASS. The increase in PC UECs may be attributed to the change in PC questions that split out desktop and laptop PCs.

#### *Well Pumps*

The estimated UECs for well pumps for single-family homes, townhomes, and mobile homes were 562 kWh, 511 kWh, and 447 kWh respectively. UECs were also estimated for small and large multi-family homes, 614 kWh and 561 kWh, respectively. However, the multifamily estimates may reflect usage of more than one unit and should be treated with caution.

#### *Miscellaneous*

Estimates for the miscellaneous UEC ranged from 2,177 kWh for single-family homes to 1,141 kWh for apartments in buildings with five or more units. These estimates compare to estimates from the 2003 RASS that ranged from 2,147 kWh for single-family homes to 1,257 kWh for larger apartment buildings.

**Table 2-5: Electric UECs by Residence Type**

	Single Family		Town Home		2-4 Unit Apt		5+ Unit Apt		Mobile Home	
	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.
All Household	7,605	15354 homes	4,561	1990 homes	3,821	2018 homes	3,709	4236 homes	5,580	858 homes
Conv. Heat	1,171	0.01	501	0.04	552	0.06	570	0.11	739	0.07
Heat Pump	994	0.01	320	0.01	324	0.01	522	0.03	504	0.02
Aux. Heat	382	0.01	86	0.00	62	0.02	99	0.02	342	0.01
Furnace Fan	216	0.73	91	0.61	80	0.42	64	0.40	157	0.66
Attic Ceiling Fan	96	0.19	217	0.08	286	0.08	304	0.06	280	0.11
Central Air Conditioning	894	0.56	483	0.41	494	0.33	324	0.36	876	0.48
Room AC	293	0.13	126	0.11	104	0.19	81	0.24	423	0.16
Evap. Cooler	650	0.06	359	0.02	383	0.04	266	0.02	552	0.28
Water Heat	3,169	0.05	2,190	0.06	1,301	0.09	1,543	0.11	2,575	0.16
Solar Water Heat	1,877	0.00	2,075	0.00	.	0.00	.	0.00	.	0.00
Dryer	719	0.33	508	0.36	540	0.21	480	0.21	489	0.37
Clothes Washer	121	0.96	66	0.79	60	0.46	26	0.36	7	0.81
Dishwasher	83	0.74	62	0.68	60	0.49	50	0.58	52	0.56
First Refrigerator	827	1.00	731	1.00	643	1.00	660	1.00	740	1.00
Second Refrigerator	1,286	0.33	665	0.14	695	0.10	635	0.05	1,123	0.18
Freezer	968	0.23	877	0.14	846	0.10	742	0.06	802	0.27
Pool Pump	3,502	0.16	.	0.00	.	0.00	.	0.00	.	0.00
Spa	293	0.14	134	0.02	.	0.00	.	0.00	264	0.03
Outdoor Lighting	388	0.78	210	0.65	168	0.42	196	0.29	204	0.65
Range/Oven	310	0.42	234	0.43	218	0.43	165	0.55	224	0.30
TV	738	1.00	646	1.00	574	1.00	611	1.00	697	1.00
Spa Electric Heat	1,013	0.07	764	0.02	.	0.00	.	0.00	981	0.03
Microwave	133	0.94	111	0.93	109	0.88	99	0.89	109	0.88
Home Office	89	0.23	71	0.20	51	0.17	62	0.16	132	0.08
PC	673	0.88	495	0.84	479	0.77	498	0.80	437	0.72
Well Pump	562	0.06	511	0.02	614	0.01	561	0.01	447	0.20
Miscellaneous	2,177		1,441		1,233		1,141		1,510	

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-6: Electric UECs by Home Age**

