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ELECTRICAL ENERGY CONSUMPTION IN CALIFORNIA:

DATA COLLECTION AND ANALYSIS*

A Report to the California Energy Resources Conservation and Development Commission

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INTRODUCTION

Background

The California Energy Resources Conservation and Development Commission (ERCDC) is required by the legislation which established it to develop a methodology for forecasting electricity sales and demand in the State. The ERCDC concluded that one necessary element in such a methodology was a procedure for assessing the impact of various energy conservation measures on electricity sales and demand. Foremost among these measures are mandatory performance standards for appliances and for residential and commercial buildings. These measures have been referred to by the ERCDC as "non-price" energy conservation measures since they prevent the waste of energy without the active intervention of consumers motivated by market forces.

It was recognized at an early stage that the development of methods for estimating the impact of "non-price" energy conservation measures would require detailed information on the patterns and efficiencies of electricity use in California. For example, in order to estimate the impact of standards on refrigerator performance, it is necessary to know how much energy is used by refrigerators and how efficient the existing stock of refrigerators is.

As a first step in meeting these kinds of information needs, the ERCDC asked Lawrence Berkeley Laboratory (LBL) to make an examination of existing sources of data related to patterns and efficiencies of electricity use. This report describes the results of the effort undertaken by LBL.

Overview of Electricity Use in California

In 1975 Californians used approximately 149 billion kilowatt hours of electricity for all purposes. This use can be roughly apportioned between seven sectors: residential, commercial, industrial, agricultural, government, water systems, and other.

Residential electricity uses are those take place in single family, multi-family, and mobile dwelling units. These uses are dominated by household appliances, space conditioning (heating and cooling), and lighting. Commercial use includes wholesale and retail trade, office buildings, hotels, and services such as hospitals and private schools. Use in the commercial sector is dominated by lighting and space conditioning. The industrial sector includes manufacturing and raw materials processing. Use in the industrial sector is very diversified. Agricultural uses include all farm uses and are dominated by groundwater and other irrigation water pumping.

Government uses include many of the elements included in the residential, commercial, and industrial sectors. However, it is proper to separate them since their energy consumption is not subject to market forces in the same way as the private sector. Large users in this sector include the military and education. Elements which are unique to this sector are street lighting and electric railways. The latter use is at present the only significant use of electricity for transportation.

Electricity use in water systems is almost entirely for the pumping of water in the various Federal, State, and local water supply projects. The relatively great importance of this sector in California's electricity use together with the concentrated nature of this use make it appropriate

to separate this sector from the "government" sector. The "other" sector includes internal uses by utilities and other miscellaneous uses.

Table 1 breaks down electricity sales in California for 1975 according to the above seven categories. About 75% of the sales are divided approximately evenly between the residential, commercial and industrial sectors with the balance in the remaining sectors.

Considerable caution should be exercised in the use of the data in Table 1 since they are based on the billing categories in utility rate schedules. These categories do not always give a good indication of the true end use of the electricity. For example, public schools may be in a commercial billing category, small manufacturers may also be included in the commercial sector, and some large commercial establishments may be in an industrial billing category. The significance of the above difficulties is not known at present, but they may be the cause of inaccuracies larger than 10%, especially in the commercial, industrial, and government sectors. Further, it should be noted that the data in Table 1 do not include electricity which was generated and used at industrial sites without the participation of utility companies.

Electricity sales are not the only data which are important in understanding electricity use and in planning for future electricity needs. One must also know the structure of the demand. Electricity generating capacity requirements are determined by peak demand (i.e. the maximum instantaneous power requirement). The proper mix of generating capacity (peaking units, cycling units and base load units) is determined by the daily fluctuations in demand.

TABLE 1 - California Electricity Sales 1975[1]

Sector	Sales (kwhr/yr x 10^6)	Percent of Sales
Residential	43,517	28.9
Commercial	40,920	27.2
Industrial	39,335	26.0
Agricultural	5,568	3.6
Government (except water systems)	8,335[2]	7.2
Water Systems	6,872[3]	4.6
Other	4,320	2.5
Total	148,867	

1. Preliminary draft, Quarterly Fuel and Energy Report-4th Quarter 1975. California ERCDC, 1111 Howe Avenue, Sacramento, California (1976).
2. ERCDC value less 1,478 x 10^6 kwhr/yr used by the U.S. Bureau of Reclamation. Source of U.S.B.R. figures: Calendar Year 1975 PO&MOOB, the Yearly Report of Energy Deliveries and Income for the Central Valley Project. U.S. Bureau of Reclamation, Mid-Pacific Regional Office, 2800 Cottage Way, Sacramento, California 95825.
3. ERCDC value plus 1,478 x 10^6 kwhr/yr used by the U.S. Bureau of Reclamation. See two above.

The structure of demand is usually described by the use of load curves. These curves plot the instantaneous power requirement against time. An example of such load curves is shown in Figure 1. These load curves are for the Pacific Gas and Electric Company (PG&E) system on the peak day in 1972. Data with which to construct similar curves for the entire state are not available.

Again, considerable caution should be exercised in the use of the data shown in these curves. They are limited not only by the difficulties with billing categories discussed above, but also by the fact that the data were necessarily based on samples from the various customer classes. PG&E has been making this kind of load analysis for only a few years and the adequacy of its sampling procedures is not fully established.

Methodological Considerations in Developing Forecasting Data

The overview of electricity use presented above gives a taxonomy of consumption which can be used to organize description data (i.e. by consuming sector, and by sales and demand). However, since our purpose in developing electricity consumption data was that it be useful for the purpose of forecasting, it was important to have some insight into the forecasting methodology in order to develop additional organizing principles.

Usually, the process of forecasting is an evolutionary one. First the data that might be used to make a forecast are examined and then a tentative forecasting model is constructed. The data are re-examined, the model is revised, and so on. The process continues until the results are no longer timely or until the value of improved results is less than the cost of further revision.

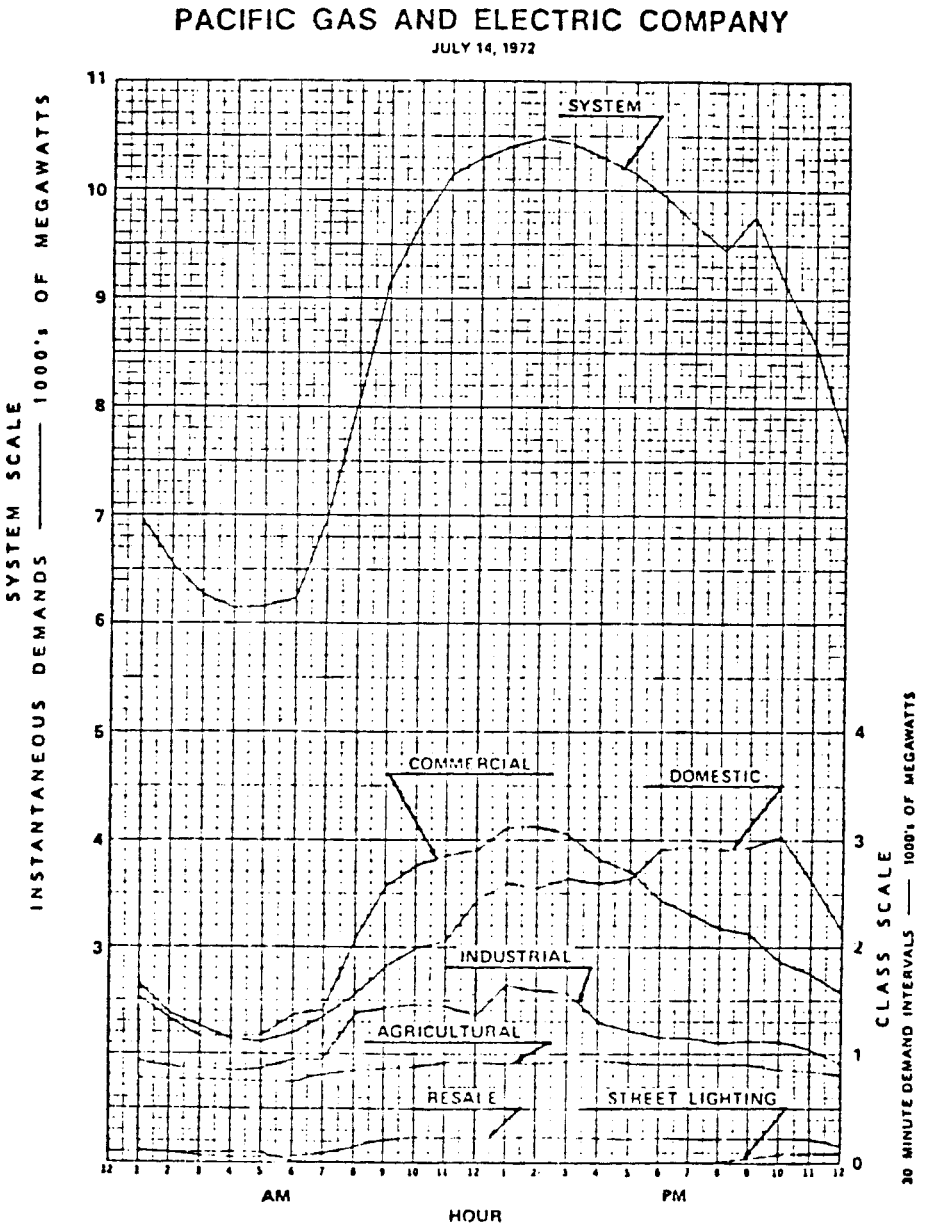


Figure 1. Load curves for the Pacific Gas and Electric Company on the peak day in 1972. The top curve is the "net system input" curve and reflects the amount of electricity generated to meet demand by PG&E and the Bureau of Reclamation. The six curves at the bottom reflect demand at the point of use for the sectors as labeled. The lower curves do not sum to give the top curve because of transmission losses from the point of generation to the point of use and because not all customers are included in the customer classes shown. Data for the end-use sectors are based on PG&E billing categories and on sampling procedures devised by PG&E. Reference: Source Documents Supporting PG and E's Response to Commission's Order Instituting Investigation, Case No. 9804 Before the California Public Utilities Commission.

While we have not made forecasts of electricity consumption, we have, to an extent, engaged in the process of model development. Reflecting the ERCDC's immediate priorities, we have worked primarily on a model for electricity sales. Out of this work an "exponential lifetime stock-use" model has evolved.

The elements of our exponential lifetime stock-use model are shown in Figures 2 and 3. The model starts with the stocks of electricity using devices and the average energy consumption of units in the stock at some initial time and, in a stepwise process, estimates these parameters for some future time of interest. Figure 3 shows the calculation procedure that is used. The operation of the model requires estimates of the devices and forecasts of the annual sales and unit energy consumption of new devices for each year up to and including the year of interest. Electricity sales are given by the product of the number of devices in the stock and the average unit energy consumption.

The basic simplicity of the model is due to the exponential lifetime assumption. That is, for each type of device we assume that a constant fraction of the stock are removed (i.e. junked) in each unit time interval, independent of the age or year of manufacture. If this assumption is relaxed, a more complicated model must be used and the requirements for data are increased substantially.

Comments on the adequacy of the exponential lifetime assumption are made at various points in the text and appendices. At present, while there are some indications that the assumption is not entirely adequate, the data are not sufficient to justify a more complex hypothesis. It

$$\left.\begin{array}{l} \mathrm{LIFETIME}_i \\ \mathrm{STOCK}_i\ (t_o) \\ \overline{\mathrm{UEC}}_i\ (t_o,\ t_n) \\ \left.\begin{array}{l} \mathrm{SALES}_i\ (t_k) \\ \mathrm{UEC}_i\ (t_k,\ t_n) \end{array}\right\}\ k = 1,2,\ \ldots,n \end{array}\right\} \Rightarrow \begin{array}{l} \overline{\mathrm{UEC}}_i\ (t_n,\ t_n) \\ \mathrm{STOCK}_i\ (t_n) \end{array}$$

Figure 2. Inputs for and outputs from an exponential lifetime stock-use model. $\mathrm{LIFETIME}_i$ is the exponential decay constant for device i. STOCK_i (t_o) is the initial stock of device i. $\overline{\mathrm{UEC}}_i$ $(t_o,\ t_n)$ is the average unit energy consumption of the devices in STOCK_i (t_o) when they are used according to the use-patterns of the year t_n. SALES_i (t_k) is the sales of device i in the year t_k. UEC_i $(t_k,\ t_n)$ is the unit energy consumption of devices sold in the year t_k used according to the use-patterns of the year t_n. $\overline{\mathrm{UEC}}_i$ $(t_n,\ t_n)$ and STOCK_i (t_n) are the values of the unit energy consumption and the stock for the forecast year.

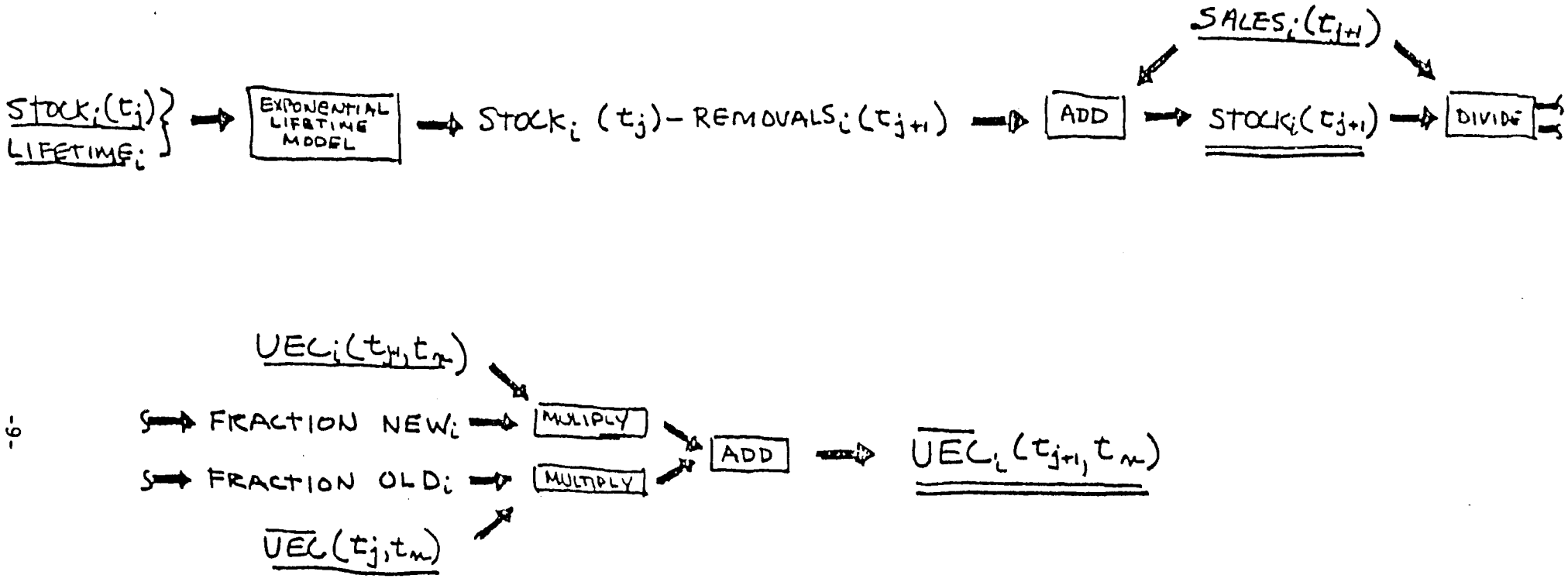


Figure 3. Computations for a one year step in an exponential lifetime stock-use model. Input is underlined once, output is underlined twice. STOCK and $\overline{\text{UEC}}$ for device i are updated from the year t_j to the year t_{j+1} (j+1 less than or equal to n).

should be noted that relaxation of the exponential lifetime assumption for one stock of devices does not require that the assumption be relaxed for other stocks. This is an important advantage of the stock-use type of model.

The exponential lifetime stock-use model provided a conceptual framework for our data collection and analysis. Much of our work was directed towards obtaining input data for such a model. Particular attention was paid to data on the stock of energy using devices, on the average unit energy consumptions, and on the lifetimes. Attention was also given to data which might be useful in making forecasts of sales and electricity consumption of new devices. These data included sales trend information and information on proposed standards for new devices.

The problem of developing a stock-use model for electricity demand appears to be somewhat more difficult than for electricity sales. One approach might be to replace the average unit energy consumption in the model described above by the average unit operating power (i.e. the power required when the unit is on). Demand would be given as the product of the number of devices in the stock, the average unit operating power, and a weighting function which determined what fraction of the total possible power requirement was actually demanded. This function would depend on the time of day, the day of the week, the temperature, the price of electricity, etc.

Obviously, the construction of such a weighting function presents some formidable difficulties. We have not found data which are adequate to the task. We think it is likely that data for approximate weighting functions can be developed, but we are not certain that the approach

outlined above is the best. We have collected some data on unit operating power, these are given at various points in the following text and appendices.

Outline of the Remainder of this Report

The remainder of this report is divided into five sections. The first of these describes electricity consumption data in the residential sector. Data for this sector are far more abundant than for any other sector. Thus, the results in this sector are the most complete. The next section discusses the commercial sector (including government buildings). Results for this sector are less certain and the breakdown of uses is less refined than in the residential sector. The remaining consuming sectors have been examined only in a very cursory fashion. A brief section discusses some of the important issues and data needs.

The amount of data collected for this report was sufficient to require the adoption of some computer data management practices. A section of the report is devoted to a description of these procedures. Finally, there is a section summarizing our recommendations for improving the quality of information on electricity consumption.

The main report is supported by four appendices: Appendix A on the residential sector, Appendix B on solar energy installations in the residential sector, Appendix C on the commercial sector, and Appendix D which contains a listing of the data that has been collected.

THE RESIDENTIAL SECTOR

Introduction

Data on electricity consumption in the residential sector are sufficient to construct a rough, but reasonably complete picture of electricity sales in this sector. Two kinds of data are required to construct this picture: the stock of electricity using equipment and the average electricity consumption per unit in the stock (the unit energy consumption, UEC). The total energy consumption for any component of the residential sector is given by the product of the stock and the UEC.

The stock of electricity using equipment consists of heaters and air-conditioners, lighting, appliances, and miscellaneous. The appliances include ranges, clothes washers, clothes dryers, dishwashers, water heaters, televisions, refrigerators, and freezers. The miscellaneous category accounts for all other residential uses of electricity.

In this report, because of the type of data available, we describe the stock in terms of saturations relative to housing stock (i.e. the number of devices in use divided by the number of households). The primary sources for the saturation data that we use are utility company saturation surveys. Various adjustments have been made to these survey data based on Census data, cross comparisons of the saturation surveys, and other information. Data for household stock are based on the Census, building permit data, and mobile home sales.

Unit energy consumption data are considerably more difficult than saturation data to derive. The UEC depends on both the efficiency of the equipment and the manner in which the equipment is used. Data based on direct measurements of the UEC are extremely limited. Therefore, we have used a combination of engineering calculations, manufacturers data, sales data, equipment lifetime estimates, and other information to arrive at estimates for equipment UEC's.

The results of our data collection and analysis for the residential sector are summarized in Table 2. This table presents data for 1975 on a statewide basis for UECs, lifetimes, and saturations. Unit energy consumption data are given for the average of all stock ($\overline{UEC}$) and for new additions (UEC(75)). An estimate for the UEC of 1980 additions is also presented (UEC(80)). Total electricity consumption for each energy using device is computed in kilowatt hours per year and as a percentage of the total electricity sales in the residential sector.

The data in Table 2 are subject to some uncertainty and should not be viewed as the definitive disaggregation of electricity consumption in the residential sector. As we noted earlier, even the data on total sales for the sector are open to question. The $\overline{UEC}$ values in Table 2 which are most uncertain are the estimates for lighting, heating, and cooling. These are based on very limited information and may be significantly in error.

However, we are encouraged that the data on $\overline{UEC}$s and stock (derived independently of the total kwhr sales) can be used to construct a

TABLE 2 - 1975 ELECTRICITY SALES IN THE RESIDENTIAL SECTOR

	$\overline{UEC}$ (kwhr/yr)	UEC (75) (kwhr/yr)	UEC (80) (kwhr/yr)	Lifetime (years)	Saturation (percent)	Total Number of Units	Total Sales (kwhr/yr x 10^6)	Total Sales (percent)
Households	5,881				100.0	7,441,000	43,517	100.0
Refrigerators	1,200	1,575	1,050	20.0	115.0	8,557,000	10,269	23.6
Lighting	1,130				100.0	7,441,000	8,408	19.3
Resistance Heaters	5,330	5,040	2,750		10.1	752,000	4,006	9.2
Ranges	1,200	1,200	1,075	16.9	36.3	2,701,000	3,241	7.4
Water Heaters	4,000				10.7	796,000	3,185	7.3
Central Air Conditioners	2,500	1,950	960		15.1	1,124,000	2,809	6.5
Color Television	420	255	220	15.5	75.0	5,581,000	2,344	5.4
Freezers	1,400	1,400	1,050	24.5	22.2	1,652,000	2,313	5.3
Clothes Dryers	950	875	825	15.3	29.1	2,165,000	2,057	4.7
Room Air Conditioners	900		640		23.6	1,756,000	1,580	3.6
Black & White Television	140	60	35	13.8	80.0	5,953,000	833	1.9
Dishwashers	250	300		13.6	36.6	2,723,000	681	1.6
Clothes Washers	70	70		12.3	64.7	4,814,000	337	0.77
Miscellaneous (residual)	195				100.0	7,441,000	1,454	3.3

reasonable balance sheet. That is, the sum of all stocks multiplied by their respective $\overline{UEC}$ approximates total residential electricity consumption. Of course, the reasonableness of the result may be due to the fortuitous cancellation of errors. Moreover, additional data are needed on miscellaneous devices (electric blankets, furnace fans, music systems, heat pumps, etc.) to complete the picture.

In the remainder of this section, we give a more detailed discussion of Table 2 and present results on disaggregation of the data both by geographical region and by housing type. The geographical disaggregation is by districts which are based on the boundaries of the major utility companies (some small utilities are included within these boundaries). This is required for the analysis of utility company forecasts. The housing disaggregation is by single family, multi-family, and mobile units. This type of disaggregation is very important when considering heating and cooling requirements which differ markedly by unit type.

The discussion in the following text is intended to provide an overview of the important data and the key problems in data analysis. A more complete discussion is given in Appendix A and a much more extensive listing of the data is given in Appendix D.

The Residential Building Stock

The reference point for our data on the residential sector is the residential building stock. Information on the number of units in the housing stock is necessary to derive the total number of energy

using devices from saturation data. Further, the size and thermal qualities of the units in the housing stock are important determinants of the energy requirements for space heating and cooling. The types of units in the housing stock may also influence other factors that effect energy consumption such as the size and use patterns of appliances.

The basic unit in the residential building stock is the household. For the purposes of this study, a household is defined as a group of people who share common cooking facilities. The number of these households corresponds to Census data on the number of year-round occupied housing units.

In this report, we divide households into three types: single family units, multi-family units, and mobile homes. Table 3 presents a summary of our data on households for 1975 by housing type and by utility district.

The derivation of the data in Table 3 provides an illustration of the use of an exponential lifetime model and one of its simple refinements. The building stock [STOCK (t_0)] was measured by the Census in 1970. Since then, only the rate of new construction [SALES (t_k)] has been measured. However, with the aid of lifetimes which can be derived from the Components of Inventory Change (CINCH) data of the Census (See Appendix A1), and the exponential lifetime assumption, a determination of the stock in 1975 is straightforward.

TABLE 3 - Housing Units in California by Utility District and Housing Type in 1975

UTILITY DISTRICT[1]	SINGLE FAMILY UNITS (x 1000)	MULTIPLE FAMILY UNITS (x 1000)	MOBILE UNITS (x 1000)	TOTAL (x 1000)
PG&E	1863	798	131	2792
SMUD	158	68	9	235
SCE	1721	745	139	2605
LADWP	619	547	7	1173
SDG&E	361	189	36	586
OTHER	37	6	6	49
ALL	4759	2353	328	7441

1. See Appendix A1 for the boundaries of the utility districts.
PG&E = Pacific Gas and Electric Company, SMUD = Sacramento Municipal Utility District,
SCE = Southern California Edison Company, LADWP = Los Angeles Department of Water and Power,
SDG&E = San Diego Gas and Electric Company.

In its elementary form, the exponential lifetime model requires only one lifetime to describe the decay rate of an entire stock. A simple refinement of the model involves division of the stock into component parts each with its own lifetime. The components are then analysed independently using the elementary form of the model.

We have made this refinement in our analysis of the residential building stock. We have divided the stock not only by housing type, but also by geographical region. Data on stock, sales, and lifetimes have been collected on single family, multi-family and mobile homes for the San Francisco-Oakland area, the Los Angeles-Long Beach area, and the rest of the State. Thus, values for the total stock are derived from the results of nine separate elementary models. Of course, the decay curve for the total stock is no longer a simple exponential and a single constant is not sufficient to describe the housing removal rate. This is why a lifetime is not given for housing stock in Table 2. Further details, including the derivation of the appropriate constants, are given in Appendix A1.

Another approach to the determination of housing stock is to make use of utility data on their customers. We have not taken this approach for two reasons. First, the utility data do not distinguish customers by the types of housing units that they occupy. Second, some of the utility customers are "master-metered" (i.e. one meter serves several customers) and data on the number of customers per meter is incomplete. In principle, utility customer data is to be preferred since it can provide a direct measure of the number of electricity users. Also, when combined with data on electricity sales, it can provide better information on energy consumption by housing type.

Heating, Cooling and Lighting

The analysis of electricity consumption for heating and cooling requires that the data be highly disaggregated. This requirement for disaggregation is due to many factors. First, heating and cooling loads are quite different in the various housing types. Second, even for any one housing type these loads vary over the diverse climatic zones of California. Third, the unit energy consumption to meet these loads spans a wide range with the different devices. Fourth, heating and cooling loads are strongly affected by both the amount of insulation present and the present operating practices. The impact of standards upon these insulation levels will cause the loads to be strong functions of time. Finally, the saturations of heating and cooling equipment also vary with time. New construction in California is about three times more likely to have electric resistance heating than the rest of housing stock. It would be extremely difficult to model these effects without a sophisticated system to handle the accounting for the various categories of types of dwellings, ranges of locations, types of devices, and degree of insulation.

Our estimates for the saturations of resistance heating, central air conditioners, and room air conditioners are given in Table 4. These data are disaggregated by housing type and utility district. Three types of data were used to derive saturations in these various categories. These were: utility saturation surveys, the Census, utility records of gross additions and customers numbers in different rate categories.

These data on saturations suffer from various defects. First, the SDG&E comparisons between responses and utility bills indicate that respondents often do not know their type of heating fuel. Second, the

TABLE 4 - Saturations of Heating and Cooling Equipment by Utility District and Housing Type

		PG&E	SMUD	SCE	LADWP	SDG&E
Resistance Heat	-Total	6.7	9.8	12.0	11.1	16.7
	-Single Family	5.5	4.1	5.0	(4.1)[2]	6.8
	-Multi-Family	9.1	24.2	29.0	(19.1)[2]	38.0
	-Mobile Home	(5.5)[1]	(4.1)[1]	6.9	(4.1)[1]	4.2
Central Air Conditioner	-Total	9.2	44.7	20.6	14.1	10.5
	-Single Family	(9.2)[3]	(44.7)[3]	19.2	(14.1)[3]	8.1
	-Multi-Family	(9.2)[3]	(44.7)[3]	21.0	(14.1)[3]	10.1
	-Mobile Home	(9.2)[3]	(44.7)[3]	36.7	(14.1)[3]	36.0
Room Air Conditioner	-Total	16.6	39.2	31.4	24.6	15.3

1. These quantities were estimated as being equal to those of the single family units.

2. These quantities were estimated by assuming that the ratio of the saturation in single family and multi-family units in LADWP was equal to the average ratio of the rest of the state and then weighting this ratio by the housing fractions to the proper overall saturation.

3. These quantities were estimated to be roughly equal to the total saturation rate.

questions used in the surveys can lead to confusion between the heating fuel of the main unit and of any supplementary heaters. Third, with the exception of SDG&E, these data are not adequately cross-tabulated by housing type, location, and age. Finally, gross additions data are of uncertain quality since they only deal with additions at the time of service connection.

The unit energy consumption data in Table 2 for resistance heating and central air conditioning are derived in detail in the appendices. Briefly, UECs were determined using the thermal load program TWOZONE.[1] Loads determined by TWOZONE were weighted by the stock sizes of each housing type in each geographical region. The strong improvement in UECs for 1980 is due primarily to the assumptions that double glazing will be required in housing units which have central air conditioning or resistance heat and that the energy efficiency ratio of central air conditioners will improve from 6.5 to 8.7.

Our number for the unit energy consumption of lighting was derived by the General Electric Corporation[2] from statistics on the national sales of various kinds of lamps in 1973 and their measurements of the lifetime energy consumption of each lamp type. From their detailed sales data (which are proprietary), General Electric allocated this national number of total energy consumption for lighting into the various use sectors. This result for residential lighting is probably a function of region, but the available data does not support a more complicated analysis. This unit energy consumption for lighting agrees reasonably well with the limited load survey data.

Appliances

While considerable information is available on residential appliances, much of it was collected for other purposes than energy forecasting and in its present form is unsuited to forecasting. Most of the primary data was collected by utilities and trade organizations for marketing purposes. The studies are often proprietary and usually display methodological weaknesses. Thus, all published sources must be used selectively, subjected to consistency tests, and reworked to reflect a better sensitivity to the determinants of energy consumption. This analysis requires different techniques for different end uses, depending on the detailed characteristics of that use and on the abundance, quality, and clarity of those studies that are available. In most cases, it is necessary to adjust the figures obtained in the published studies to reflect the differing uses to which the information is being applied and to compensate for inadequate technical or sociological care that went into the study.

The central problem in evaluating data on appliances is to determine what are the important variables that influence a given end use and to make sure that the studies one uses take appropriate account of these variables. For example, the use of laundry facilities (washers and dryers) can be expected to be proportional to family size; this expectation is borne out by the results of a survey.[3] However, one of the few field tests of dryer electricity consumption[4] used a sample of families whose average size was almost 50% higher than that typical of the State. If this study were used without adjustment, it might seriously bias energy consumption estimates. The data can be corrected, however, because the average size of dryer-owning families can be estimated.

Some secondary problems involve tracing the original sources of data, getting proprietary data from manufacturers, and taking meaningful averages over data which have large variation.

All these problems are present, for instance, in calculating the average energy consumption of refrigerators. One source of average refrigerator energy use is a RAND study[5]; it makes use of Edison Electric Institute (EEI) figures on refrigerator usage. However, EEI gets its data from member utilities' submissions; these submissions may be based on in-house load surveys or on estimates by the utility staff. These surveys and estimates can be in error due to statistical problems. The range in energy consumption of 1976 frost-free refrigerators is over 2½ to 1, so a sample of middle-class suburban consumers may yield averages which are inappropriate to the population as a whole. Furthermore, the average consumption of existing units takes into account not only recent units of about 1700 kwhr/yr average usage but also some pre-1950 units which use less that 400 kwhr/yr. A realistic estimate of refrigerator energy use would be a weighted average consumption of all existing brands and models of refrigerator. The data with which to compute such an average exist; however, the sales weights are proprietary and have not been released by the manufacturers.

Our results for appliance saturation are given in Table 5. These results are subject to considerable uncertainty as will be seen from the discussion below.

For the purposes of modeling energy use, saturation must be defined as the number of devices in use divided by the number of households. While

TABLE 5 - Percentage Saturations of Appliances by Utility District in 1975

	PG&E	SMUD	SCE	LADWP	SDG&E
Refrigerators	116	116	114	113	116.5
Ranges	46	59	31	18	41
Water Heaters	11	16	12	6	12
Color Television	74	77	74	78	74
Freezers	25	36	19	12.5	35
Clothes Dryers	42	67	19	14	28
Black & White Television	80	80	76	80	80
Dishwashers	36	55	40	24	42
Clothes Washers	66	80	66	53	68

this definition seems obvious, it is not always the definition used in the literature. Often, saturations are taken to be "the fraction of households having one or more of a device". For items like televisions, there is a substantial difference in these definitions, as many households have two or more TVs.

Two basic sources of saturation data are the U. S. Census and utility mail surveys. Both sources have some problems. The Census questions are not as detailed as the utilities' and are sometimes misleading. For example, the question, "Do you have a refrigerator?" cannot reveal the fact that a significant number of California households have more than one refrigerator. On the other hand, the Census is more likely to catch most of the residents of the State and get a fairly representative sample. The utility surveys tend to ask better questions than the Census, and they are more up to date (i.e. more recent than 1970). Their survey size is also usually large enough to reduce random errors to one or two percent. However, they may not be random samples. They are subject to a bias among socio-economic groups--poorer city people may be less likely to respond. Spanish speaking groups are probably very poorly represented in the Southern utility areas.

Problems with sample bias are evident in all three utility district surveys; SMUD, SCE, and SDG&E all underestimate the fraction of people in multi-unit housing. Furthermore, no surveys are done on people in master-metered units. Whenever the utility collects separate saturation figures for the different types of housing, we construct the overall saturation using these figures and our estimates of the proportion of each type of unit from our housing stock data. The alternate method of using the utility estimate of its customer classes yields substantially the same results.

A problem with all survey data is lack of knowledge on the part of the respondent. For example, there is evidence that a significant number of people (particularly in multi-family units) respond incorrectly when asked whether they have a gas or electric water heater. One way to adjust for such problems is to compare the respondents' utility bills with his answers. At present, only SDG&E makes this kind of correction.

A further problem with the utility surveys is the treatment of blank or unreadable answers. These are handled differently at each utility and sometimes within a utility over different surveys. San Diego Gas and Electric reports the number of non-answers and unreadables, SMUD calculates the saturations without them, and SCE reports them when they are a substantial fraction of the answers and sets them equal to a negative response (zero) when they are a 1% or less of total answers.

Finally, with one exception, none of the survey data were cross-tabulated to the extent that is necessary for complete analysis. For example, the average size of family owning an appliance cannot be determined from any of the surveys except SDG&E. Again only SDG&E presents the saturation of electric space heat and electric appliances versus the year the dwelling unit was built. The first kind of cross tabulation gives a clue as to the use of appliances (especially dishwashers, clothes washers, and clothes dryers), the second cross tabulation is an excellent method of determining time trends.

Most studies and estimates of appliance lifetimes actually refer to the retention of an appliance by a given owner, instead of the service life of the appliance. Two studies[6] derived both new and used retention lifetimes. These lifetimes cannot be directly added to produce a service

lifetime. However, the retention lifetimes are computed from actuarial tables,[7] and in Appendix A13 we derive a method to use these tables to get an estimate of the service life. Follow-up surveys indicate that the errors in estimating retention lifetimes ($2\sigma \sim 20\%$) are probably random.[8] The method used to derive the service life produces a bias if there is a time trend in the number of sales, but the error appears to be within the uncertainty produced by the random errors described above.

While saturations and lifetimes of appliances generally present the same problems for all appliances, the unit energy consumption calculations are more specialized. We refer the reader to the appendices for a detailed description of the methods used to derive the data in Table 2.

References

1. L. Wall, personal communication. TWOZONE is part of the CAL/ERDA buildings analysis program now under development at LBL. CAL/ERDA is being developed under the direction of Prof. A. H. Rosenfeld and is sponsored jointly by the ERCDC and the U. S. Energy Research and Development Administration.
2. C. M. Crysler, "Energy for Electricity and Lighting", Lamp Marketing Department, General Electric Company, 1973.
3. The San Diego Gas & Electric Appliance Saturation Survey (1971) asked for the number of laundry and dryer loads per week and presented this information in a table versus family size. The trend is almost linear with a roll-off for families above six members in size and a dip for two person families.
4. The average family size in the Pacific Gas & Electric Residential Electric Laundry Dryer Load Research Project January--June 1966 was 4.5 persons per family and the energy consumption was 1400 kwh/yr. The MIRACLE I data base compiled by SDG&E indicates that the average family

size of households with dryers is about 3.1. Scaling the dryer consumption on the PG&E study by 3.1/4.5 approximates Edison Electric Institute figures for average dryer energy consumption for the country; it is also within 10% of the result (similarly compensated) of the Oklahoma Gas and Electric Company survey. (See Appendix discussion of laundry facilities.)

5. The Rand study, R-995, "A Methodology for Projecting the Electrical Energy Demand of the Residential Sector in California" by C. C. Mow, W. E. Mooz and S. K. Anderson, March 1973, uses the EEI figures to get a Unit Energy Consumption (UEC) for refrigerators as a function of time.
6. M. D. Ruffin and K. S. Tippett, Service Life Expectancy of Household Appliances: New Estimates from the USDA, Home Economics Research J., March 1975, Vol. 3, #3 page 159. Also, J. L. Pennock and C. M. Jaeger, Household Service Life of Durable Goods, Journal of Home Economics, 1964 Vol. 56, page 22.
7. We derived our service life estimates from Ruffin and Tippett's data, Life Tables for Major Household Appliances - July 1972 Survey (18 tables), Consumer and Food Economics Inst., Agriculture Research Service, USDA, Federal Building, Hyattsville, MD 20782.
8. C. M. Jaeger and J. L. Pennock, An Analysis of Consistency of Response in Household Surveys, American Statistical Association Journal, June 1961, 56, page 320.

THE COMMERCIAL SECTOR

Introduction

The commercial sector presents a very different data problem than the residential sector. We know a lot about the residential sector from secondary sources. The U. S. Census, financial institutions, public utilities and trade associations have been collecting data related to residential energy use for many years. In the commercial sector, however, primary data gathering has been sketchy and estimates of various kinds dominate the literature in the field. The best data concerning commercial buildings is on new construction. The F. W. Dodge Division of McGraw-Hill has been collecting and processing building permit data since 1957. There is also reasonably good data on the existing stock of non-residential buildings (see Table 6 and Appendix C1). The difficulty in estimating sector-wide energy consumption, however, lies in determining the energy use per square foot of the various kinds of non-residential buildings.

It is clear that the use made of a building determines its energy consumption. Hospitals require relatively larger and more sophisticated lighting and HVAC systems than warehouses. Computers in office buildings require more air conditioning than is provided in prisons, or armories. Schools operate for many fewer hours than retail stores, and so on. Spielvogel offers further examples of variation within use categories (see reference 1). To estimate energy consumption for any particular type of building, however, requires averaging over a large number of individual structures with different design characteristics, heating and cooling systems, occupancy densities, and maintenance practices. Documentation of these variables is sparse or non-existant. Research efforts

TABLE 6 - Stock Size Millions of Square Feet
SMSA

	Total	LA	Orange	SD	SF-OAK	Santa Clara	Average Unit Energy Consumption[3.] Kwh/ft^2/yr	Relevant Variables	Percentage Savings for 1980 Constructio
Retail	890	316.4	104.3	66.3	75.3	51.6	17.7-19	size, height, occupancy and lighting	27.2-30.4[4.]
Office	630	230.4	53.8	35.2	90.4	25.6	15.8-21	size, height	27.8-30.5[4.]
Schools[1.]	566	86.9	45.3	24.1	83.4	31.9	6.6-13.2	night and summer use	22.0-23.6[4.]
K-12	442	145.9	35.4	30.9	66.3	26.5	7		
College and University	124	40.9	9.9	8.7	18.6	7.4	12.2		
Hospitals[2.]	187	72.0	15.1	12.6	27.2	9.6	20.3-22	N.A.	18.0[5.]
Government	469			Not Allocated			9.0-10.6	N.A.	N.A.
Military	360.5			Not Allocated					
State, Local and Other Federal	108.7	35.9	8.7	7.6	16.3	6.5			
Hotels[1.]	227	74.9	18.2	16.8	33.4	12.7	7	N.A.	N.A.
Garages[1.]	169	55.8	13.5	12.5	24.8	9.5	5	N.A.	N.A.

Stock estimates based on the period 1974-75 depending on sector (see Appendix C1).
1. Allocated by population.
2. Allocated by % of total beds (see California Statistical Abstract).
3. From Dubin-Mindell-Bloome Associates, "A Study of Existing Energy Use on Long Island..."
4. A. D. Little, Impact Assessment of ASHRAE Standard 90-75 (see Appendix C3).
5. Hugh Carter

N.A. = Not Available

directed at analyzing commercial energy use have typically resorted to defining prototypical structures that can be studied in detail with computer simulation programs. The simulation programs can generate unit energy consumption (UEC) data. This simplification has advantages as well as drawbacks which will be discussed below in the context of particular studies.

In principle, the exponential lifetime stock use model can be applied to the stock of residential buildings. There is historical data on construction collected by F. W. Dodge, which can be used to project future additions to the stock. Estimates of the lifetime of commercial buildings, however, vary considerably. They range from 40 to 60 years, and there is little evidence to support any particular choice. The question of removals for commercial buildings has not been studied.