	New House		Old House	
	UEC	Saturation	UEC	Saturation
All Household	6,645	2077 homes	6,262	22379 homes
Conv. Heat	932	0.04	688	0.04
Heat Pump	653	0.02	640	0.01
Aux. Heat	62	0.00	228	0.01
Furnace Fan	200	0.82	177	0.61
Attic Ceiling Fan	98	0.14	132	0.14
Central Air Conditioning	1,055	0.83	715	0.46
Room AC	675	0.07	187	0.16
Evap Cooler	854	0.05	561	0.05
Water Heat	2,214	0.06	2,408	0.07
Solar Water Heat	.	0.00	1,959	0.00
Dryer	549	0.34	663	0.30
Clothes Washer	118	0.92	102	0.78
Dishwasher	78	0.93	74	0.66
First Refrigerator	707	1.00	778	1.00
Second Refrigerator	1,079	0.29	1,227	0.24
Freezer	768	0.18	955	0.18
Pool Pump	3,341	0.07	3,513	0.10
Spa	311	0.08	288	0.09
Outdoor Lighting	424	0.67	334	0.64
Range/Oven	268	0.39	262	0.45
TV	645	1.00	698	1.00
Spa Electric Heat	925	0.03	1,011	0.05
Microwave	127	0.96	122	0.92
Home Office	75	0.23	82	0.20
PC	647	0.93	607	0.84
Well Pump	563	0.05	551	0.04
Miscellaneous	1,720		1,849	

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-7: Electric Household UECs by Home Age, Electric Utility, and Residence Type**

	New House		Old House	
	Household UEC	Count	Household UEC	Count
All	6,645	2,077	6,262	22,379
All PG&E	6,429	648	6,461	6,742
SF PG&E	7,504	468	7,701	4,535
MF PG&E	4,101	166	3,992	2,023
All SDG&E	6,635	331	5,911	3,551
SF SDG&E	7,811	204	7,453	2,368
MF SDG&E	3,725	124	3,232	1,134
All SCE	7,134	968	6,376	9,546
SF SCE	8,063	665	7,450	5,626
MF SCE	3,817	265	4,350	3,356
All LADWP	4,689	130	5,568	2,540
SF LADWP	9,764	40	7,777	1,448
MF LADWP	3,583	90	3,372	1,086

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-8: Electric UECs by Electric Utility**

	PG&E		SDG&E		SCE		LADWP	
	UEC	Satura- tion	UEC	Satura- tion	UEC	Satura- tion	UEC	Satura- tion
All Household	6,458	7390 homes	5,970	3882 homes	6,444	10514 homes	5,538	2670 homes
Conv. Heat	1,032	0.05	353	0.03	371	0.03	169	0.02
Heat Pump	818	0.01	483	0.02	508	0.01	228	0.00
Aux. Heat	267	0.02	98	0.01	141	0.01	66	0.00
Furnace Fan	245	0.65	133	0.62	143	0.66	99	0.48
Attic Ceiling Fan	104	0.15	118	0.13	156	0.15	139	0.10
Central Air Conditioning	709	0.44	493	0.43	883	0.58	699	0.41
Room AC	221	0.11	107	0.13	238	0.18	152	0.24
Evap. Cooler	458	0.06	494	0.02	716	0.07	345	0.03
Water Heat	2,680	0.09	2,149	0.07	2,143	0.05	1,737	0.05
Solar Water Heat	1,897	0.00	2,231	0.00	1,838	0.00	.	0.00
Dryer	648	0.46	587	0.28	693	0.19	639	0.15
Clothes Washer	88	0.83	110	0.78	119	0.82	107	0.59
Dishwasher	71	0.73	76	0.71	77	0.68	73	0.49
First Refrigerator	774	1.00	725	1.00	784	1.00	766	1.00
Second Refrigerator	1,226	0.25	1,188	0.20	1,174	0.26	1,344	0.18
Freezer	959	0.22	898	0.15	914	0.16	964	0.12
Pool Pump	3,250	0.09	3,794	0.12	3,442	0.11	4,360	0.08
Spa	274	0.08	283	0.13	294	0.10	381	0.04
Outdoor Lighting	319	0.67	345	0.67	348	0.66	423	0.50
Range/Oven	251	0.58	271	0.51	282	0.32	255	0.27
TV	672	1.00	620	1.00	735	1.00	696	1.00
Spa Electric Heat	1,056	0.06	956	0.06	951	0.04	1,003	0.01
Microwave	119	0.93	117	0.94	128	0.93	123	0.88
Home Office	82	0.19	83	0.25	80	0.21	85	0.20
PC	593	0.86	638	0.87	618	0.85	625	0.80
Well Pump	547	0.08	513	0.01	594	0.02	428	0.01
Miscellaneous	1,798		1,835		1,909		1,740	