Data on UEC for this sector is available on a kwhr/square foot/year basis from various simulation studies. Salter[2] and Dubin[3] provide average energy consumption data, weighted by the various size and age distributions of the existing stock. The reports of Hugh Carter[4] and Economic Sciences Corporation[5] give UEC data for new additions. The A. D. Little[6] study of ASHRAE 90-75 is a reasonable proxy for the impact of the Title 24 standards on new construction beginning in 1977. We summarize the relevant results for electricity consumption in Appendix C3.

The average UEC for various building types in the existing stock can be expected to change in the future as conservation measures are implemented. We discuss some fragmentary data on the magnitude of this effect below.

Finally, we have refrained from attempting a balance sheet calculation because the reliability of utility data on commercial electricity consumption is questionable. Indeed, the billing category which traditionally has

been called "commercial" is now referred to as "medium light and power" because of uncertainty involving just what customers are included. Large apartment buildings are often in this category, for example. Moreover, large commercial structures can be billed as industrial due to the size of their connected loads. If forecasting is to be done for the commercial sector as we have defined it, the billing category problem must be resolved by the utilities.

Methodology

As a first step toward estimating unit energy consumption data for various building use types, we will review the existing studies in this area. In 1975, the ERCDC commissioned a study by Hugh Carter Engineering to evaluate the impact of the Title 24 standards for non-residential buildings. This study has been the subject of a good deal of controversy. Carter claims to have analyzed six prototypical buildings in the commercial sector. His study, however, provides no basis on which to evaluate the claim that the structures discussed are typical. This is a central problem in any analysis that is not based on sampling the actual population of commercial buildings. There is no way to know if representative examples have been chosen.

A particular problem with the Carter study is that the various uses of energy in the reference structures are not segregated, so we do not know what part of the total consumption is due to lighting, what part is due to elevators, refrigeration, etc. Therefore, when the building simulation program is run with the Title 24 standards applied, it is impossible to identify which variables are responsible for the reduced energy con-

sumption and to what degree each has input. In priniciple, of course, this segregation of variables can and should be done, so that the impact of strategies for reducing lighting, increasing insulation, double glazing and so on can be evaluated.

As a general rule, building simulation programs should be verified against actual data to be sure that they are in fact simulating the real world. Carter does not identify what, if any, consistency checking he has done. Therefore, when he reports energy savings of 35-40% for high-rise office buildings, we don't know what factors are primarily responsible and how this saving compares with the potential of retrofitting. As a point of comparison here, the PG&E energy conservation program in their own company offices and service centers showed an average 32.4% decrease in electricity consumption without a change in HVAC systems for 1974 over the base year (9/72 - 8/73). For 1975, the reduction was 33.2% compared to the base year.[7] Another example is the conservation program of the Buildings and Grounds Division of the State of California's Department of General Services. They report a reduction in electricity use in state office buildings of 22.9-24.6% in December 1973-75 over the base year (1972) and a reduction of 28.3-28.7% in June 1974-75 over the base year 1973. A report from the Committee on Grounds and Buildings of the University of California shows a reduction in total energy use of 15% for 1974 over 1973 as a result of their conservation program. These reductions are due to operating and maintenance practices. They can also be realized in new construction, over and above the technical co-efficients listed in Table 6.

Carter reports several interesting results that seem to be confirmed by other experts in commercial energy consumption. One result is that variations in California climate zones have a relatively insignificant

effect on energy consumption. A large building is generally dominated by its internal loads and, therefore, requires cooling during most of the year. Even if the outside temperature is relatively low, cooling will still often be used. Thus similar buildings in San Francisco or Sacramento will show little variation in their energy requirements.

A related result is the higher energy intensity of large buildings compared to small ones. Carter's prototypical low-rise office building uses roughly 60% of the energy that the high-rise office building uses per square foot (reference (4) D2-D7). There are several plausible explanations for this phenomenon; small buildings use natural ventilation, they are less crowded, they are older and, therefore, not overlighted. It is not clear which of these reasons, alone or in combination, or what other factors account for the lower energy intensity of small buildings. Data should be gathered, however, on the size distribution of buildings because it is correlated with energy use. For some cities primary data is available from departments of local government in particular San Diego and in the future San Francisco. This data should be analyzed and energy use sampled systematically in these well documented building populations. Ideally the cooperation of the local utility will be obtained for such analysis. For retail buildings, size distribution data is available from the Commercial Construction Markets Survey.[8]

The recent study of non-residential buildings done by Rand highlights the advantages and limitations of computer simulation programs.[2] The Rand study assumes that variations within California's climate zone are insignificant. All simulations of weather variables contrast Los Angeles with New York or some other markedly different region. Where Carter compares San Diego with Sacramento and San Jose, Rand looks only at Los Angeles. One

advantage of Rand's assumption is that building systems can then be examined more closely. The building program simulates various HVAC systems under the same thermal loads to compare technical efficiency and economy of performance. While the analysis is suggestive, its ranking of efficiencies is not conclusive because no validation procedure has been used to verify the results. It is not clear that the mass of manufacturer's sales data could be reasonably aggregated into the HVAC system prototypes Rand uses. The gap between the simulated building features and the real world is again non-trivial.

Because Rand fixes attention on essentially one building type, it is able to assess the relative importance of the various electricity loads in those structures. From such an examination, Rand concludes that lighting is the dominant load in office buildings followed by cooling requirements. (See the summary in Ahern, et al. Energy Alternatives for California[9] p. 196 where electricity demand for lighting in the reference structure is 10 kwh/sq ft/yr and cooling uses 2.6 kwh/sq ft/yr out of a total 17 kwh/sq ft/yr). The importance of this estimate is that it suggests priorities for energy conservation measures. Rand evaluates the impact of various energy saving techniques with their simulation program. The results are suggestive, but cannot be considered conclusive because of the general lack of validation procedures. Qualitatively, Rand suggests that a reduction in lighting loads with its accompanying decrease in cooling requirements will have the greatest impact on electricity consumption. The next most important measure in the Rand simulation is increased equipment maintenance and feedback control for HVAC systems. Future studies should attempt to check these results.

Since primary data on energy consumption in commercial buildings is not available in sufficient quantity of accurate estimates of sector wide use, it is necessary to rely on computer simulation studies. The report by

Dubin-Mindell-Bloome Associates on Long Island Lighting Company's electricity demand[3] is unique in the literature because it employs a validation technique to substantiate the output of computer simulations studies. The Dubin study compares its aggregate simulated estimate of electricity consumption in the commercial sector with utility records and finds close agreement. This lends considerable support to its gross conclusions about energy use and makes plausible the disaggregated estimates of individual uses in particular building types. In Appendix C2 these estimates from the Dubin study are reproduced. For comparison, we include the table on relative energy intensities from Salter, et al..

It should be noted at the outset that the Long Island data cannot be directly applied to California because the climate and the energy supply systems differ significantly in the two regions. The greatest differences are due to the lack of widespread electric space and hot water heating in California. These uses depend primarily on natural gas in California. Moreover, differences in the building stock may reflect different lighting levels; older buildings tend to have less lighting than newer ones. Finally, of course, climate differences affect the cooling and heating loads.

Estimates of unit energy consumption in 1980 are listed for some building types in Table 6. We discuss the derivation of these numbers in Appendix C3. Our main sources are the recent A. D. Little study, An Impact Assessment of ASHRAE Standard 90-75, Energy Conservation in New Building Design and Carter's report. The ASHRAE 90-75 standard, which A. D. Little studies, closely resembles the Title 24 standards for Non-Residential Buildings adapted by the California ERCDC. Unfortunately, the climate chosen to represent the Western United States by A. D. Little, namely Albuquerque,

New Mexico, differs significantly from California. Nonetheless, the impact on electricity use can be estimated from this study for some buildings.

Efforts to build a data base on the components of energy use in commercial buildings must ultimately rest on sampling the actual stock. A beginning can be made by surveying manufacturers and installers of HVAC systems for data on the coefficient of performance (COP) of different HVAC system types. Rand has done some simulations of this which need checking. Maintenance and operation practices can be documented by surveying associations of building managers and firms which perform that service. A study done for the Minnesota Energy Agency has some data on the manner in which these practices vary from one building type to another. The process of constructing a data base for non-residential buildings, however, will be a long and difficult job. We can only be said to have just begun this task.

References

1. Lawrence Spielvogel "Exploding Some Myths About Building Energy Use," Architectural Engineering (February, 1976) 125-128.
2. Richard G. Salter, Robert L. Petruschell, Kathleen Wolf, Energy Conservation in Non-Residential Buildings R-1623-NSF Draft, March, 1975.
3. Dubin-Mindell-Bloome Associates, A Study of Existing Energy Usage on Long Island ---, New York, 1975.
4. Hugh Carter Engineering Corp., Non-Residential Energy Conservation Standards Title 24 Economic and Energy Effectiveness Study, La Jolla.
5. R. D. Caughran, E. A. Green, and R. M. Thuneu, An Electrical Energy Impact Assessment of California Title 24 Building Standards; Energy Conservation in Non-Residential Buildings, Economic Sciences Corporation, Berkeley, California 1976.
6. A. D. Little Inc., An Impact Assessment of ASHRAE Standard 90-75, Energy Conservation in New Building Design, 1975.

References (cont'd)

7. Internal Energy Usage, Company Offices and Service Centers, Pacific Gas and Electric Company MR & S Department February 11, 1975 and January 27, 1976.

8. Commercial Construction Markets Survey IV Mountain, Pacific Edition, (July, 1975) Vol. 2, No. 4, pp. 10, 14, 22, 20, 30.

9. William Ahern, et al. Energy Alternatives for California, Rand Corporation, Santa Monica, California, 1975.

INDUSTRIAL, AGRICULTURAL AND WATER SYSTEMS SECTORS

Because the ERCDC is not considering immediate action on "non-price" measures to effect energy conservation in the industrial or agricultural sectors, the LBL project, in accordance with priorities set by the ERCDC staff, has not devoted much attention to these sectors. However, some effort has been made to identify sources of information that may be of use in the future.

A major source of future information on industrial electricity use will be the utilities. All of the major California utilities are now in the process of accounting for their industrial sales according to the Standard Industrial Classifications (SIC). This information will be provided to the ERCDC by the utilities on a routine basis.

There are three information issues in the industrial and agricultural sectors which appear to be especially significant in the context of future demand for electricity in California. These are: the potential for the cogeneration of electricity and process steam by industrial users, the possible requirements for electricity as a substitute for natural gas in industrial processes, and the potential for the adoption of load management practices in water pumping for agricultural use.

Industrial cogeneration of electricity may have the potential to reduce significantly the demand for utility generated electricity.[1] Assessing this potential will probably require a cross-sectorial analysis of California industry with industry in other countries where cogeneration is more common.[2]

Information on the possible requirements for electricity as a substitute for natural gas in industrial processes has necessarily been

generated as a consequence of the establishment of natural gas allocation priorities based on end-use by the California Public Utilities Commission (CPUC).[3] The major gas utilities in California have now assigned priorities to their customers based on the CPUC schedules. Since gas uses for which electricity is the only substitute are high priority, the utilities will have to have fairly good data on these uses.

No attempt has been made in this project to collect this data from the utilities. However, some indication of the type of information that is available can be seen from a CPUC report on gas curtailment.[4] This report gives SIC coded natural gas peak day demands by priority class for the PG&E, SDG&E, and Southern California Gas Company service areas.

Water pumping consumes a significant fraction of the electricity used in California as can be seen from Table 1 (p. 4). PG&E (the largest single supplier) estimates that 90 percent of its electricity sales in the agricultural sector are for water pumping.[5] If the 90 percent factor applies to all agricultural users, then from the values for agricultural and water systems electricity sales in Table 1 it can be estimated that approximately 12 billion kwhr/yr is used in water pumping. This is approximately 8 percent of all California electricity sales.

Although the large water agencies such as the Department of Water Resources are aware of the importance of load management, there have been no studies of a comprehensive nature on the potential for improved load management in water pumping. Information for such a study can probably be obtained without much difficulty from the large water utilities. However, information on groundwater pumping (especially load curves) may be more difficult to obtain. In short, the potential for improved load management may be quite large, but the data at this time are inadequate for making sound judgments.

References

1. However, demand for utility generated electricity is not necessarily reduced by industrial cogeneration since the utilities may own the cogenerating plants. For example, four of PG&E's power plants now sell process steam. Pacific Gas and Electric Company, Annual Report to the Public Utilities Commission, 1975, pp. 434-B, C; notes M and M-1 and p. 416).
2. See, for example, L. Schipper and A. J. Lichtenberg, Efficient Energy Use and Well Being: The Swedish Example, LBL-4430, Lawrence Berkeley Laboratory, Berkeley, California (1976).
3. California Public Utilities Commission, Decision No. 85189. (December 2, 1975).
4. California Public Utilities Commission, Report on Staff Recommended End-Use Curtailment Procedures for Natural Gas Public Utilities in the State of California, Case No. 9642 (April 24, 1975).
5. Cervinka, V. et al., Energy Requirements for Agriculture in California, Ag. Eng. Department, U.C. Davis, Davis, California 1974.

DATA MANAGEMENT

Information about energy is unusual in several respects. The fact that until recently such information was not considered valuable has produced a situation in which relatively few data are available, and these are often of dubious quality. Since no standardized system for collecting or reporting such data exists, the available information uses a number of different geographical breakdowns; the heterogeneity of energy use often hinders conversion from one geographical system to another. In order to forecast energy use, a data base from which one can project changes in stocks, growth trends, etc., is required. Because the factors that determine energy use change with time, the information that describes those factors must be positioned with respect to time. All of these characteristics of energy information are dealt with in the data system which we have adopted.

The information which we have collected is located by both the geographical area and the period of time for which it is true. Geographically, a piece of information may apply to the whole state, a single county, a utility's service area, or a Standard Metropolitan Statistical Area (SMSA). A datum may be located in time as applying to a single year or a period of several years. To facilitate the projection of stocks of energy-consuming entities, time series of constructions and removals of buildings, and sales and retirements of appliances have been collected and constructed; the size of the stock of these entities has also been noted in the data base. Given the stock size at one time, as well as time series of sales and removals, a time series for stock size can be calculated.

The information being collected falls into four categories. First is a group of data for projecting the size of stocks of energy-consuming entities. This group consists of stock magnitudes and the flows into and out of these stocks. Second is a group of data concerning energy use: annual consumption per unit of stock and per unit of each of the two flows, utilization per month, and the fraction of buildings insulated. Next is a set of data designed for economic analysis: cost per unit, and for buildings, rent and the construction price index. Finally, for energy-consuming devices, we have obtained load curves and saturation rates. With these numbers in hand it should be possible to project according to historical trends, and with the addition of assumptions concerning the effects of various policies of growth rates and unit consumption, to project the effects, both for energy and economics, of various policy alternatives.

These concepts can be made more specific by referring our discussion to the actual data entry formats used. The conventions in use for input to our primary data base are listed in Appendix D1. These formats are very compact and, hence, well suited to data storage on punched cards, but are inconvenient for reading. The data can be processed by computer and printed out in an easily readable tabular form. A magnetic tape containing the data in this printable format is also available. Hence, users may choose either the compact or expanded format for further processing.

We distinguish three categories of data: device information, building information and load curves. The distinct input card formats for each of these can be found in Appendix D1. Each item is categorized by a two digit geographical region code (county, SMSA, or utility district); a

device and sector code or building type code and a time period. We also provide formats for three other types of information: footnotes, data source information, and footnotes to sources. Details of the codes and examples of these formats are contained in Appendix D1.

In order to reflect the varied quality of the available information, each datum is associated with a "hardness" value, which represents the collector's evaluation of the accuracy. This hardness code is a "x" datums's number from one to five, according to the following scheme.

0 - Excellent; error probably less than 5%

1 - Very good; high confidence, error probably less than 10%; data well accepted and verified

2 - Good; reportable and accepted; error probably less than 25%

3 - Fair; validity may be uncertain due to method of combining or applying data; error probably less than 50%

4 - Poor; low confidence, validity questionable, error may be as high as an order of magnitude

5 - Very poor; validity unknown, error may be greater than an order of magnitude.

Clearly, these evaluations are subjective, but they should serve at least two important purposes. By indicating which numbers may be suspicious, they may warn the user to take the results of calculations which use them with at least a grain of salt. In addition, when attached to particularly critical information, a hardness code of three or more may serve as a signal indicating the need for additional research.

Just as each datum is evaluated with a hardness code, each is also referenced to its source. References are of three kinds. Where a number is simply taken directly from a document, that document is referenced as the source. Where some fairly simple calculation was done on the number found in the document, the document is referenced with a footnote des-

cribing the calculation. If a more complicated calculation was made, involving numbers from more than one source, a footnote attached to the resulting number describes the procedure that produced it and the sources for the underlying numbers. With this system, every piece of information can be traced to its origins, and any challenge to the data can be answered with the statement, "Here are our sources; please show us yours." Thus, challenges to the data's accuracy may well become a method for eliciting data we have not obtained.

We believe that these last two features of the system - the evaluation of the data with the hardness codes, and the complete referencing of all data - are especially important features which have generally been missing from energy data bases. Without these features the data simply stand there, unqualified, unsupported, and unchallengeable; with them the information stands with its sources, assumptions, and limitations revealed. The data on punched cards are processed by a computer program to produce printed tabulations. This program is listed and discussed in Appendix D1. Appendix D2 contains the data tabulations and an introduction to their use.

Information was prepared to aid the study of relationships between use of energy consuming devices and quantities such as the age and income of various population groups. Reports prepared for each California county included information from the 1970 U. S. Census Fourth Count (Housing) on the stock of buildings, numbers of various types of appliances and the value and rent for housing units. Other 1970 Census tabulations were prepared by county, for age distribution of the population, employment by occupation and industrial grouping, income distribution by occupational group, educational attainment, and information on living arrangements and

number of individuals per household. Part of this data is directly concerned with energy using devices and is included in the previously described data base. The remaining economic and demographic data were treated as a separate set of information. The approach taken to processing this data was to provide report generators to select information from the large Census data base already in use at Lawrence Berkeley Laboratory.

Underlying all of the data, of course, is the set of documents from which it was derived. The list of these documents forms a bibliography to accompany the data. Finally, there are several sets of auxiliary data which were collected for various purposes during the project. For example, a wealth of information on refrigerators has been obtained and coded for computer analysis.

In conclusion, the main data base produced by this project contains some of the basic information necessary for forecasting California's residential and commercial electrical energy consumption, with all data positioned in space and time, and with all information evaluated as to accuracy and referenced to their origins. This should provide both a tool for forecasting and a foundation on which to build a larger and more detailed energy data system.

RECOMMENDATIONS

Introduction

One of the purposes of our study was to develop recommendations on ways to improve the data on electricity consumption in California. We have identified five areas where we feel improvements are necessary. These are:

- o Load research
- o Saturation studies
- o Data management systems

We discuss each of these areas below, but first we make some comments on general problems associated with improving the data.

Any improvement of the data on electricity consumption will have costs associated with it. In some cases, these costs are far from negligible. Since the rate payers of California will ultimately bear these costs, reasonable care should be taken to see that their interests are served by the investments in better data.

Significant improvement in the quality of data on electricity consumption also requires institutional commitments. The development of a good data base is not a "one-step" process. It cannot be accomplished simply be deciding what information is wanted and then asking clerical personnel to "look it up". Rather, it proceeds by trial and error. Many ways must be tried to elicit the desired information. Data must continually be evaluated and updated. Efforts must be focused so that

time is not wasted on irrelevant problems. Success requires that the work be conducted in a stable environment by professional personnel with sufficient autonomy and authority to maintain high standards. If the institutions responsible for developing the data cannot create the conditions necessary for effective work, then the results of their efforts are likely to be found wanting.

The development of a data base should not proceed in the absence of a clear understanding of the uses of the data. Since the intended uses of data frequently change to reflect new developments, it is important to establish good liaison between data base users and data base developers. This is especially true in the case of data intended for use in electricity forecasting models. These models are in an early stage of development and their requirements for data can be expected to evolve considerably as they become more sophisticated.

One method that the ERCDC may wish to consider in dealing with the problems discussed above is the establishment of an advisory panel on electricity consumption data. This panel might be composed of experts on data collection, analysis, and management together with representatives of data users. The panelists could be drawn from the utility companies, the ERCDC and other governmental agencies, academic institutions, and the public at large.

This panel could assist in the cost benefit analysis of new data base development initiatives. That is, it could weigh the costs of better data against the benefits in greater understanding or better forecasts. The panel could also examine the problem of institutional commitments. It could make recommendations to the Commission as to what

kinds of commitments were necessary and how they might be obtained. Further, the panel could serve as the focal point of data user-supplier liaison efforts. Finally, the panel could examine some of the specific problems related to data base development such as those discussed below.

Load Research

The object of load research is the determination of when and how much electricity is required for a given end use. This type of information is necessary for any complete analysis of electricity sales and demand.

Load research can be conducted at different levels of refinement. It can involve monitoring the load for an entire system, for a group of users served by a single substation, for individual users, or for a sample of specific energy using devices. Usually, because it involves continuous monitoring, load research is very expensive. This is especially true when the objective is the determination of load characteristics of specific devices.

Today, load research as a technical discipline is still in its infancy. Only one California utility (P.G. and E.) has an ongoing load research program. Current efforts are frequently characterized by very small sample sizes, and the representativeness of the results is open to question. As with all infant disciplines, there are many areas for improvement.

As a starting point, we have identified three areas in load research that we believe should be given high priority. These are:

- Non-residential buildings
- Experiment design
- Instrumentation

We discuss our reasons for suggesting these priorities in the following paragraphs.

There is an almost total absence of measurements on electricity consumption in California non-residential buildings. Almost all of the data in this area are based on engineering estimates and computer calculations. Field measurements to check these estimates and calculations are essential not only for the purposes of forecasting, but also as a check on the efficacy and appropriateness of standards which have been developed. Therefore, we think that experiments in the area of non-residential buildings should be the highest priority for load research.

Since the primary limiting factor in load research is cost, great attention needs to be devoted to problems associated with the design of experiments. Proper experiment design is necessary to insure that the limited number of measurements that can be taken provide the best possible information on the true electricity requirements for the end use under study. Proper experiment design can reduce unnecessary data collection. Also, it is possible that good analysis of experiments before they are undertaken will reveal other ways to reduce costs. For these reasons we recommend the initiation of research on the design of experiments. Work in this area should involve the cooperative efforts of engineers, statisticians, and social scientists. The initial effort should be directed toward developing a set of guidelines for the proper conduct of load research experiments.

One of the reasons for the high cost of load research is the expense associated with instrumentation for continuous monitoring of devices. We have not examined this area in any detail, but we believe that a modest

effort might produce worthwhile developments. One example which might be worth pursuing is a recording "on-off" meter. The power requirement for many electricity using devices is either zero or a constant depending on whether the device is on or off. If the constant is known (this usually requires only one measurement), then the load can be monitored by an "on-off" meter which records when the device is on and when it is off. A recording "on-off" meter should be significantly less expensive than a recording watt meter.

In our view, adequate load research is going to require substantially greater commitments of resources than has thus far occurred. We have argued that immediate efforts should be focused on the unexplored territory of non-residential buildings and on efforts to improve quality and reduce costs. However, even with vigorous efforts to reduce costs, it seems likely that load research will remain a costly undertaking. If good results are desired, then substantial expenses must be anticipated.

Saturation Studies

Studies on saturations of appliances and other equipment can have a variety of purposes. Historically, they have been used as a measure of the standard of living or for marketing. They are necessary for stock-use forecasting models because they can be used to determine the stock of energy using devices.

Since information on a household can usually be obtained with a single mailed questionnaire, saturation studies are considerably less expensive than load research. Also, the general techniques for saturation studies (i.e., survey research methods) are more advanced than those for load

research. Survey research is an established field of study within academic departments and at specialized research centers. Many private firms routinely conduct surveys.

In spite of the advantages that saturation studies enjoy relative to load research, there are a number of areas which require improvement. We have again identified three areas which we think should be given high priority:

- o non-residential buildings
- o survey design and analysis
- o coordination with the Census.

The first two items are similar to problem areas we have identified in load research, but we think they may prove more tractable than their load research counterparts. The third item may provide a method for achieving a significant improvement in saturation data at a relatively low cost to state agencies and utilities.

Data on electricity using devices in non-residential buildings is very limited. In order to improve the understanding of energy consumption in these buildings, information is needed on the amount of lighting, on the types of heating, ventilating and air conditioning systems, and on a variety of other equipment such as elevators and refrigerators. To be most useful, this information should be cross tabulated with the building type and use as well as the floor space (square feet) enclosed by the building. Surveys for this type of information would not appear to be significantly more difficulty than residential saturation surveys. We think that, in view of the poor quality of exisitng information and the relatively low cost for surveys, saturation studies in non-residential buildings should be initiated immediately.

There appear to be a number of areas where the design and analysis of saturation studies can be improved. The single most important improvement, for utility conducted surveys, is the matching of customers' responses with billing data. This information would be extremely useful both for analyzing energy consumption and for editing the data for incorrect responses. For example, a comparison of households which were identical except for heating fuel type could provide a good indication of the energy used for electric heating. Respondents who claimed to have electric heat, but did not have a winter electricity use peak, could be assumed to be in error.

Only one utility (SDG & E) now makes use of billing data; we think that the results of their preliminary analysis have proved the value of this information. (Unfortunately, SDG&E has not completed analysis of their information and no final results were available for use in this study.) We believe that billing data should be incorporated in all future utility conducted saturation surveys.

A problem with existing saturation studies is inadequate cross tabulations. Only one utility (SDG & E) has organized its survey analysis procedures so that cross tabulations can be made routinely. This information is essential for any thorough analysis. Examples of useful cross tabulations are: heating type with housing type, water heat type with water using appliances, heating type with age of house, and, of course, saturation data with billing data.

With the use of computers, the problem is easy to correct. We think that data from future saturation studies should be encoded and preserved in a form that will facilitate cross tabulation. Standard statistical programs can be used to make cross tabulations when the data is analyzed.

A further measure which can be taken to facilitate the analysis of saturation studies is the standardization of questionnaires and data reporting formats. At present it is difficult to compare results from surveys conducted by different utilities because the questions asked are not identical.

We do not recommend that all questionnaires be completely identical. Differences in utility service areas may warrant special questions. Also, it may be desirable to ask experimental questions so that ways can be developed to improve survey results. However, we do recommend that a group of "core" questions be developed which would be used by all utilities.

The "core" questions for saturation surveys should be carefully designed to elicit the essential information and to eliminate improperly constructed questions. (E.g., The answer to, "Is your refrigerator frost free?" is ill-defined if the respondent has more than one refrigerator.) If the core questions are developed by pooling the knowledge of all the utilities, then we believe that all of the surveys will be strengthened in the process.

Of course, if the advantages of standardized questions are to be realized, data reporting must also be standardized. All survey results should be encoded in a standard, computer compatible format. This will make possible not only the comparison of results but also the pooling of data from different surveys.

One of the most difficult methodological problems in the conduct of survey research is biases in the results due to non-uniform responses from various groups in the population surveyed. All of the utility survey data that we examined showed evidence of bias due to fewer responses from residents in multi-family households. We suspect that there are other biases

for example, due to fewer responses from low income groups and from single occupant households. Almost certainly, the data from Southern California utilities are biased by low responses from Spanish speaking households.

Many of the biases in utility surveys can be corrected (at least approximately) by using data from the Census as we discuss below. However, careful thought must be given to the problem of biases in the design phase of saturation studies. Biases should be anticipated and correction measures should be planned. Survey questions should be devised which can be used for detecting and correcting biases. Special attention should be given to master-metered customers (these are not questioned by utility surveys) and other groups where inadequate responses can be anticipated.

We believe that the utility companies could benefit from the advice of outside experts in the design phase of their saturation studies. These experts could assist the utilities in bringing the methodology already developed by survey researchers to bear on the problem of biases. Further, we believe that an independent examination, by experts in survey research, of biases in utility surveys would contribute significantly to the solution of this problem.

The decennial Census (to be quinquennial beginning in 1985) provides the most complete data on the characteristics of the residential sector. In addition to data on housing types, income, number of occupants per household, etc., it asks many questions related to the saturations of energy consuming devices. In particular, data relevant to heating, cooling, and appliances are solicited. Since the samples are very large and response is compulsory, Census results are more representative of the population as a whole.

Because it is more representative, the Census can be used to correct biases in utility saturation surveys. For example, we have used the Census data on housing (together with data on housing additions) to correct for utility survey biases due to low responses from occupants of multi-family housing units. We assumed that the responses that were obtained from multi-family unit residents were representative of the group as a whole. In calculating saturations for all households, we weighted these responses more heavily to compensate for the low response rate. The weighting factors that we used were derived from the Census. Clearly, this kind of procedure could also be used to correct for biases due to low responses from single occupant households and other similar biases.

In order to make full use of the Census in checking and correcting utility saturation surveys, at least two steps should be taken. First, since the Census was not designed with the determination of energy use as an important objective, an effort should be undertaken to develop and gain adoption of questions that best serve this objective for the 1980 Census. Second, a careful comparison should be made of results from utility surveys with results from the 1970 Census. This effort should seek to identify and find explanations for differences. As part of this effort, cross tabulations of the Census 4th Count Housing Data should be made.

It should be noted that we do not believe that the Census can replace utility surveys. The most important reason for this is that we do not think it is feasible to incorporate billing data into the Census (this would be very useful if a method could be devised). Another reason is that it may be difficult to obtain sufficiently detailed information in the Census because so much other information is also needed.

Further, the interval between Census years and the long time lag before Census data is completely tabulated may make it impossible to maintain the kind of current data necessary for forecasting.

We believe that improved saturation studies can provide an important advance in the understanding of how energy is consumed, especially in the residential sector. We have made a number of suggestions on how to make improvements. Many of these suggestions could lead to overlapping or redundant efforts. Clearly, a well coordinated program will be required if any significant effort to gain better information from saturation studies is attempted.

Data Management

We regard the data base and data management procedures developed during this project as first steps in establishing an energy use data system for forecasting California energy use and for other energy assessments. The specific data processing system described in this report was designed to produce the tables in appendix D2 but can be extended to form the basis for a larger data management scheme. To provide an effective data system will require a continuing effort to incorporate new information, correct errors, evaluate data and develop new estimation procedures. A stable professional energy data staff is necessary to carry out these functions adequately. The data base staff must work closely with the forecasting and assessment personnel to tailor the contents of the data base and the retrieval and analysis computer programs to best fit forecasting and modelling requirements.

We have large blocks of data available which can and should now be added to the existing data base. This information includes:

- Detailed performance data, from AHAM, on refrigerators and freezers.
- National Bureau of Standards data on refrigerators, freezers and air conditioners.
- 1976 appliance price information.
- Additional data from the 1970 census.
- Information on the size distribution of buildings in San Diego.
- Data from an SMUD saturation survey.
- Data from the Brookhaven National Laboratory Energy Model Data Base.

Although this information has not yet been entered into the data base, much of it was used in preparing this report or supplied to the CERCDC in the form of computer generated reports. The existing data base is mostly concerned with residential and commercial electricity consumption; it would be valuable to add data on industrial and agricultural consumption and the use of other fuels. Energy use surveys and other information obtained by the utilities should be entered into the data base. For forecasting, energy use data must be related to socio-economic data describing the age, income and other characteristics of the population of California. Hence a data system should permit the selection of subsets of data from sources such as the 1970 census for use in conjunction with energy data; energy sales data should be conveniently accessible in the same system.

The basic data management operations required: addition, deletion or changing of records, retrieval of selected sub-sets of data and provision of summary reports - can be adequately provided by many existing computer data management systems. Provision for producing graphical plots should also be made. A convenient interface should be provided to permit the data to be processed by standard statistical analysis routines.

It seems likely that data will be required for use with a series of distinct energy forecasting or other models. Some of these models are likely to have been developed without reference to the structure of this particular data base. Hence it should be made easy to output data in the arbitrary formats required as input to various models. For certain assessments a linked series of calculations or models are required. Data

conventions should be established and format conversion facilities provided to enable model calculations to pass on information to other programs via the data management system. A coherent set of analysis and modeling calculations could be based on the use of one data management system. A simple user command language should be provided to relieve the user from requiring familiarity with the often incompatible and arbitrary data input conventions of various modeling programs.

GLOSSARY

Glossary of Selected Terms

Billing data - classification of utility customers into groups based on their power requirements for the purpose of rate making. Electric energy sales to the various customer classes and the revenue generated by those sales are listed in utility company annual reports.

Coefficient of Performance (COP) - a measure of efficiency typically applied to refrigerators and heat pumps. COP is the ratio of heat transferred for a useful purpose to the work input required. COP is a dimensionless number, so that the denominator in the ratio, which is usually electric energy must be converted to BTU's at the rate of 3413 BTU/kwh.

Cogeneration - the process of generating electricity in conjunction with industrial use of steam.

Connected load - the maximum instantaneous electric power measured in kilowatts deliverable to a given utility customer.

Cross tabulation - a distribution of one variable in a data base with respect to another variable. For example, refrigerator ownership can be cross tabulated with family size to determine how many two-person families own one refrigerator, how many three person families own two refrigerators, etc.

Decay curve - a curve plotting the quantity of a decaying stock of objects with respect to time.

Decay rate - the fraction of the remaining stock of a decaying set of objects which is removed in one year.

Double glazing - two panes of glass with an air space between them.

Efficiency - engineers define efficiency as the ratio of useful energy output per unit of energy input. We generalize this definition to include the extent of any end-use satisfaction (e.g., number of square feet of building space maintained at a comfortable temperature) per unit energy input.

Electricity demand - the rate at which electric energy is delivered to a piece of equipment.

Electricity sales - the total amount of electric energy purchases from a utility company in a given time interval (usually one year).

Electricity efficiency ratio (EER) - a measure of efficiency usually applied to air conditioning equipment. EER is the cooling output measured in BTU's divided by the kilowatt hours necessary to produce that output. Since EER is dimensionless, kilowatt hours must be converted to BTU's at the rate 3413 BTU/kwh.

Exponential lifetime - also known as the mean lifetime, this is the reciprocal of the decay rate.

Household - a group of people sharing common cooking facilities. This is numerically equal to the U.S. Census data on year-round occupied housing units.

HVAC - heating, ventilating and air-conditioning equipment that is large enough to be used in commerical buildings.

Lifetime - the average number of years a device is used regardless of ownership transfers.

Load curve - a graph of instantaneous power demand for a device or system with respect to time. The relevant time period may be one day or one year.

Load management - a set of practices designed to flatten the load curve of a utility by distributing power demands more evenly over time.

Load survey - an experimental procedure to determine a load curve for a device or set of devices.

Master-meter - a device which measures total electricity sales to a multi-unit residential structure.

Performance standard - a maximum energy budget for a device without specification of the technical means of achieving the required efficiency.

Price index - the cost of a fixed "market basket" of goods and services at a given point in time expressed as a percentage of the cost of the same "market basket" in some designated base year.

Retrofit - the retroactive modification of a building or a machine usually to improve its energy efficiency.

Saturation - the number of devices of a given kind in use divided by the number of households in the region considered.

Standard industrial classification (SIC) - a two to five digit code that classified establishments according to their principal economic activity in increasing levels of disaggregation. a firm conducting business at different locations, or conducting several district activities at one location, will be treated as several "establishments" for SIC purposes. Five digit SIC codes identify distinct manufac-

turing, central administrative and research activities within each industry.

Standard Metropolitan Statistical Area (SMSA) - an integrated economic and social unit with a large population nucleus, such as a city of 50,000 or a city of 25,000 with surrounding communities.

Thermal load - the number of BTU's of heat to be removed by air conditioning or to be added by heating to a given building space.

Time series - a variable which takes on a sequence of values at successive points in time.

Title 24 standards - a building code for non-residential structures issued by the California ERCDC which is designed to improve the energy efficiency of new construction.

Unit energy consumption (UEC) - the energy consumed by a single device to meet a certain end-use.

Selected Abbreviations and Acronyms

AEIC	Associated Edison Illuminating Companies
AHAM	Association of Home Appliance Manufacturers
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning
BTU	British Thermal Unit
Btuh	BTU per hour
COP	Coefficient of performance
CPUC	California Public Utilities Commission
EEI	Edison Electric Institute
EER	Energy efficiency ratio
ERCDC	Energy Resources Conservation and Development Commission
FHA	Federal Housing Administration
HUD	Department of Housing and Urban Development
HVAC	Heating, ventilating and air-conditioning equipment
kw	Kilowatt
kwhr	Kilowatt-hour
LADWP	Los Angeles Department of Power and Water
LBL	Lawrence Berkeley Laboratory
PG & E	Pacific Gas and Electric Company
R-19	19 BTU^{-1}-hr-deg F-ft^2
SAT	Saturation
SCE	Southern California Edison Company
SMSA	Standard Metropolitan Statistical Area
SMUD	Sacramento Municipal Utility District
UEC	Unit energy consumption
USDA	U.S. Department of Agriculture

APPENDIX A

Analysis of Residential Energy Uses

A1	Residential Building Stock	R. B. Weisenmiller with the assistance of P. Caesar
A2	Thermal Properties of Residential Buildings	R. B. Weisenmiller
A3	Electric Heating	R. B. Weisenmiller
A4	Air Conditioners	D. B. Goldstein and R. B. Weisenmiller
A5	Lighting	R. D. Clear and D. B. Goldstein
A6	Water Heaters	R. D. Clear and D. B. Goldstein
A7	Refrigerators	R. D. Clear and D. B. Goldstein
A8	Cooking Facilities	R. D. Clear and D. B. Goldstein
A9	Television	R. D. Clear and D. B. Goldstein
A10	Freezers	R. D. Clear and D. B. Goldstein
A11	Home Laundry Facilities	R. D. Clear and D. B. Goldstein
A12	Dishwashers	R. D. Clear and D. B. Goldstein
A13	Appliance Lifetimes	C. J. Blumstein, R. D. Clear and D. B. Goldstein

A.1 Residential Building Stock

The building stock estimates provide an underlying component for much of the appliance data; since the number of devices was often derived by combining these stock estimates with the saturation rates, which were mostly determined from surveys of small samples of housing units. The wide variation of these saturation rates and of the UEC's of various devices with location, time, and building type required that the building stock be disaggregated into single family, multi-family, and mobile homes stocks as a function of time for the various utility service areas. While the basic stock data were available in terms of counties, the saturation rates were collected for utility districts. Accordingly, it was necessary to develop an allocation scheme to translate these stock data from counties to utility service areas.

The available stock data consists of three types; first, the 1970 Census, determined the stock sizes of both occupied and all housing in each county at March 31, 1970 for each housing type; second, the Security Pacific National Bank[2] has collected the number of building permits used per year in each county; and third, the Mobile home Market Research Inc.[3] has collected sales data for mobile homes in each county for each year. These data sources provide the stock at one point in time and the gross additions after this time, so that in this exponential decay stock model the decay rates must also be determined to account for removals from this stock. These decay rates were determined to account for removals from this stock. These decay rates were determined from the Components of Inventory Change (CINCH) data[4], which was collected as part of the

1970 Census by determining the changes in the building stock since the 1960 Census.

We employed the Census data for occupied housing to eliminate seasonal, migratory, and vacant housing. Single family housing includes both attached and detached units (detached units are those surrounded by open space on all sides or those that are only connected to a garage or a shed). These definitions, along with that of housing unit, varies with data source. For example, it is not clear that the Security Pacific National Bank permit data has the same aggregation of attached and detached single family units as this study employed for the Census data. Another inconsistency is that vacant mobile homes are not included by the Census in the housing stock, unlike vacant single family and multi-family units. The mobile home data does include trailers, but excludes vacation trailers. The Census also collects data on the ages of the housing structures and provides these data cross-tabulated by county and household characteristics, but not by housing type or by housing type and by county.

The Security Pacific National Bank building permit data does not separate seasonal, migratory, or vacant housing. We have attempted to correct for this by assuming that a constant 4% of these gross additions fall into these categories. This correction term may be inadequate for the previous year's construction, which judging from Table A1.1 may have a vacancy and "other" housing type component of closer to 23%. However, this effect was built into the 1970 Census data for the 1969 housing stock and this effect can be considered to progress from the 1969 stock to the newest contingent each year.

TABLE A1.1 - Comparison between All Units and Occupied Units by the Age of the Structure[1]

Year Structure Built	Occupied Units	All Units	Fraction of Units Occupied
1969-1970	184,000	238,000	.773
1965-1968	664,000	707,000	.939
1960-1964	1,176,000	1,241,000	.948
1950-1959	1,945,000	2,031,000	.958
1940-1949	1,045,000	1,106,000	.945
1939 or earlier	1,557,000	1,653,000	.942
Total	6,572,000	6,976,000	.942

1. Derived from Department of Housing and Community Development, California Statewide Housing Element, Phase II (1973), p. 54--which is in turn based upon The 1970 Census, Fourth Count Housing Tapes, Table 8.

Along similar lines it should be realized that the housing stocks are listed for year end, but for the purposes of energy accounting calculations the contingent built during the last year will not consume their full share of energy (which will be balanced in part by those buildings removed during the year which consume some energy). Similarly, construction and demolitions do not occur at a continuous rate during the year, but are focused in the spring and summer months. However, the saturation data are not typically all for the same month, so that all of these corrections cannot be adequately handled. For example, SMUD's 1975 saturation survey was performed in January of 1975, SCE's 1975 saturation survey was conducted in February and March of 1975, SDG&E's Miracle I survey was collected in February of 1974, LADWP's data are for July of 1975, and PG&E's data are for either December 31, 1975 or March of 1975.