Source: 2010 California Residential Appliance Saturation Survey



**Table 2-9: Electric UECs for Weather-Sensitive End Uses in Forecast Zones 1-7**

	Forecast 1		Forecast 2		Forecast 3		Forecast 4		Forecast 5		Forecast 7	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	7,509	638 homes	7,933	628 homes	7,870	1313 homes	6,452	2617 homes	4,870	2194 homes	7,303	1180 homes
Conv. Heat	1,122	0.09	1,887	0.02	1,061	0.02	759	0.05	1,164	0.07	1,150	0.02
Heat Pump	932	0.01	905	0.00	657	0.02	412	0.01	1,213	0.02	3,069	0.00
Aux. Heat	360	0.03	287	0.03	444	0.01	170	0.02	343	0.01	890	0.01
Furnace Fan	239	0.49	200	0.70	174	0.75	178	0.72	441	0.52	255	0.64
Attic Ceiling Fan	40	0.16	53	0.23	258	0.19	70	0.17	26	0.09	298	0.19
Central Air Conditioning	660	0.43	811	0.79	1,189	0.77	348	0.46	40	0.10	1,122	0.61
Room AC	314	0.10	286	0.16	510	0.13	90	0.13	20	0.05	358	0.23
Evap Cooler	360	0.12	349	0.09	582	0.15	255	0.02	64	0.00	646	0.27
Water Heat	2,852	0.33	2,780	0.07	2,871	0.10	2,711	0.07	2,066	0.05	2,799	0.07
Solar Water Heat	1,435	0.00	1,972	0.00	2,051	0.01	937	0.00	3,073	0.00	2,138	0.00

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-10: Electric UECs for Weather-Sensitive End Uses in Forecast Zones 8 to 13**

	Forecast 8		Forecast 9		Forecast 10		Forecast 11		Forecast 12		Forecast 13	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	6,046	3672 homes	6,161	2456 homes	7,143	3206 homes	4,771	1573 homes	6,866	1097 homes	5,970	3882 homes
Conv. Heat	296	0.04	328	0.03	606	0.01	169	0.03	166	0.01	353	0.03
Heat Pump	252	0.02	401	0.01	1,204	0.01	229	0.01	203	0.00	483	0.02
Aux. Heat	53	0.01	262	0.00	235	0.00	66	0.00	.	0.00	98	0.01
Furnace Fan	87	0.65	115	0.58	212	0.78	89	0.38	110	0.66	133	0.62
Attic Ceiling Fan	75	0.12	129	0.15	229	0.18	138	0.07	140	0.17	118	0.13
Central Air Conditioning	382	0.44	763	0.54	1,318	0.80	494	0.25	829	0.68	493	0.43
Room AC	122	0.15	216	0.26	445	0.12	126	0.22	187	0.27	107	0.13
Evap. Cooler	250	0.02	718	0.04	844	0.14	258	0.02	417	0.04	494	0.02
Water Heat	2,113	0.05	1,713	0.04	2,377	0.06	1,651	0.06	2,247	0.02	2,149	0.07
Solar Water Heat	.	0.00	1,557	0.00	1,718	0.00	.	0.00	.	0.00	2,231	0.00

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-11: Space Conditioning Electric UECs for Single-Family Residences in Forecast Zones 1-7**

Single Family	Forecast 1		Forecast 2		Forecast 3		Forecast 4		Forecast 5		Forecast 7	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	8,217	523 homes	8,919	505 homes	8,836	988 homes	7,514	1782 homes	6,138	1205 homes	7,987	707 homes
Conv. Heat	1,275	0.09	2,090	0.02	1,312	0.01	1,043	0.02	1,932	0.02	1,590	0.01
Heat Pump	1,108	0.01	1,010	0.00	831	0.02	813	0.00	3,103	0.00	5,509	0.00
Aux. Heat	400	0.04	301	0.03	417	0.01	284	0.02	663	0.01	954	0.01
Central Air Conditioning	748	0.45	904	0.81	1,359	0.80	415	0.50	54	0.11	1,169	0.66
Room AC	349	0.11	341	0.14	649	0.12	111	0.10	24	0.06	389	0.23

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-12: Space Conditioning Electric UECs for Single-Family Residences in Forecast Zones 8-13**