The mobile home sales data are only for the county in which the unit was sold, instead of the county in which the unit was to be located. Since mobile homes are indeed mobile, no better approximation is possible then to assume that they remain in the county in which they are sold. These sales data also include mobile homes that are used for non-residential purposes, but this also cannot be corrected.

The remaining component of the basic exponential stock model is the decay rates. We have estimated these decay rates from the CINCH data, which are displayed in Tables A1.2 through A1.5. These data include new construction, demolition, "other" removal (which includes fires, floods, becoming unfit for occupancy, and conversions between commercial

TABLE A1.2 - Summary of Some of the CINCH Data
(over 1960 - 1970 period)

(Percent)

West	1970	1960	New Const. % of stock	% of New Const.	Other New	Removal Demol.	Removal Other	Same
Inside SMSA's	78.7	77.4	31.7	81.3	.6	7.6	3.8	86.9
In central city	35.1	38.2	25.0	28.6	.1	8.4	3.6	85.8
Not in central city	43.6	39.1	37.1	52.6	1.0	6.7	4.0	88.1
Outisde SMSA's	21.3	22.6	27.1	18.7	1.8	8.6	9.6	80.3
Total			30.7	100.0	.9	7.8	5.1	85.4

TABLE A1.3 - CINCH Data for Some Selected Areas
(over 1960 - 1970 period)

	Percent						Rates		
			New		Removal		If exp. rates		
West Total	1970	1960	Const.	Other	Demol.	Other	Rem.	Dem.	New Const.
All	-	-	30.9	.9	7.8	5.1	- 1.4	- .8	+2.7
1	69.7	76.0	25.7	.3	7.3	3.6	- 1.2	- .8	+2.3
2+	26.6	12.7	38.5	1.0	9.3	5.2	- 1.6	-1.0	+3.3
Mobile	3.6	2.3	75.3	10.5	10.6	54.4	-10.5	-1.1	+5.6
Year Built									
All	-	-	-	.9	7.8	5.1	- 1.4	- .8	+2.7
1960+ or later	30.9	-	-	-	-	-	-	-	-
1950-1959	26.9	38.3	-	2.3	1.6	2.3	-	- .16	-
1940-1949	12.6	18.1	-	.5	9.2	4.5	-	-1.0	-
1939 or earlier	29.5	43.6	-	.6	10.6	5.9	-	-1.1	-
West Inside SMSA's									
All	-	-	31.7	.6	7.6	3.8	- 1.2	- .8	+2.8
1	67.1	74.7	26.6	.2	6.6	2.4	- .9	- .7	+2.4
2+	30.0	23.3	39.2	.7	10.1	4.2	- 1.5	-1.1	+3.3
Mobile	2.9	2.0	71.8	9.0	13.3	50.0	-10.0	-1.4	+5.4
Year Built									
All	-	-	-	.6	7.6	3.8	- 1.2	- .8	+2.8
1960+ or later	31.7	-	-	-	1.1	1.5	-	- .1	-
1950-1959	28.5	39.2	-	1.3	1.5	1.5	-	- .15	-
1940-1949	12.6	19.3	-	.6	9.1	4.2	-	-1.0	-
1939 or earlier	27.3	41.5	-	.6	11.6	4.3	-	-1.2	-
West in Central Cities									
All	-	-	25.0	.1	8.4	3.6	- 1.3	- .9	+2.2
1	58.0	64.5	19.6	.08	7.0	2.3	- 1.0	- .7	+1.8
2+	40.4	33.8	31.5	.2	10.6	4.8	- 1.7	-1.1	+2.7
Mobile	1.7	1.7	56.3	1.4	21.0	32.3	- 7.6	-2.4	+4.5

TABLE A1.3 (cont'd)

	Percent						Rates		
			New		Removal		If exp. rates		
Year Built	1970	1960	Const.	Other	Demol.	Other	Rem.	Dem.	New Const.
West in Central Cities									
All	-	-	-	.1	8.4	3.6	- 1.3	- .9	+2.2
1960+	25.0		-	-	.9	1.1	-	- .09	-
1950-1959	24.9	31.6	-	.19	1.4	1.4	-	- .14	-
1940-1949	12.7	18.0	-	-	9.0	3.8	-	- .9	-
1939 or earlier	37.4	50.4	-	.19	12.1	4.3	-	-1.3	-
LA-LB SMSA									
All	-	-	24.0	.3	7.2	2.9	- 1.1	- .75	+2.5
1	61.0	69.3	15.9	.25	6.6	1.6	- .9	- .68	+1.5
2+	37.7	29.7	53.8	.16	8.5	3.9	- 1.3	- .89	+4.3
Mobile	1.3	1.1	98.7	10.2	7.0	52.4	- 9.0	- .73	+6.9
Year Built									
All	-	-	-	.3	7.2	2.9	- 1.1	- .75	+2.5
1960+ or later	24.0	-	-	-	-	-	-	-	-
1950-1959	30.0	38.0	-	1.0	2.2	2.9	-	- .22	-
1940-1949	15.3	21.2	-	-	5.8	2.2	-	- .60	-
1939 or earlier	30.7	40.8	-	.17	12.4	3.2	-	-1.3	-
LA-LB in Central City									
All	-	-	22.5	.1	7.6	2.9	- 1.1	- .79	+2.0
1	51.8	59.6	13.9	.18	6.7	1.3	- .8	- .70	+1.3
2+	47.6	39.8	31.3	.02	6.6	3.5	- 1.1	- .68	+2.7
Mobile	.6	.6	58.7	.0	-	33.3	- 4.0	.0	+4.6
Year Built									
All	-	-	-	.1	7.6	2.9	- 1.1	- .79	+2.0
1960+ or later	22.5	-	-	-	-	-	-	-	-
1950-1959	24.4	29.9	-	.38	1.8	2.3	-	- .18	-
1940-1949	14.4	18.7	-	-	5.1	1.7	-	- .52	-
1939 or earlier	38.8	51.4	-	.02	11.9	3.7	-	-1.27	-
SF SMSA									
All	-	-	24.7	.5	6.49	3.3	- 1.0	-1.29	+2.6
1	58.5	63.3	21.6	.2	4.09	.19	- .6	-1.44	+2.2
2+	40.7	36.0	28.4	.8	9.6	7.7	- 1.9	- .9	+3.3
Mobile	.7	.7	73.5	4.8	19.1	55.9	-13.9	-2.1	+6.4

TABLE A1.3 (cont'd)

SF SMSA	Percent						Rate		
			New		Removal		If exp. rates		
Year Built	1970	1960	Const.	Other	Demol.	Other	Rem.	Dem.	New Const.
All	-	-	-	.5	6.49	3.3	-1.0	- .67	+2.6
1960+ or later	24.7	-	-	-	-	-	-	-	-
1950-1959	23.2	28.7	-	.6	.9	2.5	-	- .09	-
1940-1949	13.3	17.4	-	.5	10.0	2.1	-	-1.1	-
1939 or earlier	38.8	53.9	-	.8	10.4	4.8	-	-1.1	-

TABLE A1.4 - Summary of Rates for Exponential Stock Model
(over 1960 - 1970 period)

Area	Single Family	Multi-Family	Mobile	Mobile' (with mobile demolition plus other rate of other units)
			Removal Rate	
LA-LB SMSA	- .9	-1.3	- 9.0	-1.0
SF-SMSA	- .6	-1.9	-13.9	-2.5
West	-1.2	-1.6	-10.5	-1.6
			Demolition Rate	
LA-LB SMSA	- .7	- .9	- .7	
SF-SMSA	-1.4	- .9	- 2.1	
West	- .8	-1.0	- 1.1	
			Construction Rate	
LA-LB SMSA	1.5	4.3	6.9	
SF-SMSA	2.2	3.3	6.4	
West	2.3	3.3	5.6	
			Observed Net	
LA-LB SMSA	.5	4.1	3.8	
SF-SMSA	1.1	3.1	2.0	
West	1.4	4.4	7.0	

TABLE A1.5 - The Decay Rate Used in Our Exponential Stock Model

Area	Single Family	Multi-Family	Mobile
LA Region	- .861	-1.32	- .983
SF Region	- .486	-1.90	-2.49
Other	-1.16	-1.56	-1.58

1. LA Region corresponds to Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura counties.
2. SF Region corresponds to Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Sonoma counties.
3. Rest of state. Decay rate corresponds to Western Region.

and residential or between single family and multi-family status), and the fraction remaining the same in various geographical regions for each building type. The decay rate was computed from the total removal rate (the sum of demolition and "other" removal), except for mobile homes (where "other" removal could refer to moving from one trailor park to another) where the decay rate was derived from the sum of demolitions and the average "other" removal rate for single family and multi-family units. Without this type of prescription the lifetime of mobile homes about 10 years. The 1970 Census data for California occupied mobile homes tabulated according to the year sold is shown in Table A1.6. These data are not consistent with such a short lifetime, especially since the sales of mobile homes has increased substantially in recent years.

Using these decay rates we have computed the lifetimes shown in Table A1.7. These all seem rather long, but an exponential model has a very long tail as part of its decay curve. It should be noted that the overall effect of this model is not a simple exponential decay model, since the building stock has been decomposed into three building types in three distinct regions (for a total of nine stocks and nine decay constants). This should provide a better model than any simpler treatment within this framework.

However, one can question the use of a single decay constant for housing, since one would expect this constant to be a function of the age of the unit. In general there should be two components to the decay rate: one for stochastic or random processes such as fires, floods, earthquakes, or highway programs and the other a process of aging induced

TABLE A1.6 - The Fraction of Occupied Mobile Homes in 1970 in Time Series Form

Year Built	Percentage of Total
1969-March 1970	11.1
1965-1968	28.9
1960-1964	29.4
1950-1959	24.8
1940-1949	3.1
1939 or earlier	2.2

TABLE A1.7 - Lifetime Estimates

Area	Single Family	Multi-Family	Mobile
San Francisco Region	206	53	40
Los Angeles Region	116	76	102
Remainder of State	86	64	63

effects. A single decay constant through time is the correct way of dealing only with the random part, but the ratio of these two types of processes is not determined and the data are inadequate for constructing any more complicated models.

Not only should the decay constant be a function of the age of the building to at least some extent, but also these decay constants will be functions of time. These decay constants should reflect the ratio of construction costs to renovation costs, the general level of economic activity (i.e. in a recession the new construction rate is very low so the removal rate is also lower[5]). Moreover, as societal values change, these decay rates may also change (e.g. the removal rate for brown-shingle or Victorian housing is rather low for the San Francisco area). However, the CINCH data by averaging over the entire decade should correct for some of these effects.

At this point the stock data are for each building type in each county, so this must be further transformed into utility service area data. The allocational scheme that we have developed is shown in Table A1.8. The conversion is <u>not</u> into the actual utility districts, but into more generalized utility service areas. This approach is quite similar to that of the California Public Utility Commission, and consists of aggregating the smaller municiple utilities (except SMUD and LADWP) into the larger surrounding utilities. For example, PG&E includes Alameda, Palo Alto, Santa Clara, and San Francisco in this scheme and LADWP includes Glendale, Pasadena, and Burbank. Also all the smaller utility companies (except Sierra Power Company, Pacific Power & Light, Surprise Valley Electrification Corporation, and the Imperial

TABLE A1.8 - Allocation Scheme from Counties to Utility Service Areas

COUNTY	UTILITY	FRACTION	UTILITY	FRACTION
Alameda	PG&E	1.0000		
Alpine	Other	1.0000		
Amador	PG&E	1.0000		
Butte	PG&E	1.0000		
Calaveras	PG&E	1.0000		
Colusa	PG&E	1.0000		
Contra Costa	PG&E	1.0000		
Del Norte	Other	1.0000		
El Dorado	PG&E	1.0000		
Fresno	PG&E	.9925	SCE	.0075
Glenn	PG&E	1.0000		
Humboldt	PG&E	1.0000		
Imperial	Other	1.0000		
Inyo	LADWP	.5030	SCE	.4970
Kern	PG&E	.7620	SCE	.2380
Kings	PG&E	.5550	SCE	.4450
Lake	PG&E	1.0000		
Lassen	Other	1.0000		
Los Angeles[1]	SCE	1.0000		
Madera	PG&E	1.0000		
Marin	PG&E	1.0000		
Mariposa	PG&E	1.0000		
Mendocino	PG&E	1.0000		
Merced	PG&E	1.0000		

TABLE A1.8 (cont'd)

COUNTY	UTILITY	FRACTION	UTILITY	FRACTION
Modoc	Other	1.0000		
Mono	SCE	.8190	LADWP	.1810
Monterey	PG&E	1.0000		
Napa	PG&E	1.0000		
Nevada	PG&E	1.0000		
Orange	SCE	.9470	SDG&E	.0530
Placer	PG&E	.9800	SMUD	.0200
Plumas	PG&E	1.0000		
Riverside	SCE	1.0000		
Sacramento	SMUD	.9596	PG&E	.0404
San Benito	PG&E	1.0000		
San Bernardino	SCE	1.0000		
San Diego	SDG&E	1.0000		
San Francisco	PG&E	1.0000		
San Joaquin	PG&E	1.0000		
San Luis Obispo	PG&E	1.0000		
San Mateo	PG&E	1.0000		
Santa Barbara	SCE	.5700	PG&E	.4300
Santa Clara	PG&E	1.0000		
Santa Cruz	PG&E	1.0000		
Shasta	PG&E	1.0000		
Sierra	PG&E	1.0000		
Siskivou	Other	1.0000		
Solano	PG&E	1.0000		

TABLE A1.8 (cont'd)

COUNTY	UTILITY	FRACTION	UTILITY	FRACTION
Sonoma	PG&E	1.0000		
Stanislaus	PG&E	1.0000		
Sutte	PG&E	1.0000		
Tehama	PG&E	1.0000		
Trinity	PG&E	1.0000		
Tulare	SCE	.8450	PG&E	.1550
Tuolomne	PG&E	1.0000		
Ventura	SCE	1.0000		
Yolo	PG&E	1.0000		
Yuba	PG&E	1.0000		
Los Angeles[2]	LADWP	1.0000		

1. Los Angeles County minus the cities of Los Angeles, Pasadena, Glendale, and Burbank.

2. The cities of Los Angeles, Pasadena, Glendale, and Burbank.

Irrigation District which comprise the "Other" classification) are included into the larger surrounding companies. For example, Turlock-Modesto Irrigation District is included in the PG&E service area. The categories are the same as the CPUC's except that in our SMUD scheme is separated from PG&E. It should be noted that the disadvantage of this arrangement is that the final data is not directly comparable to either the utility data or the Census or county data.

The remaining component of the allocation scheme involves the eleven counties that are serviced by more than one of the utility companies. The basic part of this allocation is shown in Table A1.9, which was compiled from SCE data. Sacramento and Placer county were allocated in a similar fashion based upon the SMUD customer records. This fractional allocation assumed that housing types were uniformily distributed within these counties and that new construction was similarly homogenous.

The results from these conversions of the various sources of data are listed in Table A1.10. This listing was produced by the computer program RHIANON[7]. From these results the number of removed houses can be calculated and is shown along with the averaged decay rates for each utility service area in Table A1.11.

The most interesting trend in the additions to the building stock is in the split between single family and multi-family units, which is listed in Table A1.12. This fraction of single family units in new construction seems to be more a cyclic, than a smooth linear, function. However, the oversite long term trend has been towards a higher fraction of multi-family units. The cycles could be caused by fluctuations in

TABLE A1.9 - Fraction of Residential Population Served by SCE, Derived Using SCE Customer Estimates and California County Factbook 1975 Populations

County	Ratio	SCE/Total	Rest Allocated to:
Fresno	3,300/439,220	.0075	PG&E
Kern	80,500/337,700	.238	PG&E
Inyo	8,500/17,100	.497	LADWP
Kings	30,400/68,300	.445	PG&E
Mono	5,900/7,200	.819	LADWP
Orange	1,595,000/1,684,500	.947	SDG&E
Santa Barbara	161,700/283,600	.570	PG&E
Tulare	178,900/205,800	.845	PG&E

SCE System Forecast (1975 - 1994), Electric System Planning, Table III-C, p.19

TABLE A1.10 - Our Estimates of Housing Stocks

(Number/Percentage)

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E	OTHER
a) As of 1970 Census						
All	2,437,000 (37.1)[1]	195,000 (3.0)	2,284,006 (34.8)	1,164,000 (17.7)	446,000 (6.8)	45,000 (.7)
Single Family	1,690,000 (69.3)[2]	146,000 (75.0)	1,636,000 (71.6)	621,000 (53.3)	306,000 (68.7)	36,000 (80.4)
Multi-Family	673,000 (27.6)[2]	44,000 (22.7)	564,000 (24.7)	536,000 (46.0)	116,000 (26.1)	4,800 (10.7)
Mobile	74,000 (3.1)[2]	4,600 (2.3)	83,900 (3.7)	7,400 (.6)	23,000 (5.2)	4,000 (8.9)
b) As of Year-end 1975						
All	2,792,000 (37.5)[1]	235,000 (3.2)	2,605,000 (35.0)	1,173,000 (15.8)	586,000 (7.9)	48,500 (.7)
Single Family	1,863,000 (66.7)[2]	158,000 (67.1)	1,721,000 (66.1)	619,000 (52.8)	361,000 (61.6)	37,200 (76.7)
Multi-Family	798,000 (28.6)[2]	68,300 (29.0)	745,000 (28.6)	547,000 (46.6)	189,000 (32.2)	5,670 (11.7)
Mobile	131,000 (4.7)[2]	9,260 (3.9)	139,000 (5.3)	7,390 (.6)	36,200 (6.2)	5,650 (11.6)

TABLE A1.10 - (cont'd)

(Number/Percentage)

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E	OTHER
c) New Construction 1970 - 1975						
All	529,000 (40.2)[1]	56,600 (4.3)	468,000 (35.6)	84,300 (6.4)	171,000 (13.0)	6,990 (.5)
Single Family	255,000 (48.2)[2]	22,000 (38.8)	172,000 (36.8)	30,100 (35.7)	71,800 (42.0)	3,570 (51.1)
Multi-Family	206,000 (38.9)[2]	29,300 (51.7)	234,000 (50.1)	53,800 (63.8)	84,400 (49.4)	1,340 (19.2)
Mobile	67,800 (12.8)[2]	5,340 (9.4)	61,300 (13.1)	460 (.5)	14,800 (8.6)	2,080 (29.7)

1. The percentage refers to the fraction of the entire state.

2. The percentage refers to the fraction of the particular service area.

TABLE A1.11

Demolitions

	PG&E	SMUD	SCE	LADWP	SDG&E	Other
All	174,000	16,400	146,000	75,300	31,000	3,400
Single Family	82,000	10,500	87,000	32,000	17,000	2,500
Multi-Family	81,000	5,300	52,000	43,000	12,000	480
Mobile	11,000	600	6,600	460	1,800	430

Decay Rates

Single Family	.00727	.0116	.00874	.00862	.00861	.0116
Multi-Family	.0182	.0156	.0132	.0132	.0132	.0156

TABLE A1.12 - California Building Permits

Year	Multi Units	Single Units	% Single Units		
1955	32,939	179,554	84.5		
1956	38,514	138,654	78.3	1955-59	71.7%
1957	57,442	112,167	66.3		
1958	71,986	124.688	63.4		
1959	80,225	155,901	66.0		
1960	75,035	119,512	61.4		
1961	94,808	117,765	55.2		
1962	127,198	117,765	48.1		
1963	176,785	128,739	42.1		
1964	143,132	112,065	43.1		
1965	85,431	94,766	52.6	1960-69	50.6%
1966	34,314	64,769	65.4		
1967	43,146	67,542	61.0		
1968	74,145	84,159	53.2		
1969	104,776	79,531	43.2		
1970	124,306	71,362	36.5		
1971	143,328	113,348	44.2		
1972	156,861	123,990	44.1	1970-75	47.7%
1973	114,130	102,734	47.4		
1974	53,321	76,205	58.8		
1975	42,131	89,846	68.1		

the interest rate versus rental costs or by the distribution of age groups within the general population (e.g. the "post-war baby boom" group could have caused a noted trend towards multi-family dwellings when they reached household status but, after they began having larger families, they could have later forced the market back towards single family units). Of course, the other part of this trend is the absolute construction rate of each housing type.

We have analyzed these trends within each utility district and there were no pronounced differences. There was a general trend in SMUD, which had a very large fraction of single family houses, for a large trend towards multi-family houses in new construction over the last five years. Their housing fractions are now more typical of the state wide form. The most noticable effect in each utility was the effect of the 1973 recession upon the housing market. It was interesting that the responses to this effect were not in phase between single family and multi-family units, which would indicate that the present high fraction of single family units may be an affect of the time lag in the multi-family unit construction to respond to the economic recovery (which as a more speculative venture might be as expected).

Footnotes and References

1. U. S. Census, Fourth Count Housing Tape, Table 9, (1970).
2. Research Department, Security Pacific National Bank, "California Construction Trends", Los Angeles, CA., monthly publication.
3. Mobile Home Market Research Inc., "California Mobile Home Report Annual Summary-1975 Sales: A Special Summary and Analysis of Retail Mobile Home Sales in California", Woodland Hills, CA (1976), p. 6.
4. U. S. Census, "Components of Inventory Change", (1970).
5. F. G. Mittelbach, F, Case, D. M. McAllister, and D. G. Gasparis, "The Role of Removals from the Inventory in Regional Housing Market", Occasional Paper No. 4, Graduate School of Business Administration, University of California, Los Angeles, (1970).
6. California Public Utilities Commission, Utilities Division, Electric Branch, Report on Ten-Year Forecasts of Electric Utilities' Loads and Resources, (1975).
7. RHIANON is a computer program written at Lawrence Berkeley Laboratory as part of this research program by R. B. Weisenmiller and D. B. Goldstein.

A2 Thermal Properties of Residential Buildings

The consumption of energy for space heating and cooling can be calculated only if the average levels of insulation are known. New housing must conform to California insulation standards (which are essentially R-19 [that is 19 BTU^{-1} - hr - degree F - ft^2] in the ceiling and R-11 in the walls), but we are forced to make estimates for existing houses, since there is very little direct data.

The sensitivity of the thermal loads to the insulation levels decreases as the insulation increases, so that the results are much more sensitive to the difference between no insulation and R-7 insulation in the walls and ceiling than between R-7 insulation in the walls and ceiling and R-19 in the ceiling and R-7 in the walls. There has been a historical trend for some insulation in electrically heated houses, so that one can estimate the thermal loads in these houses with less sensitivity to the insulation levels than in the case of gas-heated households or all households in general.

This trend towards some insulation in electrically heated houses has arisen from the higher operating costs of electric heating and the urging of the utilities (which wanted electric heating to smooth the load curves by filling in the winter "valleys") for some insulation in these houses. In terms of the building contractors these past practices have been most influenced by two factors -- persuasion by the utility company to insulate (which may be more or less forceful and cogent in different areas) and the desire of the builder to cut costs and to conform to the lower insulation levels in gas-heated houses. The balance

of these forces would tend to lie with some insulation in most electrically heated houses, but only a few inches. This balance is different between single family and multi-family units, since the operating costs incentive is relatively ineffective in rented units.

We have not been able to satisfactorily determine these insulation levels in general, but we feel that for electrically heated units that about R-7 walls and ceiling is a reasonable estimate. This estimate is conservative, since we essentially assume that all units have this level of insulation and none are retrofitted to greater insulation. This assumption should introduce a bias towards under-estimating the impact of conservation measures.

This estimate is based in part upon the thermal load computer program TWOZONE[1]. This program calculates the hourly heat balance from heat transfer through the building shell, the solar gain through the windows, the internal load from the occupants, and infiltration (which includes the effect of winds upon the rate of air exchanges). This balance calculation is based upon the standard ASHRAE algorithms and weather data tapes. These results are then compared to data from load surveys. There is very little direct data on the energy consumption for heating and cooling of residential buildings. It should be noted that the estimates contained in the Federal Power Commission's <u>All Electric Homes</u> are taken from the EEI estimates or are of unknown origin (except for SCE's which are based upon sub-metering tests), so that we have accorded these little weight in comparison to load surveys.

There are only a limited number of load surveys. PG&E has conducted

a load survey in the Sierra Foothills for electrically heated houses (and one at Pinole for gas-heated homes). Similarly, SCE has conducted sub-metering tests to measure the electricity consumed in household heating. Finally, PG&E has conducted a load survey of the electricity used for space cooling in residential buildings in Fresno. These surveys typically have problems with the sample size, the representative nature of the sample, and the allocation of electricity consumption among various devices and appliances.

TWOZONE's results agree remarkably well with the SCE data for heating and the PG&E data for cooling (see Appendix A3 for a more detailed discussion of the heating results and Appendix A4 for a more detailed description of the cooling comparison), but the agreement with the PG&E heating data is poor. (However, it should be noted that this direct comparison is misleading since it is between data that is only representative of this one locale -- according to PG&E -- and estimates for the entire PG&E service area). This comparison with these measured data provides some reassurance for the insulation estimates. However, it should be cautioned that this agreement is also a measure of the program accuracy and the validity of the thermostat setting assumptions. This comparison does indicate that TWOZONE yields reasonable results with reasonable estimates for the insulation level (R-7 in the ceiling and walls) and with reasonable thermostat setting estimates (a constant 70° setting for heating and a 76.5° setting for cooling).

As a further check of these estimates we have also extensively investigated other means of determining the insulation level by several

possible indicators of these levels. The most important data were the TWOZONE comparisons.

There are several approaches possible for indirectly determining these insulation levels in the existing stock of electrically heated houses. First, one can survey the present housing stock. This can be performed in ways that require either an active or a passive response on the part of the occupant. One example of the active approach is that used by SDG&E in its appliance saturation surveys, which asks the respondent whether they think that their dwelling has any insulation and what part of the structure they think is insulated (if any). These results are shown in Table A2.1. Another example is the telephone survey conducted[2] by the Drossler Research Company for PG&E. This approach has several flaws. In general, people may not know whether the house is insulated, or if the insulation was properly or completely installed, or how much insulation was installed. Also the Drossler survey only dealt with owner-occupied housing, which comprises only 54.1% of the California housing stock and which may introduce some biases (such as income effects) into these results. Neither of these surveys have been compared to billing data, which could eliminate some of the incorrect responses.

The passive approach is illustrated by the PG&E and SMUD experiment with night aerial infra-red surveys in the Sacramento area that began in March of 1976. The data from this experiment will depend not only upon the amount of insulation, but also upon the exterior temperature, the type of roof or the existence of an attic, and whether the occupants

TABLE A2.1 - Insulation in SDG&E Households from Their Saturation Survey Responses[1]

(Percent)

	Single Family	Multi-Family	Mobile
Ceiling Only	25.7	6.2	4.5
Ceiling and Wall	24.1	15.6	68.2
None	23.0	11.0	3.0
Don't Know	27.2	67.2	24.2

1. Special cross-tabulated of MIRACLE I (February, 1974) for LBL-ERCDC.

have adopted a night time temperature setback policy (or, more generally, the interior ambient temperature). A possible passive technique would be for the utility companies to use their billing data to isolate the largest energy consumers in the summer and winter months and then use this group a target of surveys and retrofit programs.

Second, there has been some measurements of the rate of heat loss of some types of structures in particular circumstances. An example of this type of data is shown in Fig. A2.1, which is a measurement of the rate of heat loss of a mobile home. The authors[3] of this study did note that two comparable units had a measured heat flow of half of this example. This figure is part of the data on mobile homes, which will indicate that this housing type has poor thermal integrity.

Third, one can check on whether the building codes, by specifying materials used and construction practices followed, determine the thermal characteristics of existing buildings. Dr. Ed Dean (of Lawrence Berkeley Laboratory's Energy and Environment Division and the University of California at Berkeley's Architecture Department) and Ms. Vera Adams (of this project and the Architecture Department) attempted this approach earlier this year without marked success[4]. However, one important trend is the availability of crawl spaces. The Drossler Report found that about 5% of the surveyed units had no crawl spaces. Beamed ceilings would be one indicator of a probable poor ceiling U-value.

Finally, one can investigate national and local historical building standards. There are two broad classes of such standards. First, all of the utilities (except PG&E) have for many years recommended standards for electrically heated houses. We have obtained copies of some of these

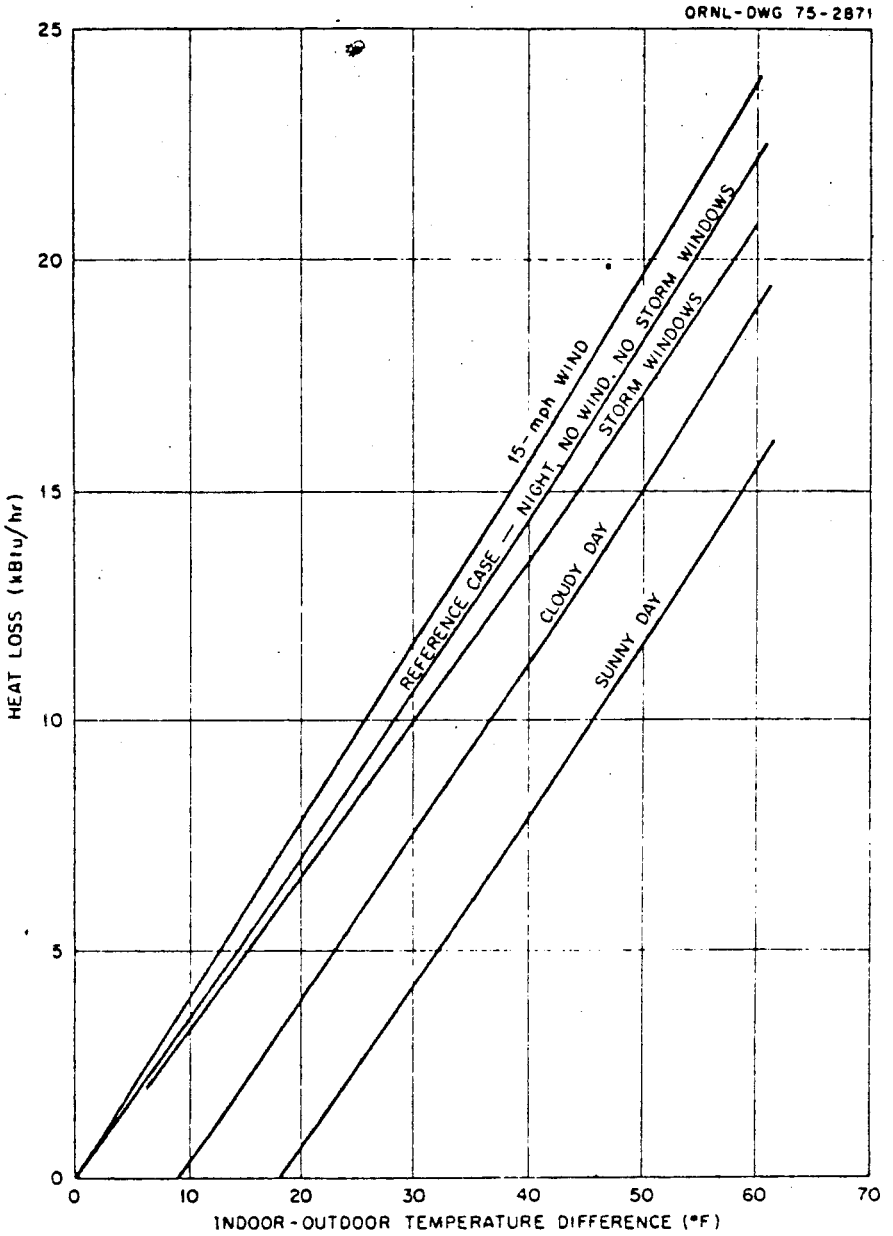


Figure A2.1 Steady--state heat loss from mobile homes (derived from experimentally based model) for a 600 sq ft (12 x 50') mobile home. Published in "Energy Conservation Studies" ORNL-NSF-EP-84, (December 31, 1974), p. 7.

standards (see Fig. A2.2, A2.3, A2.4, and A2.5). In general, these utilities felt that they have succeeded in getting some insulation in the vast majority of single family housing (around 95%), but have been less successful with multi-family dwellings. (The Drossler Report in its cross-tabulations found that in 88% of these owner-occupied dwellings (which were electrically heated), the respondent felt there was some insulation and that 20% felt there was only ceiling insulation. It should be noted that these are only owner-occupied units, and that PG&E did not actively recommend insulation).

Second, the Department of Housing and Urban Development (and the Federal Housing Administration in earlier years) have set Minimum Property Standards (MPS), which have included insulation (see Table A2.2). These standards apply directly to public housing projects and to new construction which has Federal Housing Administration, Veteran Administration, and Farmer's Home Association insured mortgages. These annually account for 20-30% of national new construction.

These standards have also had indirect effects. To a limited extent they have influenced the construction industry in general. Also some of the local agencies have adopted these national standards. The California Veteran's Affairs Office used to offer new construction loans as part of the California Veteran's mortgage program. At that time it inspected these houses to insure that they complied with the Federal standards. These mortgages have represented a small portion of the housing market (only a few percent of new construction). At their present bond level they do not offer new construction loans and now assume that construction meets the appropriate State standards.

Figure A2.2

SMUD Recommendations for Residential Insulation
1966 vs. 1976

1966: Recommended 6" ceiling. We didn't talk "R" factor in 1966. The 6" insulation could run from R-13 to R-19 according to product and method of installation.

Recommended 3" sidewall (about R-11).

1977: Recommend State Title 25 standards:

Ceiling: .05"U", requires R-19 insulation usually.

Walls: .08"U", requires R-11 insulation usually.

We suggest floor dinsulation but seldom get it. State does not require in our area.

Figure A2.3

Gold Medallion Apartment Standards

Exhibit "A"

ELECTRICITY SHALL BE THE SOLE SOURCE OF ENERGY FOR LIGHT, HEAT AND POWER

The Builder shall meet each of the Appliance and/or Equipment Requirements, Wiring Requirements, Lighting Requirements, and Electric Comfort Heating Requirements set forth hereinafter, unless it is expressly made optional.

APPLIANCE AND/OR EQUIPMENT REQUIREMENTS

1. An electric range, built-in or free standing (if built-in, both oven and counter top units shall be provided).
2. An electric refrigerator or refrigerator-freezer.
3. An electric water heater.
4. At least one additional major electric appliance, selected from the following list, shall be furnished and installed:
   a. Freezer
   b. Clothes dryer**
   c. Dishwasher (permanently installed)
   d. Waste disposer
   e. Air conditioning (one horsepower or larger, permanently installed—designed for the total air conditioning of each apartment)*
   f. Electric heat pump (designed for total apartment heating and cooling)*
5. PLUS at least one additional appliance, selected from the following list, also furnished and installed:
   a. Electronic oven (in addition to No. 1 above)
   b. Electric barbecue (permanently installed in the living area)
   c. Patio package (permanently installed electric barbecue and a minimum of 2 kw of permanently installed electric patio heating)
   d. Or, an additional appliance selected from those listed in Paragraph 4 above

*Central systems for electric air conditioning, heat pump, or electric heating, will be equivalent to individual units in each apartment.

**When an electric clothes dryer(s) is installed by the Builder or Owner as part of a community laundry facility for use by apartment occupants, each apartment may be credited with this appliance under Paragraph 4, above.

WIRING REQUIREMENTS

Wiring capacity in service entrance and/or main feeder serving each apartment is to be calculated on the basis of the electrical code in effect in the area, or with the current edition of the National Electrical Code.

1. Individual Appliance and Equipment Branch Circuits:
   Special purpose circuits, of adequate capacity, shall be provided for all installed appliances as indicated above under "Appliance Requirements" and for all heating and/or air conditioning equipment.
2. Appliance Branch Circuits:
   There shall be at least one three-wire, 120/240 volt, 20 ampere branch circuit equipped with "split-circuit" receptacles for all convenience outlets in the kitchen, family room, dining room or dining areas of other rooms, including breakfast room or nook. This circuit shall also serve convenience outlets in the laundry area not otherwise required to be served by individual equipment circuits. Although not as desirable, two 20 ampere, 120 volt circuits may be substituted for the three-wire circuit.
3. General Purpose Branch Circuits:
   It is recommended that separate branch circuits be provided for lighting and for convenience outlets; however, where local code allows fixed lighting and appliances to be combined on the same branch circuit, a general purpose branch circuit is required:
   a. for each 375 square feet of living area where No. 14 conductors are used, or
   b. for each 500 square feet of living area where No. 12 conductors are used

4. Convenience Outlets:

   Convenience outlets shall be installed in all living areas, and are to be placed so that no point along the floor line in any usable wall space is more than six feet from an outlet in that space. Wall spaces less than two feet at the floor line are not considered usable. Convenience outlets shall also be provided at the following locations:

   Kitchen must have at least two duplex convenience outlets located to provide one outlet for each four linear feet or major fraction of continuous work surface. Each unbroken counter work surface of over twenty-four inches requires a duplex convenience outlet. (This outlet can be one of the two required above.) Island work surfaces must have a convenience outlet.

   Exception: Compact (one wall) kitchen of eight linear feet or less and with no more than one work area, may be served by one duplex outlet.

   Bath must have one outlet, not switch controlled, adjacent to lavatory.

   Halls: One outlet in any hall over ten linear feet.

   Garage areas must have a minimum of one outlet.

   Exterior convenience outlets should be provided in patio, balcony and similar areas.

5. Wall Switch Control:

   Wall switches are required to control all fixed lights in major rooms or spaces except in attics and closets. Multiple switch control is required in any room which has two or more commonly used entrances which are ten feet or more apart. Multiple switch control is required for stairways connecting finished rooms.

LIGHTING REQUIREMENTS

Some form of fixed electric lighting (fixture, cove, valance, cornice, recessed or luminous ceiling) is required in the following locations:

Living Rooms*
Activity Rooms*
Family Rooms*
Dens*
Bedrooms*
Dining Rooms
Bathrooms
Kitchen—general
Kitchen—local (over-sink or other specialized lighting to provide shadowless lighting at sink area)
Outside Entrance(s)
Hallways—minimum of one lighting fixture for every ten linear feet
Entryways
Stairways
Walk-in Closets
Garages, Carports and Subterraneans must provide sufficient illumination throughout the entire area

*In lieu of a fixed lighting outlet in rooms larger than 150 square feet of livable floor space, at least two convenience outlet locations shall have "split-circuit" receptacles of which one plug position in each shall be wall switch controlled. (In rooms smaller than 150 square feet of livable floor space, one fully switched convenience outlet will be accepted.)

ELECTRIC COMFORT HEATING REQUIREMENTS

The dwelling shall be heated electrically. Sufficient insulation shall be installed to limit the calculated maximum heat loss to 25 B.t.u.h. per square foot of floor area to be heated. Design temperatures for calculation of system design and maximum heat loss are the median of extremes published in the *Recommended Outdoor Design Temperature, Southern California, Arizona and Nevada*, third edition, Southern California Chapter, ASHRAE, March 1967, or the same reference manual published for Northern California, second edition, March 1965, both as last revised.

Figure A2.4

Gold Medallion Home Standards

Exhibit "A"

ELECTRICITY SHALL BE THE SOLE SOURCE OF ENERGY FOR LIGHT, HEAT AND POWER

The Builder shall meet each of the Appliance and/or Equipment Requirements, Wiring Requirements, Lighting Requirements, and Electric Comfort Heating Requirements set forth hereinafter, unless it is expressly made optional.

APPLIANCE AND/OR EQUIPMENT REQUIREMENTS

1. An electric range, built-in or free standing (if built-in, both oven and counter top units shall be provided).
2. An electric refrigerator or refrigerator-freezer.
3. An electric water heater.
4. At least one additional major electric appliance, selected from the following list, shall be furnished and installed:
   a. Freezer
   b. Clothes dryer
   c. Dishwasher (permanently installed)
   d. Waste disposer
   e. Air conditioning (designed for total home air conditioning)
5. PLUS at least one additional appliance, selected from the following list, also furnished and installed:
   a. Electronic oven (in addition to No. 1 above)
   b. Electric barbecue (permanently installed in the living area)
   c. Patio package (permanently installed electric barbecue and a minimum of 2 kw of permanently installed electric patio heating)
   d. Or, an additional appliance selected from those listed in Paragraph 4 above
6. Forced Ventilation—an exhaust fan of adequate capacity shall be provided in each kitchen suitably vented to outside of structure.

WIRING REQUIREMENTS

Electrical codes—the wiring and equipment installation shall comply with the electrical code in effect in the area or with the current edition of the National Electrical Code.