Single Family	Forecast 8		Forecast 9		Forecast 10		Forecast 11		Forecast 12		Forecast 13	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	7,464	1948 homes	7,138	1613 homes	7,862	2023 homes	6,806	767 homes	8,975	721 homes	7,486	2572 homes
Conv. Heat	593	0.01	444	0.01	1,200	0.01	178	0.00	323	0.00	759	0.00
Heat Pump	419	0.01	818	0.00	1,356	0.01	452	0.00	.	0.00	1,111	0.01
Aux. Heat	178	0.00	467	0.00	259	0.00	.	0.00	.	0.00	403	0.00
Central Air Conditioning	480	0.51	908	0.59	1,412	0.81	773	0.24	999	0.80	590	0.52
Room AC	188	0.11	276	0.24	527	0.11	249	0.17	323	0.19	150	0.09

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-13: Space Conditioning Electric UECs for Townhomes in Forecast Zones 1-7**

Town Home	Forecast 1		Forecast 2		Forecast 3		Forecast 4		Forecast 5		Forecast 7	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	7,410	17 homes	4,154	37 homes	5,762	44 homes	4,562	249 homes	3,815	216 homes	4,553	63 homes
Conv. Heat	525	0.06	.	0.00	722	0.00	682	0.01	1,267	0.02	2,815	0.02
Heat Pump	81	0.02	.	0.00	.	0.00	719	0.00	.	0.00	194	0.00
Aux. Heat	.	0.00	.	0.00	.	0.00	94	0.00	365	0.00	.	0.00
Central Air Conditioning	718	0.80	327	0.87	742	0.89	231	0.42	51	0.07	830	0.56
Room AC	218	0.07	153	0.11	330	0.10	74	0.07	31	0.01	160	0.08

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-14: Space Conditioning Electric UECs for Townhomes in Forecast Zones 8-13**

Town Home	Forecast 8		Forecast 9		Forecast 10		Forecast 11		Forecast 12		Forecast 13	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	4,668	415 homes	4,575	168 homes	5,530	208 homes	4,663	144 homes	3,951	61 homes	3,787	368 homes
Conv. Heat	436	0.07	278	0.11	282	0.00	316	0.04	123	0.01	652	0.09
Heat Pump	130	0.01	381	0.01	1,181	0.00	.	0.00	.	0.00	305	0.01
Aux. Heat	47	0.01	112	0.01	168	0.00	.	0.00	.	0.00	56	0.01
Central Air Conditioning	216	0.41	506	0.38	1,136	0.89	459	0.31	446	0.48	294	0.26
Room AC	83	0.12	105	0.22	215	0.13	135	0.22	109	0.32	194	0.04

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-15: Space Conditioning Electric UECs for 2-4 Unit Apartments in Forecast Zones 1-7**

2-4 Unit Apt	Forecast 1		Forecast 2		Forecast 3		Forecast 4		Forecast 5		Forecast 7	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	3,674	19 homes	3,304	26 homes	4,595	86 homes	4,197	191 homes	3,418	244 homes	4,069	114 homes
Conv. Heat	.	0.00	503	0.02	408	0.02	1,046	0.14	382	0.06	263	0.07
Heat Pump	.	0.00	.	0.00	.	0.00	529	0.01	996	0.00	566	0.03
Aux. Heat	419	0.01	86	0.01	.	0.00	89	0.04	194	0.00	261	0.00
Central Air Conditioning	294	0.26	421	0.93	602	0.76	187	0.31	8	0.03	774	0.42
Room AC	112	0.04	74	0.07	131	0.21	61	0.23	7	0.03	222	0.24

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-16: Space Conditioning Electric UECs for 2-4 Unit Apartments in Forecast Zones 8-13**

2-4 Unit Apt	Forecast 8		Forecast 9		Forecast 10		Forecast 11		Forecast 12		Forecast 13	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	4,069	431 homes	3,802	192 homes	5,146	251 homes	2,800	173 homes	3,270	47 homes	3,448	244 homes
Conv. Heat	304	0.03	408	0.07	406	0.01	259	0.05	116	0.10	496	0.14
Heat Pump	185	0.04	478	0.00	467	0.00	.	0.00	.	0.00	447	0.01
Aux. Heat	37	0.03	92	0.00	28	0.00	.	0.00	.	0.00	42	0.12
Central Air Conditioning	196	0.32	323	0.40	1,204	0.69	295	0.10	276	0.38	147	0.33
Room AC	60	0.26	218	0.25	290	0.16	67	0.26	89	0.31	50	0.31

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-17: Space Conditioning Electric UECs for 5+ Unit Apartments in Forecast Zones 1-7**

5+ Apt	Forecast 1		Forecast 2		Forecast 3		Forecast 4		Forecast 5		Forecast 7	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	4,300	38 homes	3,479	46 homes	5,248	99 homes	3,882	355 homes	3,466	522 homes	4,970	87 homes
Conv. Heat	1,517	0.07	1,343	0.04	596	0.01	518	0.19	1,137	0.21	155	0.07
Heat Pump	290	0.03	261	0.01	167	0.07	315	0.06	1,186	0.06	.	0.00
Aux. Heat	88	0.04	61	0.01	.	0.00	67	0.07	200	0.04	.	0.00
Central Air Conditioning	77	0.57	347	0.52	600	0.76	93	0.40	15	0.11	945	0.63
Room AC	69	0.10	179	0.52	172	0.17	65	0.27	16	0.07	168	0.36

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-18: Space Conditioning Electric UECs for 5+ Unit Apartments in Forecast Zones 8-13**

5+ Apt	Forecast 8		Forecast 9		Forecast 10		Forecast 11		Forecast 12		Forecast 13	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	3,880	846 homes	4,076	435 homes	4,718	411 homes	3,185	486 homes	3,541	265 homes	3,053	646 homes
Conv. Heat	180	0.13	244	0.06	289	0.07	115	0.06	212	0.00	105	0.07
Heat Pump	215	0.03	282	0.02	164	0.00	259	0.01	203	0.00	99	0.04
Aux. Heat	43	0.04	114	0.00	31	0.00	66	0.00	.	0.00	31	0.00
Central Air Conditioning	156	0.31	327	0.47	823	0.81	268	0.30	394	0.51	144	0.28
Room AC	81	0.25	89	0.35	194	0.17	57	0.27	86	0.44	61	0.20

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-19: Space Conditioning Electric UEC for Mobile Homes in Forecast Zones 1-7**

Mobile Home	Forecast 1		Forecast 2		Forecast 3		Forecast 4		Forecast 5		Forecast 7	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	6,579	41 homes	4,643	14 homes	5,917	96 homes	4,395	40 homes	3,062	7 homes	5,740	209 homes
Conv. Heat	345	0.26	2,508	0.02	961	0.13	651	0.05	.	0.00	1,968	0.03
Heat Pump	.	0.00	.	0.00	1,372	0.02	.	0.00	.	0.00	.	0.00
Aux. Heat	241	0.06	.	0.00	871	0.01	.	0.00	.	0.00	172	0.01
Central Air Conditioning	120	0.07	413	0.56	917	0.39	282	0.62	.	0.00	959	0.31
Room AC	251	0.09	134	0.35	496	0.19	154	0.06	.	0.00	381	0.16

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-20: Space Conditioning Electric UEC for Mobile Homes in Forecast Zones 8-13**

Mobile Home	Forecast 8		Forecast 9		Forecast 10		Forecast 11		Forecast 12		Forecast 13	
	UEC	Sat.	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household	4,190	32 homes	4,795	48 homes	5,909	313 homes	5,758	3 homes	4,832	3 homes	4,434	52 homes
Conv. Heat	95	0.02	130	0.02	359	0.01	.	0.00	.	0.00	.	0.00
Heat Pump	.	0.00	.	0.00	120	0.00	182	0.88	.	0.00	.	0.00
Aux. Heat	.	0.00	.	0.00	30	0.00	.	0.00	.	0.00	.	0.00
Central Air Conditioning	452	0.70	364	0.54	1,242	0.66	.	0.00	597	1.00	584	0.61
Room AC	40	0.04	248	0.05	537	0.20	127	0.06	.	0.00	357	0.18

Source: 2010 California Residential Appliance Saturation Survey

### Estimated Natural Gas UECs

The average annual household natural gas consumption was estimated as 354 therms for individually metered households in the study population. This section contains seven tables that present the calibrated natural gas UECs, segment frequencies, and the associated saturations.

- Table 2-21 shows estimated UECs by residence type for all households and for homes with gas account data.
- Table 2-22 presents estimated UECs by home age for all households and for homes with gas account data.
- Table 2-23 presents estimated UECs by home age by gas utility and by residence type.
- Table 2-24 shows estimated UECs by gas utility service area.
- Tables 2-25 through 2-27 detail estimates by Energy Commission forecasting climate zone.