Minimum Requirements for Wiring:

1. Service Entrance:
   a. Minimum service entrance rated at not less than 100 amperes total capacity shall be provided
   b. The distribution panel shall contain a minimum capacity of 20 circuits
2. Space for a spare two-pole circuit and a ¾ inch raceway or its equivalent stubbed out to a readily accessible location.
3. A 240 volt dryer circuit with receptacle.
4. Individual Appliance and Equipment Branch Circuits:
   Special purpose circuits, of adequate capacity, shall be provided for all installed appliances as indicated above under "Appliance Requirements" and for all heating and/or air conditioning equipment.
5. Appliance Branch Circuits:
   There shall be at least one three-wire, 120/240 volt, 20 ampere branch circuit equipped with "split-circuit" receptacles for all convenience outlets in the kitchen, family room, dining room or dining areas of other rooms, including breakfast room or nook. This circuit shall also serve convenience outlets in the laundry area not otherwise required to be served by individual equipment circuits. Although not as desirable, two 20 ampere, 120 volt circuits may be substituted for the three-wire circuit.

6. General Purpose Branch Circuits:
   It is recommended that separate branch circuits be provided for lighting and for convenience outlets; however, where local code allows fixed lighting and appliances to be combined on the same branch circuit, a general purpose branch circuit is required:
   a. for each 375 square feet of living area where No. 14 conductors are used, or
   b. for each 500 square feet of living area where No. 12 conductors are used

7. Convenience Outlets:
   Convenience outlets shall be installed in all living areas, and are to be placed so that no point along the floor line in any usable wall space is more than six feet from an outlet in that space. Wall spaces less than two feet at the floor line are not considered usable. Convenience outlets shall also be provided at the following locations:
   Kitchen must have at least two duplex convenience outlets located to provide one outlet for each four linear feet or major fraction of continuous work surface. Each unbroken counter work surface of over twenty-four inches requires a duplex convenience outlet. (This outlet can be one of the two required above.) Island work surfaces must have a convenience outlet.
   Bath must have one outlet, not switch controlled, adjacent to lavatory.
   Halls: One outlet in any hall over ten linear feet.
   Garage: A minimum of one outlet.
   Exterior: At least one weatherproof outlet.

8. Wall Switch Control:
   Wall switches are required to control all fixed lights in major rooms or spaces except in attics and closets. Multiple switch control is required in any room which has two or more commonly used entrances which are ten feet or more apart. Multiple switch control is required for stairways connecting finished rooms.

LIGHTING REQUIREMENTS

Some form of fixed electric lighting (fixture, cove, valance, cornice, recessed, or luminous ceiling) is required in the following locations:

Living Rooms*
Activity Rooms*
Family Rooms*
Dens*
Bedrooms*
Dining Rooms
Bathrooms
Kitchen—general
Kitchen—local (over-sink or other specialized lighting to provide shadowless lighting at sink area)
Laundry
Utility Rooms
Outside Entrance(s)
Hallways—minimum of one lighting fixture for every ten linear feet.
Entryways
Stairways
Walk-in Closets
Garages
Carports

*In lieu of a fixed lighting outlet in rooms larger than 150 square feet of livable floor space, at least two convenience outlet locations shall have "split-circuit" receptacles of which one plug position in each shall be wall switch controlled. (In rooms smaller than 150 square feet of livable floor space, one fully switched convenience outlet will be accepted.)

ELECTRIC COMFORT HEATING REQUIREMENTS

The dwelling shall be heated electrically. Sufficient insulation shall be installed to limit the calculated maximum heat loss to 30 B.t.u.h. per square foot of the floor area to be heated. Design temperatures for calculation of system design and maximum heat loss are the median of extremes published in the *Recommended Outdoor Design Temperature, Southern California, Arizona and Nevada*, third edition, Southern California Chapter, ASHRAE, March 1967, or the same reference manual published for Northern California, second edition, March 1965, both as last revised.

Figure A2.5

STANDARDS FOR APPLICATION AND INSTALLATION OF RESIDENTIAL ELECTRIC SPACE HEATING. RESIDENTIAL ELECTRIC AIR CONDITIONING RESIDENTIAL ELECTRIC HEAT PUMPS RESIDENTIAL ELECTRIC WATER HEATING

Exhibit "B"

I. GENERAL

The purpose of these standards is to assist in the selection of properly designed equipment, and in the application and installation of quality electric systems that will perform in a satisfactory, dependable manner.

II. RESIDENTIAL ELECTRIC SPACE HEATING

A. *Equipment Selection.*

1. *Load Calculation.* Heat loss calculations for electric heating shall be made for each individual room and/or area by using methods prescribed by NEMA, National Environmental Systems Contractors Association, Manual J, ASHRAE Guide and Data Book, or other approved methods. The outdoor winter design conditions to be used are stated in "Recommended Outdoor Design Temperatures, Southern California, Arizona, Nevada" and "Recommended Outdoor Design Temperatures, Northern California," as last revised, published by Southern California and Golden Gate Chapters, ASHRAE. The median of extremes temperature should be used. A standard of 70°F. indoor design temperature should normally be used.

   (a) In computing ceiling losses where radiant cable is used, temperature difference at the ceiling surface shall be based on 100°F.

   (b) In multiple housing units, no heat loss is assumed through ceilings, walls and floors of adjacent units.

2. *Sizing.* Electric resistance space heating equipment shall be sized to replace the calculated heat loss of all habitable rooms or modernized portions of the structure at outdoor winter design conditions with a minimum of 10% of the heat loss added for unusual climatic conditions.

B. *Thermal Insulation.*

1. *Structure*

   (a) Residences utilizing electric space heating shall be insulated to limit the heat loss, at winter design conditions, using the minimum insulation values specified by the Utility in Item II.B.3. In no event will the following Btuh loss per square foot of gross floor area be exceeded.

New Single Family Dwellings or Room Additions	30 Btuh
New Multiple Family Dwellings	25 Btuh
Existing Structures	35 Btuh

   (b) *Ceiling Cable Heating.* Structures with ceiling cable heating shall have insulation with a minimum rating of nominal R-19 in exposed ceilings and nominal R-11 for interior ceilings. Foil enclosed insulation material shall not be applied in the ceiling area. Class A structures will be considered individually.

2. *Air Distribution System*

   Portions of the air distribution system supply for electric furnaces or duct heaters which are exposed to outside air shall have thermal insulation with at least R-6 rating. The return portion of the air distribution system shall have thermal insulation according to the provisions of Industry Standards for equipment, installation and service of residential electric air conditioning and heat pumps up to ten tons by Industry Standards Committee of Southern California.

3. *Insulation Requirement.* Structural thermal insulation with resistance (R) values indicated below shall be installed in accordance with manufacturer's instructions.

	R Value*	Remarks
Top Floor Ceiling		
Between Floors		
Exterior Walls		
Floor Over Unheated Space		

*NOTE: Thermal resistance of insulating material only.

C. *Thermostats.*

Thermostats should be located on an interior wall surface, except where thermostats are an integral part of the space heating equipment. A thermostat should be located at such a point that it will sense the average mean temperature of the area it serves. Wall-mounted thermostats should be firmly attached in a level position four to five feet above the floor and should be free from undue influence of vibration or heat from foreign sources.

D. *Equipment Installation.*

1. All electric space heating equipment shall be installed in accordance with manufacturer's recommendations and local codes.

2. Spacing of cable in Ceiling Cable Heating installations shall not exceed 2½ inches for nominal 8 foot ceilings. When ceiling cable is installed in ceilings higher than 8 feet, extra capacity shall be supplied to compensate for the additional space to be conditioned by increasing the wattage of the ceiling cable and/or furnishing supplementary heating using other electric heating methods.

E. *Fireplaces.*

Fireplaces in residences should be equipped with tight fitting dampers to reduce infiltration losses when the fireplace is not in use.

F. *Responsibility.*

The Builder (or Homeowner for Modernization) is responsible for the selection and installation of equipment in conformance with these standards.

III. RESIDENTIAL ELECTRIC AIR CONDITIONING

A. *Design, construction, and installation of equipment.*

All electric air conditioning equipment shall be designed, constructed, and installed in accordance with the Industry Standards distributed by the Industry Standards Committee of Southern California (ARC Supplement to ARI 210-64, 240-64, 260-64) except as herein amended.

B. *Thermostats.*

Thermostats should be located in accordance with Item II.C.

C. *Thermal Insulation.*

1. *New Construction and Room Additions.* New construction and room additions shall have insulation with the following ratings:
   a. Nominal R-11 in ceilings in areas where the outdoor summer design temperature is 100°F. or less.
   b. Nominal R-11 in ceilings and nominal R-7 for outside walls in areas where the outdoor summer design temperature exceeds 100°F.
2. *Existing Structures.* Existing structures shall have insulation with an installed rating of nominal R-11 in ceilings.

D. *Responsibility.*

The Builder (or Homeowner for Modernization) is responsible for the selection of equipment in conformance with these standards.

IV. RESIDENTIAL ELECTRIC HEAT PUMPS

A. *Design, construction, and installation of equipment.*

All electric heat pumps shall be designed, constructed, and installed in accordance with the Industry Standards distributed by the Industry Standards Committee of Southern California (ARC Supplement to ARI 210-64, 240-64, 260-64) except as herein amended.

B. *Thermostats.*

Thermostats should be located in accordance with Item II.C.

C. *Thermal Insulation.*

Thermal Insulation shall be installed in accordance with Item II.B.3.

D. *Responsibility.*

The Builder (or Homeowner for Modernization) is responsible for the selection and installation of equipment in conformance with these standards.

V. RESIDENTIAL ELECTRIC WATER HEATING

A. *Design and Construction.*

1. Drain Valve: A drain valve shall be provided.
2. *Heating Element Size.* To provide a sufficient recovery rate, heating element(s) shall meet the following minimum wattage requirements:
   (a) 4,000 watts per element in dual element water heaters.
   (b) 5,500 watts in single element water heaters larger than 30 gallons capacity (a 3,500 watt element will be accepted for single element 30 gallon water heaters).

B. *Equipment Selection.*

1. Electric water heaters shall be installed according to the following table:

	Storage (Gallons)		
No. of Bedrooms	1-1½ Bath	2-2½ Bath	3-3½ Bath
1	40		
2	40	40	
3	40	50	60
4	40	50	60
5		60	60
6			60

2. If a separate water heater is provided for laundry (multi-family dwellings only), the sizes listed above may be reduced by 10 gallons.
3. *Multiple water heater installations.*

   For residences where two or more water heaters are installed to supply the hot water requirements, each water heater shall conform to the standards presented in this section and have adequate water capacity for the intended use(s). A water heater of less than 30 gallons water capacity will not be accepted.

C. *Equipment Location and Application.*

1. *Location.* Electric water heaters shall be located so that there is ready access to heating elements, thermostats, and cleanout ports (if provided) without disconnection of the heater or removal of a fixed portion of the structure.
2. *Shutoff Valves.* Electric hot water systems shall incorporate sufficient shutoff valves to isolate each water heater for maintenance.

D. *Laundry Room Water Heaters* (multi-family dwellings only).

Laundry room water heaters shall be adequately sized to perform the intended task. In no event will a water heater of less than 40 gallons water capacity be accepted.

There are federal standards for existing housing purchased with federally insured mortgages, but these standards have never required any retrofit of insulation. (These standards are now being revised in general). Similarly, the California Veteran's program has never required any retrofitting of existing houses to meet insulation standards.

The federal insulation standards for new contruction of electrically heated houses have been based upon the standards of the National Electrical Appliance Manufacturers (NEMA) as have the utility standards. Accordingly there has been only one national standard that has evolved through time, but the mortgage programs have required what most utilities have recommended.

The federal standards have several components. (See Table A2.2 and Fig. A2.6, A2.7, A2.8, and A2.9). Of primary concern is the maximum heat loss (for heating load calculations), specified in terms of BTU per hour per sq. ft. of floor space ($BTUh/ft^2$). This calculation is based upon procedures described in the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) handbook[5]. ASHRAE also lists the "design basis temperature" (which is the coldest temperature reasonably expected), as well as the dry bulb temperature at various percentile levels and geographical locations (for cooling load calculations). Heating calculations are based upon a 70°F interior temperature and the floor space is considered to be the heated area within the external walls. Historically this standard for heat loss from single family units has decreased from 60 $BTUh/ft^2$ (1953-1959) to 35 $BTUh/ft^2$ (1971). (See Table A2.2 and Fig. A2.6 and A2.7). For the

For multi-family housing, except for the most recent standards, only specific elements would affect a poorly insulated apartment house[7]. These standards are shown in Table A2.2 (and also Fig. A2.8 and A2.9). These have also evolved over time. The most recent standards (HUD 4910.1) specify the U-values of the outer perimeters for various heating and cooling zones. For a typical California multi-family house, these would correspond to U-values of 0.12 for a flat roof, 0.08 for the ceiling, and 0.17 for masonry walls or 0.07 for frame walls. (See Fig. A2.8 and A2.9).

Only in the most recent years have FHA mortgage loans been available for the purchase of mobile homes[8]. In 1971 the American National Standards Institute[9] developed a production code entitled "Standards for Mobile Homes" under the auspices of the Mobile Home Manufacturers Association. The FHA (and most states) have adopted this code for mobile homes, and these standards include a maximum permissible rate of heat loss. For gas or oil heated units, this rate is to be less than either 50 BTUh/ft^2 of total floor area or 333 BTUh per lineal foot of the perimeter of the heated space (whichever rate is greater for the particular unit). For electrically heated units this rate is to be less than 40 BTUh/ft^2 of the total floor area or 267 BTUh per lineal foot of the perimeter of the heated space (whichever rate is greater for the particular unit). For single-width-units of any length the heat loss calculated on a perimeter basis is always greater than one computed on an area basis, while for double-width-units the reverse is true[8].

In California the fraction of the sales of double-width-units has

increased in the last ten years from 33% in 1965 to 71% in 1975 (and the average from 1970 to 1975 has been 64%)[10]. It should be noted that these heat rate standards are less restrictive per square foot of the unit than the similar ones for single family or multi-family units. While most of the occupants of mobile homes in the SDG&E study felt that their mobile homes had some insulation (see Table A2.1), we feel that either this insulation level is very slight or that their responses are mistaken. Our estimate of the poor thermal integrity of mobile homes (that the average over size classes, is roughly equal to single family units in 1975) is based upon several factors: first, the high saturations of cooling devices in mobile homes compared to other housing types (see Appendix A4), the previously mentioned high measured rate of heat losses, and the rather loose nature of these standards (compared to the new State code). However, it should be noted that due to the small fraction of mobile homes in the housing stock, any errors in this estimate will not significantly affect the estimated total electricity comsumed for heating and cooling in California.

These data are a first step at determining the insulation level in the existing housing stock. Between the utility standards, the FHA-HUD codes, and the operating costs we feel that a reasonable approximation is that all electrically heated units have R-7 insulation in the ceilings and walls. This is part allows a balance between uninsulated units and better insulated or retrofitted ones; but overall should provide a conservative bias towards under-estimating the impact of the State code, of retrofitting, and thermostat cycling upon the electricity consumed in household heating and cooling.

It should be noted that some conservatism is necessary when estimating the impact of retrofit of existing houses. The Building Research Establishment (BRE) report[10] for the British Department of the Environment noted that in England the post-war experience on retrofitting residential buildings was that the gains were only about half of what was expected. This could arise from several effects. First, if the consumers responded to the market message of their utility bills by lowering their thermostats to fit their budgets, after insulating they might set higher temperatures. Second, insulation changes the heat distribution within both a room and the entire house (especially by convective transport), which complicates determining its effects, (this is part of the reason that we have used the computer program TWOZONE, instead of simple ASHRAE calculations, since this program divides the house into zones which interact through heat transport). Finally, a furnace is sized according to the design basis temperature or for worst conditions. During normal operation it cycles a great deal, which introduces substantial inefficiency into the system. (It is estimated[11] that an oversized gas furnace if about 80% efficient for converting fuel to heat, but may be only 30 to 50% efficient during operation; these values include some transport inefficiencies. For electric heating the sizing effect is less important, but this type of effect would occur from transport inefficiencies depending upon the unit location). After retrofitting, if the furnace must be replaced, then the sizing and locations may be altered to improve this efficiency.

Three ways to improve this data can be proposed. If retrofit is

TABLE A2.2 - FHA-HUD Minimum Property Standards

These directly affect:

1. FHA-HUD mortgage insurance
2. VA
3. Farmer's Home Association
4. Public housing

Single Family Units

A. Before 1959, (FHA 2257 for both 1 and 2 and multi-family units)

1. Total heat loss shall not exceed 60 BTUh/ft^2
   (Based on: a. 70°F internal
   b. ASHRAE design basis temperature
   c. All of the space within the exterior walls that is heated).

2. U-value of ceilings = 0.15
   = 0.24 if there is no air space between the ceiling and the roof and lower value is not required to meet the 60 BTUh/ft^2 standard.

B. 1959--FHA 300 (only 1 or 2 family units)

1. Total heat loss less than or equal to 50 BTUh/ft^2 if fossil fueled. Total heat loss less than or equal to 40 BTUh/ft^2 if electrically heated (they were required to meet NEMA's Manual for Electric House Heating which seemed to be 40).

2. U-value of ceilings = 0.06 if with heating panels.
   = 0.15 if without heating panels.

3. Vertical surfaces heat loss (including doors, windows, etc.) less than or equal to 30 BTUh/ft^2 (ignores infiltration).

C. 1963--FHA 300 (1 or 2 family units)

Added:

1. NEMA standards spelled out for electrically heated housing
2. If air conditioned
   a. Total heat gain 21 BTUh/ft^2 for a 95° design dry bulb temperature and a 1500 ft^2 house. (See Figure A2.6)
   b. U-value of ceilings = 0.08 (for heat gain).

TABLE A2.2 (cont'd)

D. 1971--HUD 4900.1 (1 or 2 family units)

1. Heat loss less than or equal 35 BTUh/ft^2.
   Heat gain less than or equal 20 BTUh/ft^2.
   (See attached Figure A2.7).

2. U-value of ceilings = 0.05 if with heating panels.
   = 0.08 if without heating panels.

3. Vertical surfaces

   Heat loss less than or equal 20 BTUh/ft^2.

E. State

Walls	U = 0.08
Ceilings	U = 0.05
Floors	U = 0.08 (for cold areas)

Multi-Family Units

A. Before 1963 (FHA 2257--same as single family)

B. 1963 FHA 2600

1. For each story of living units
   heat gain less than or equal to 25 BTUh/ft^2,
   heat gain less than or equal to 35 BTUh/ft^2 if either the ceiling or the floor is exposed,
   heat gain less than or equal to 45 BTUh/ft^2 if both the ceiling and the floor are exposed.