Natural gas UECs and saturations were estimated for every household that was found to have a natural gas line, regardless of whether natural gas billing data was available for them. Of the 20,670 households for which natural gas UECs were estimated, gas billing data were available for 18,908 households and no gas billing data were available for 1,762. These 1,762 households either indicated that they received natural gas from the smaller municipal gas utilities or were not included in the billing matching process defined in Chapter 4. Of the 24,464 individually metered households in the study, 3,755 had no gas service, leaving them as electric-only households.

The columns titled *Homes w/ gas* refers to households for which natural gas billing data could be identified from one of the three participating gas utilities: PG&E, SDG&E, or SoCal Gas. The columns titled *All Homes* includes all households for which gas UECs were estimated, including those that could not be matched to the gas billing records. Households serviced by one of the

small providers were also included in the *All Homes* column, as were households that received gas service from SoCal Gas, but could not be matched to the billing data.

### *Space Heating*

The UECs for primary gas heat showed considerable variation by residence type, ranging from 183 therms for single-family homes to 32 therms for apartments in buildings with five or more units. Secondary space heating UECs varied from 93 therms for single-family homes to 38 therms for apartments in buildings with five or more units.

### *Water Heating*

Natural-gas water heating UECs ranged from 195 therms for single-family homes to 183 therms for apartments in buildings with five or more units. Solar water heat with gas backup UECs were lower, ranging from 165 therms to 143 therms.

### *Dryers*

UECs for gas dryers varied between 26 therms for single-family homes and 20 therms for apartments in buildings with two to four units.

### *Ranges/Ovens*

Gas range/oven UECs were estimated between 36 therms for single-family homes and 24 therms for mobile homes.

### *Pool and Spa Heat*

The UEC for gas pool heat for single-family homes was 220 therms, and spa heat was 52 therms per year. Due to the extremely low saturations, UEC estimates for other residence types were not considered reliable.

### *Miscellaneous*

Miscellaneous gas usage for single-family homes was estimated at 23 therms per year.

**Table 2-21: Gas UECs by Residence Type for All Households and for Households With Gas Account Data**

	Single Family				Townhome				2-4 Unit Apt				5+ Unit Apt				Mobile Home			
	All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data	
	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.
All Household UEC	421	15357 homes	425	12726 homes	245	1993 homes	247	1579 homes	229	2018 homes	232	1398 homes	149	4238 homes	150	2606 homes	339	858 homes	352	459 homes
Primary Heat	183	0.85	184	0.94	58	0.80	59	0.88	66	0.70	68	0.88	32	0.61	31	0.88	143	0.56	146	0.97
Auxiliary Heat	93	0.01	118	0.01	39	0.01	38	0.01	50	0.01	61	0.01	38	0.01	49	0.00	90	0.00	70	0.01
Conv. Gas Water Heat	195	0.86	195	0.95	189	0.77	189	0.85	186	0.62	186	0.76	183	0.39	183	0.55	193	0.54	193	0.87
Solar Water Heat w/Gas Backup	162	0.00	164	0.00	145	0.00	133	0.00	143	0.00	143	0.00	165	0.00	165	0.00	153	0.00	147	0.01
Dryer	26	0.52	26	0.57	23	0.31	23	0.33	20	0.20	20	0.24	22	0.11	20	0.13	21	0.29	20	0.47
Range/Oven	36	0.69	36	0.76	32	0.61	32	0.66	33	0.57	33	0.69	28	0.46	28	0.63	24	0.52	23	0.86
Pool Heat	220	0.06	219	0.06	180	0.00	126	0.00	56	0.01	49	0.01	39	0.01	30	0.01	44	0.00	5	0.00
Spa Heat	52	0.07	52	0.08	66	0.01	72	0.01	.	0.00	.	0.00	.	0.00	.	0.00	34	0.00	29	0.00
Miscellaneous	23	0.13	23	0.14	22	0.10	22	0.11	23	0.07	23	0.08	31	0.03	35	0.03	41	0.06	66	

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-22: Gas UECs by Home Age for All Households and for Households With Gas Account Data**

	New House				Old House			
	All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data	
	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.
All Household UEC	358	2077 homes	371	1557 homes	347	22387 homes	352	17209 homes
Primary Heat	182	0.78	185	0.95	139	0.78	140	0.92
Auxiliary Heat	124	0.01	160	0.01	70	0.01	82	0.01
Conv. Gas Water Heat	147	0.74	148	0.90	198	0.74	197	0.87
Solar Water Heat w/Gas Backup	136	0.00	136	0.00	161	0.00	163	0.00
Dryer	27	0.49	28	0.58	25	0.39	25	0.45
Range/Oven	35	0.74	36	0.88	34	0.62	34	0.72
Pool Heat	198	0.03	188	0.03	210	0.04	210	0.05
Spa Heat	49	0.05	49	0.06	53	0.05	53	0.06
Miscellaneous	23	0.13	23	0.15	24	0.10	24	0.11

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-23: Gas Household UECs by Home Age by Gas Utility and by Residence Type**

	New House		Old House	
	Household UEC	Count	Household UEC	Count
All	371	1,557	352	17,209
All PG&E	383	415	407	4,835
SF PG&E	418	323	487	3,371
MF PG&E	234	88	230	1,395
All SDG&E	384	221	289	2,523
SF SDG&E	416	149	341	1,911
MF SDG&E	206	71	150	570
All SoCal Gas	360	921	326	9,851
SF SoCal Gas	419	623	397	6,349
MF SoCal Gas	198	280	182	3,179

Source: 2010 California Residential Appliance Saturation Survey



**Table 2-24: Gas UECs by Gas Utility for All Households and for Homes With Gas Account Data<sup>1</sup>**

	PG&E				SDG&E				SoCal Gas				Other	
	All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		UEC	Sat.
	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.	UEC	Sat.		
All Household UEC	402	5620 homes	405	5250 homes	291	2916 homes	298	2744 homes	329	11526 homes	328	10772 homes	226	608 homes
Primary Heat	212	0.94	213	0.95	98	0.89	100	0.93	103	0.89	102	0.91	81	0.68
Auxiliary Heat	111	0.01	129	0.01	45	0.00	56	0.00	48	0.01	43	0.00	58	0.08
Conv. Gas Water Heat	188	0.87	188	0.88	174	0.83	175	0.88	200	0.85	200	0.86	189	0.65
Solar Water Heat w/Gas Backup	172	0.00	172	0.00	141	0.00	140	0.00	165	0.00	165	0.00	114	0.00
Dryer	22	0.31	22	0.31	25	0.49	25	0.52	27	0.55	27	0.55	24	0.45
Range/Oven	32	0.58	31	0.58	32	0.71	32	0.74	36	0.83	36	0.83	29	0.73
Pool Heat	183	0.03	183	0.03	180	0.04	179	0.04	222	0.06	222	0.06	225	0.02
Spa Heat	52	0.04	52	0.04	53	0.07	53	0.07	52	0.07	52	0.07	80	0.02
Miscellaneous	23	0.08	23	0.08	21	0.15	21	0.16	25	0.13	25	0.13	23	0.20

Source: 2010 California Residential Appliance Saturation Survey

1. For households with *other* gas utility providers, the California Statewide RASS did not obtain gas account data.

**Table 2-25: Gas UECs for Forecast Zones 1-4**

	Zone 1				Zone 2				Zone 3				Zone 4			
	All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data	
	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household UEC	428	638 homes	448	169 homes	387	628 homes	390	478 homes	369	1313 homes	374	978 homes	364	2617 homes	367	2198 homes
Primary Heat	177	0.31	175	0.92	192	0.73	192	0.95	160	0.77	161	0.95	161	0.83	160	0.97
Auxiliary Heat	175	0.02	183	0.07	57	0.02	51	0.00	92	0.02	91	0.01	52	0.01	70	0.00
Conv. Gas Water Heat	245	0.28	248	0.94	190	0.72	190	0.92	205	0.69	205	0.86	195	0.78	195	0.91
Solar Water Heat w/Gas Backup	238	0.00	238	0.00	.	0.00	.	0.00	.	0.00	.	0.00	159	0.00	172	0.00
Dryer	40	0.09	38	0.28	23	0.23	23	0.28	30	0.29	30	0.35	23	0.25	23	0.29
Range/Oven	41	0.26	33	0.78	30	0.47	30	0.59	36	0.43	37	0.52	33	0.45	33	0.51
Pool Heat	241	0.00	19	0.00	219	0.02	219	0.03	189	0.05	189	0.06	236	0.03	237	0.03
Spa Heat	53	0.01	60	0.04	50	0.04	50	0.05	48	0.03	48	0.03	45	0.04	45	0.04
Miscellaneous	30	0.04	28	0.06	22	0.05	22	0.07	24	0.09	25	0.10	23	0.09	23	0.10

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-26: Gas UECs for Forecast Zones 5-9**

	Zone 5				Zone 7				Zone 8				Zone 9			
	All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data	
	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household UEC	454	2194 homes	461	1819 homes	419	1180 homes	408	681 homes	291	3672 homes	294	2927 homes	329	2456 homes	339	1843 homes
Primary Heat	302	0.81	306	0.94	181	0.67	155	0.94	71	0.82	71	0.90	88	0.80	90	0.89
Auxiliary Heat	150	0.01	150	0.01	234	0.01	157	0.00	33	0.00	33	0.00	30	0.01	36	0.00
Conv. Gas Water Heat	162	0.75	163	0.87	214	0.66	214	0.92	197	0.79	197	0.86	205	0.81	205	0.90
Solar Water Heat w/Gas Backup	141	0.00	141	0.00	174	0.00	170	0.00	154	0.00	154	0.00	.	0.00	.	0.00
Dryer	16	0.31	17	0.35	33	0.35	34	0.49	26	0.51	26	0.56	28	0.57	29	0.64
Range/Oven	27	0.63	28	0.73	44	0.61	44	0.83	32	0.75	33	0.81	39	0.78	41	0.86
Pool Heat	57	0.02	58	0.02	101	0.03	68	0.05	230	0.05	229	0.05	237	0.05	239	0.06
Spa Heat	68	0.03	68	0.03	41	0.03	40	0.04	48	0.06	48	0.07	56	0.06	54	0.08
Miscellaneous	20	0.05	20	0.06	63	0.08	73	0.10	22	0.16	22	0.17	25	0.09	25	0.10

Source: 2010 California Residential Appliance Saturation Survey

**Table 2-27: Gas UECs for Forecast Zones 10-13**

	Zone 10				Zone 11				Zone 12				Zone 13			
	All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data		All Homes		Homes w/Gas Data	
	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat	UEC	Sat
All Household UEC	390	3206 homes	402	2347 homes	273	1576 homes	274	1366 homes	303	1098 homes	305	1036 homes	295	3886 homes	305	2924 homes
Primary Heat	173	0.83	179	0.94	62	0.75	63	0.86	85	0.87	85	0.93	98	0.73	100	0.94
Auxiliary Heat	64	0.02	69	0.00	30	0.01	30	0.01	31	0.00	32	0.00	44	0.00	56	0.00
Conv. Gas Water Heat	179	0.83	181	0.92	228	0.63	228	0.73	205	0.73	205	0.78	178	0.69	178	0.88
Solar Water Heat w/Gas Backup	143	0.00	143	0.00	203	0.00	203	0.00	200	0.00	200	0.00	141	0.00	140	0.00
Dryer	26	0.57	26	0.63	28	0.29	27	0.33	25	0.51	25	0.54	24	0.41	25	0.54
Range/Oven	34	0.77	33	0.84	40	0.74	40	0.84	35	0.82	35	0.86	31	0.58	32	0.73
Pool Heat	212	0.06	209	0.07	227	0.03	229	0.03	246	0.06	246	0.07	185	0.04	185	0.05
Spa Heat	48	0.07	48	0.09	96	0.02	97	0.02	60	0.06	62	0.06	49	0.07	50	0.09
Miscellaneous	23	0.14	23	0.16	31	0.06	31	0.07	25	0.12	25	0.13	21	0.15	21	0.18

Source: 2010 California Residential Appliance Saturation Survey

## List of Acronyms

CAC	central air conditioning
CDA	conditional demand analysis
CFL	compact fluorescent lamp
DDN	degree-day normalization
Energy Commission	California Energy Commission
F	Fahrenheit
IOU	investor-owned utilities
LADWP	Los Angeles Department of Water and Power
LCD	liquid crystal display
NAC	normalized annual consumption
PC	personal computer
PG&E	Pacific Gas and Electric Company
RAC	room air conditioning
RASS	Residential Appliance Saturation Survey
SAE	statistically adjusted engineering
SAS	statistical analysis system
SCE	Southern California Edison Company
SDG&E	San Diego Gas & Electric Company
SoCal Gas	Southern California Gas Company
UEC	unit energy consumption