C. 1973 HUD 4910.1

See attached Figure A2.8 and A2.9

D. State

Walls	U = 0.08
Ceilings	U = 0.05
Floors	U = 0.08 (for cold areas)

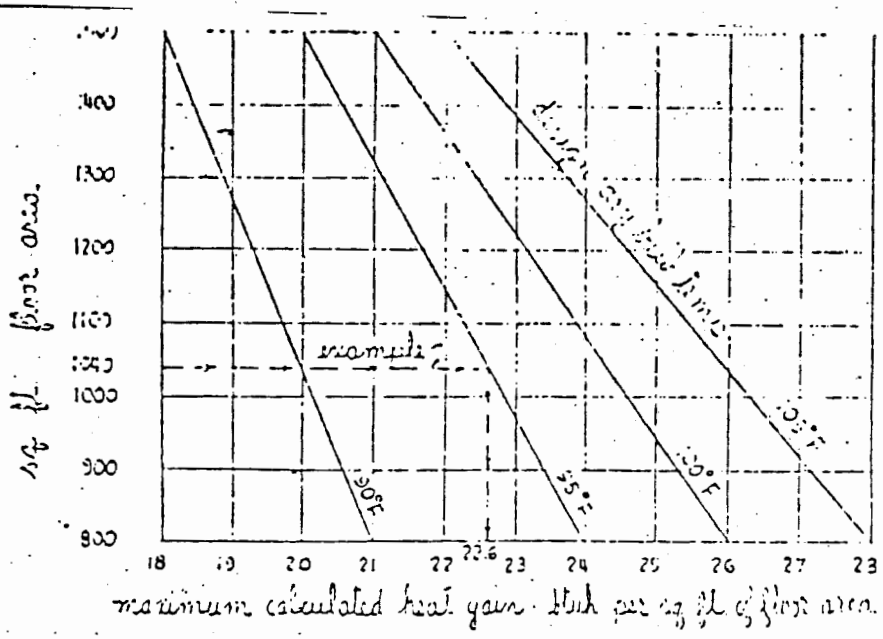


FIGURE 7b

Figure A2.6

Figure A2.7

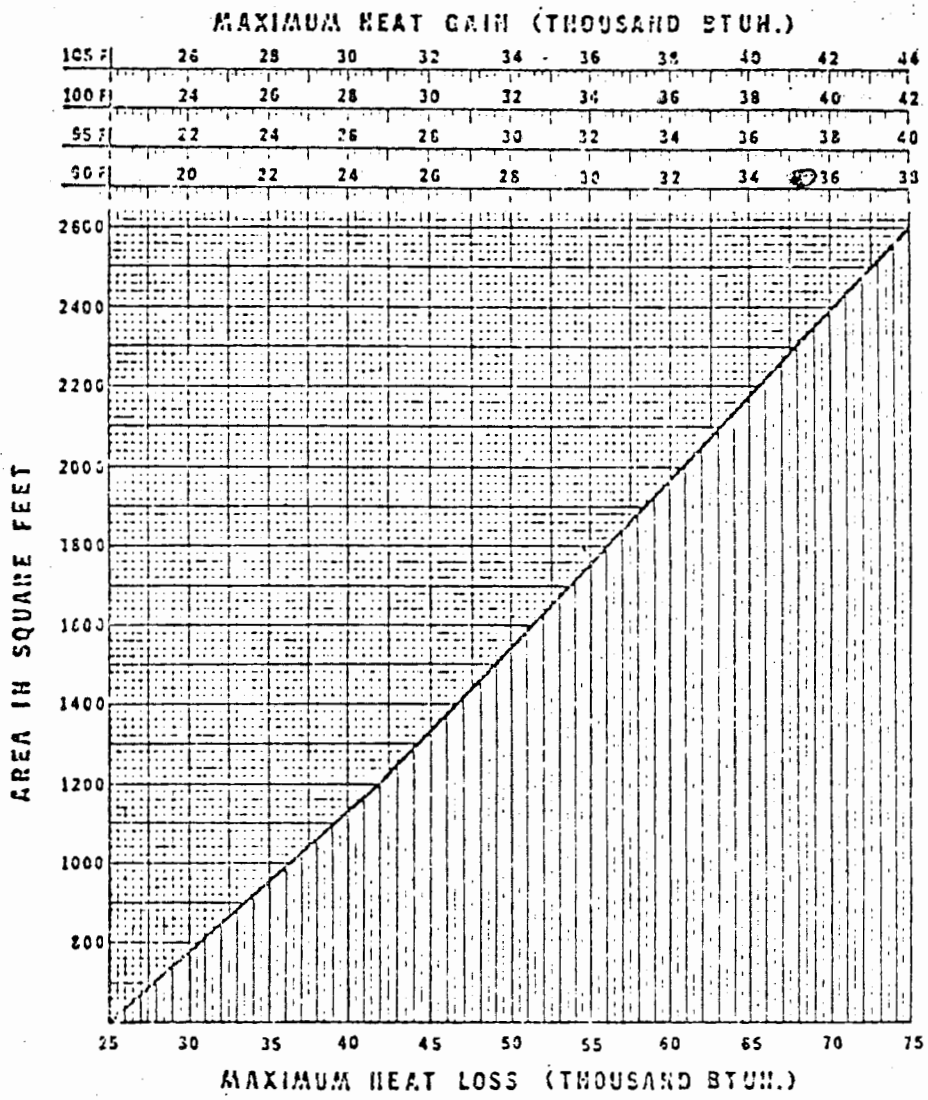

MAXIMUM HEAT GAIN (THOUSAND BTUH.)
105 F
100 F
95 F
90 F
26 28 30 32 34 36 38 40 42 44
24 26 28 30 32 34 36 38 40 42
22 24 26 28 30 32 34 36 38 40
20 22 24 26 28 30 32 34 36 38
AREA IN SQUARE FEET
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
25 30 35 40 45 50 55 60 65 70 75
MAXIMUM HEAT LOSS (THOUSAND BTUH.)

Figure A2.8

WINTER DESIGN - Maximum U Values for Ceiling and Wall Sections of Various Construction for Heat Loss

Winter Degree Days (Note 1)	Flat Roof Deck	Masonry Wall Construction		Frame Wall Construction	
		Ceilings	Walls	Ceilings	Walls
2500 or less	0.14	0.08	0.17	0.08	0.10
2501 to 4500	0.12	0.05	0.17	0.08	0.07
4501 to 6000	0.12	0.05	0.12	0.05	0.07
6001 or more	0.10	0.05	0.12	0.05	0.07

Note (1) (See Note 1, Table 6-7.2)

For thermal glazing - See Chapter 608-5.

Figure A2.9

SUMMER DESIGN - Maximum U Values for Ceiling and Wall Sections of Various Constructions for Heat Gain

Summer Cooling-Hours Over 80F (Note 1)	Flat Roof Deck	Masonry Wall Construction		Frame Wall Construction	
		Ceilings	Walls	Ceilings	Walls
400 or less	0.12	0.08	0.17	0.08	0.07
401 to 800	0.10	0.05	0.12	0.05	0.07
801 to 1500	0.10	0.05	0.12	0.05	0.07
1501 or more	0.09	0.05	0.12	0.05	0.07

Note 1. Winter degree days may be obtained from the ASHRAE Guide; the "NAHB Insulation Manual for Homes Apartments"; local utilities; and National Climatic Center, Federal Building, Asheville, N.C.

Summer cooling hours may be obtained from the "NAHB Insulation Manual for Homes Apartments", and The National Climatic Center.

Manuals are available from NAHB RF, Rockville, Md. 20850 or NMWIA, 211 E. 51st St., N.Y. 10022.

Other sources of degree day and summer cooling data may be used if available from a recognized authority.

cooling season, the FHA-HUD standards also specify a similar maximum rate of heat gain at the 1% dry bulb design temperature (which has decreased from 22 to 20 BTUh/ft^2).

This part of the standards has several problems. It is based upon a four or five year payback time, while the rest of these standards are based upon a fifteen or twenty year payback time. Moreover, updates of these standards do not keep pace with increases in fuel costs. Finally, these are national standards and it is felt that to reduce this heat gain much further will require major changes in the construction practices in the colder states (at least to the extent of requiring the use of 2 x 6 studs instead of 2 x 4's). It is reasonable that the new California standard is much more stringent than the first portion of these standards[6].

Another component of the standards is to specify the U-value of the ceiling (which has evolved from 0.15 to 0.05). With even the most stringent of these values and the U-values of the most common wall materials, this does not particularly limit the rate of heat gain or loss more than the initial part of these standards. (See Appendix A3 on heating for the thermal loads of just R-19 in the ceiling or see the thermal loads of just R.19 in the ceiling in Appendix A4 on cooling).

Finally, the more recent standards [FHA 300 (1963) -HUD 4900.1 (1971)] also set a maximum heat loss rate through the vertical surfaces of the house (which has decreased from 30 to 20 BTUh/ft^2). For a poorly insulated house (see Footnote 6), this would mean an overall U-value for the walls of 0.59, which is extremely high (compared to the new State standard of 0.08).

required in existing houses, then this program would also improve the knowledge of the insulation levels. Alternatively, a service could be established by the state or by the utilities to use thermal load programs to calculate optimum insulation levels during retrofit in return for the detailed information needed for these codes. This process could involve the utilities in measuring the thermal integrity of existing units using either infra-red cameras and / or trace gas release rates. Finally, the state could pass a "truth in housing" measure in which part of the sales process would involve determining the insulation level in houses and their projected energy budgets based upon past energy use and the savings from retrofit. These data would be collected by the state and would be made available to prospective buyers. This would be quite similar to the EER labelling of appliances.

Footnotes and References

1. L. Wall, Private communication. This computer program is being developed as part of the CAL/ERDA program. This project is under the supervision of Prof. A. H. Rosenfeld.
2. Drossler Research Company, "Ceiling Insulation Penetration and Attitude Research Report, A Summary", November, 1975.
3. R. S. Carlsmith, "Energy Conservation Studies", ORNL-NSF-EP-84 (1974), pp. 4-7.
4. Vera Adams, private communication.
5. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, ASHRAE Handbook of Fundamentals, Vol. 4, New York, N. Y. (1973).

6. As an example of the effects of these standards, we will calculate the heat loss for a single family detached house with 1500 ft^2 of floor space. We will assume that;
   1. the dimensions are 30' by 50' by 8'
   2. the U-value is 0.2 for the walls
   3. the U-value is 0.15 for the roof and ceiling
   4. the U-value is 0.1 for the floor
   5. 20% of the wall area is windows (with a U-value of 1.0).

   Then the effective U-value for the walls is

   $$.8 \times .2 + .2 \times 1.0 = .36$$

   and the total conductive heat transfer is

   $$160' \times 8' \times .36 + 30' \times 50' \times (.1 + .15) = 836 \text{ BTUh/deg.}$$

   The total heat transfer includes heat losses due to infiltration and is then

   $$836 + 216 = 1052 \text{ BTUh/deg.}$$

   for one air change per hour. For heating load calculations, with a design basis temperature of 30°F (and a temperature difference of 40°F), this would correspond to a maximum rate of heat loss of

   $$\frac{1052 \text{ BTUh/deg.} \times 40 \text{ deg.}}{1500 \text{ sq. ft.}} = 28 \text{ BTUh/ft}^2$$

Footnotes and References (cont'd)

This rate of heat loss can be compared with the rate from meeting the new California standards. The U-values will be

1. 0.08 for the walls
2. 0.05 for the ceiling
3. 0.08 for the floor (in areas with cold climates).

The effective heat transfer coefficient for the walls is then

$$.8 \times .08 + .2 \times 1.0 = .264$$

The total conductive heat transfer is

$$160 \times 8 \times .264 + 30 \times 50 \times (.05 + .08) = 533 \text{ BTUh/deg.}$$

The heat transfer by infiltration should be reduced to about half an air change per hour, or 108 BTUh/deg., for a total heat transfer of

$$533 + 108 = 641 \text{ BTUh/deg.}$$

For the same design basis temperature this would amount to

$$\frac{641 \times 40}{1500} = 17.1 \text{ BTUh/ft}^2.$$

For heating purposes either house would easily fulfill the FHA-HUD standard of 35 BTUh/ft^2 at this design basis temperature.

For the cooling season with a 30° temperature difference (which would correspond to a 76.5° F interior temperature and 106.5° F dry bulb exterior temperature), for the two houses described above, the maximum rate to heat gain would be

$$\frac{1052 \times 50}{1500} = 21 \text{ BTUh/ft}^2$$

and

$$\frac{641 \times 30}{1500} = 12.8 \text{ BTUh/ft}^2.$$

Again in California the latest FHA-HUD standards for the maximum cooling load would mean that houses would only have to be about as well insulated as the first model case.

7. As an example of these standards, it is possible to compute the heat transfer from two model apartments, one of which has little insulation and the other of which meets the present State code. We will calculate the heat loss for a multi-family unit that was in an 18-unit apartment building that was three stories and 30 feet

Footnotes and References (cont'd)

high. We will use a 1500 sq. ft. unit size for ease of comparison with the single family case. We will also use the same U-value as in the single family case (see Footnote 6). Then the total conductive heat transfer is

$$324' \times 30' \times .36 + 112' \times 50' \times (.1 + .15) = 4899 \text{ BTUh/deg}$$

or 272 BTUh/deg. per unit. With one air change an hour (216 BTUh/deg.), the total heat transfer is then 488 BTUh/deg. per unit. This corresponds to

$$\frac{488 \times 40}{1500} = 13.0 \text{ BTUh/ft}^2.$$

This can be contrasted with the HUD standards, which for masonry walls would correspond to

$$324' \times 30' \times .366 + 112' \times 50' \times (.08 + .08) = 4162 \text{ BTUh/deg.}$$

or 231 BTUh/deg. per unit. With one air change per hour, the total heat transfer is 447 BTUh/deg. or

$$\frac{477 \times 40}{1500} = 11.9 \text{ BTUh/ft}^2.$$

For the new state standards, the similar calculations yield

$$324' \times 30' \times .264 + 112' \times 50' \times (.06 + .08) = 3967 \text{ BTUh/deg.}$$

or 192 BTUh/deg. per unit. With half an air change per hour (108 BTUh/deg.) the total heat transfer is 301 BTUh/deg. or

$$\frac{301 \times 40}{1500} = 8.03 \text{ BTUh/ft}^2.$$

The results of this survey are comparable to those of the single family cases, where the first significant insulation levels will occur with the new State standards. The previous standards will not be significantly different from standard construction with a few inches of insulation.

8. J. Tansil, "Residential Consumption of Electricity 1950-1970", ORNL-NSF-EP-51 (1973), pp. 12-14.

9. Mobile Home Manufacturers Association, "Standard for Mobile Homes", Chicago, Ill., (1971).

10. Mobile home Market Research Inc., "California Mobile Home Report Annula Summary--1975 Sales in California", Woodland Hills, California (1976), p. 5.

A3 Electric Heating

Our estimates of the saturation of electric resistance heating in 1975 are shown in Table A3.1. These data are based upon three types of information from the utility companies; first, the 1970 Census saturations allocated to utility districts; second, utility saturation surveys; and third, the saturation rate in new construction. This rate for new construction was either directly supplied by the utility company, derived from the utility records of new additions (along with our estimates of new construction--see Appendix A1), or calculated from the differences in the saturation at two points in time (in conjunction with our estimates of the stocks at these times and the construction in between these years--see Appendix A1).

The original utility saturation data are shown in Table A3.2. In the cases of SDG&E and LADWP the saturation rates in 1975 were computed by combining these data with the data for the saturation rate in new construction (see Table A3.3) to form the 1975 saturation rate. This updating was necessary because the saturation rates, as a function of the year that the structure was built, have been rapidly increasing in time (see Table A3.4).

Our estimates of the overall saturations for SCE and SDG&E were derived by weighting the saturations which were contingent on housing type by our estimates of the percentage of single family, multi-family, and mobile homes (see Appendix A1). Since their surveys were under-represented in multi-family units, then the overall saturations are slightly higher than those reported by the utilities.

While the saturations in each housing type are important data (since the thermal loads differ among these types), both PG&E and SMUD do not list separately the saturation rates in mobile homes. For the purposes of the later energy consumption calculations, we have assumed that these saturations

TABLE A3.1 - Our Estimates for Electric Resistance Heating in 1975

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E
	Saturation (Percent)				
All	6.7	9.8	12.0	11.1	16.7
Single Family	5.5	4.1	5.0	(4.1)[1]	6.8
Multi-Family	9.1	24.2	29.0[3]	(19.1)[1]	38.0
Mobile	(5.5)[2]	(4.1)[2]	6.9[4]	(4.1)[2]	4.2

1. Estimated by assuming the same ratio of multi/single family saturations (4.8) as the rest of the state with the LADWP housing fractions.

2. Estimated as equal to the single family saturation rate.

3. Calculated by combining SCE apartment and condominium classes.

4. Calculated by removing the listed SCE categories from the "total class" to derive a remaining "other" component, which was assumed to be predominately mobile homes.

TABLE A3.2 - Utility Supplied Saturation Data on Electric Heating

Service Area (Time)	PG&E[1] (12/31/ 1975)	SMUD[2] (12/31/ 1975)	SCE[3] (2-3/ 1975)	LADWP[4] (3/1970)	SDG&E[5] (2-3/ 1974)
	Saturation (Percent)				
All					
Resistance	6.7	9.8	12.0	8.2	15.7
Heat Pump	-	.66	-	-	.28
Single Family					
Resistance	5.5	4.1	5.0	-	6.4
Heat Pump	-	.64	-	-	.35
Multi-Family					
Resistance	9.1	24.2	29.0[6]	-	35.9
Heat Pump	-	.83	-	-	.3
Mobile					
Resistance	-	-	6.9[7]	-	4.2
Heat Pump	-	-	-	-	.7

1. PG&E, MR&S Dept., "Residential Dwellings with Complete Electric Space Heating (including central heat pumps), PG&E System", 1-21-1976.

2. SMUD submission, "Rate 14 Types of Heating: 1975 vs 1970 (Year End)".

3. SCE Saturation Survey 1975.

4. Based upon LADWP's conversion of the 1970 Census.

5. From SDG&E's MIRACLE I data base: Appliance Saturation, special cross-tabulation provided from LBL-ERCDC by SDG&E.

6. Calculated by combining the SCE apartment and condominium classes.

7. Calculated by removing the listed classes from the "total" category to derive the remaining "other" classification (which was assumed to be predominately mobile homes).

TABLE A3.3 - Saturation of Electric Resistance Heating in New Construction

Service Area (Years)	PG&E[1] (1974 & 1975)	SMUD[2] (1971-1975)	SCE[3] (1973 & 1974)	LADWP[4] (1970-1975)	SDG&E[5] (1974)
	Saturation (Percent)				
All	21.0	28.0	27.4	52.9	49.5
Single-Family	14.3	15.2	(20.1)[6]	(23.7)[7]	19.8
Multi-Family	37.7	43.2	35.6	(69.5)[7]	86.6
Mobile	(14.3)[8]	(15.2)[8]	(20.1)[8]	(23.7)[8]	4.4

1. PG&E, MR&S Dept., "Residential Dwellings with Complete Electric Space Heating (including central heat pumps) PG&E System", (1/21/76).

2. SMUD submission "Rate 14 Types of Heating: 1975 vs 1970 (Year End)".

3. Difference between SCE Saturation Survey results 1973 and 1975.

4. LADWP, Power Services Division, Annual Reports, (7/2/1970-6/30/1975).

5. SDG&E submission, "Electrically Heated Dwelling Units Added in 1974", (3/25/1975).

6. Estimated by assuming that the saturations in single family and mobile homes were the same, and then using the fraction of housing types to derive this number (which when calculated from the difference technique, which is extremely sensitive to uncertainties and errors, is negative instead).

7. Derived by assuming that the saturation rates of single family and mobile homes were equal and that the ratio of the single family/multi-family saturations was equal to the average of the rest of the state.

8. Assumed equal to the single family saturation rate.

TABLE A3.4 - SDG&E Time Series Data for Electric Heating (1971)[1]

Year Built	Saturation (Percent) Resistance	Supplementary Built-in	Supplementary Portable
Don't know	7.4	16.4	2.6
Before 1955	4.4	27.6	3.2
1955-1959	4.2	26.0	2.6
1960-1964	5.6	15.7	1.9
1965-1971	10.6	10.6	1.1
Total	6.1	20.8	2.9

1. SDG&E, Appliance Saturation Survey (1971), p. 10 and p. 58.

are equal to those of single family housing (as the SDG&E and SCE data indicate). Similarly, LADWP only supplied the overall saturation, so for these energy consumption calculations we have assumed that the saturation rates of single family and mobile homes are equal and that the ratio of these rates in LADWP was equal to the average of the rest of the state. These assumptions, when combined with the housing type fractions (see Appendix A1), allowed us to estimate these saturation rates. All of these estimated quantities in Table A3.1 were placed in parentheses.

There has been one load survey in California (one by PG&E) to determine the electricity used for residential heating. The limited nature of this survey data has forced us to employ the computer thermal load program TWOZONE[1] to model the heating loads of these different types of housing units in various locations and with varied levels of insulation. This program computes the hourly thermal balance of the unit in terms of conductive heat transport (using the standard ASHRAE algorithm), the solar heat gain, the internal load from the occupants, and the infiltration rate (which includes the effect of winds) based upon weather data tapes and a detailed description of the building. The results of this computer program (see Table A3.5) agree reasonably well with the limited experimental data (given reasonable estimates of operating practices--a 70°F temperature setting[2]--and reasonable insulation estimates--R-7 ceilings and walls (see Appendix A2)). Estimates such as EEI's and the FPC's <u>All Electric Homes</u> are of unknown origins and cannot be accorded much weight.

From these thermal loads we have derived our estimates of the energy consumption for heating shown in Table A3.6. For this calculation we have assumed:

1. that single family units have roughly R-7 ceilings and walls,
2. that multi-family units have about this level of insulation and that

TABLE A3.5 - Our Estimates of Heating Energy Requirements

Single Family Detached House, 1450 ft^2, Resistance Heat 70° Thermostat

Insulation	Travis	Oakland	Burbank	Los Angeles (Airport)
		(kwhr/yr)		
None	27,750	31,200	19,300	15,700
R-19 Ceiling Only	18,750	20,550	12,350	10,000
∿R-7 Ceiling and Walls	∿12,000	∿12,500	∿7,000	∿6,000
Current State Code: R-11 Walls, R-19 Ceiling	10,400	10,200	5,800	4,900
Current Code Plus Double or Storm Windows	7,200	6,400	3,500	3,100
Double Glaze, R-11 Walls, R-30 Ceiling	6,700	5,900	3,100	2,800
Double Glaze, R-18 Walls, R-30 Ceiling	6,100	5,100	2,700	2,500

Multi-Family House or Townhouse, 1100 ft^2, Two-Story Building, Interior Unit; 70° Thermostat, Resistance Heat

		(kwhr/yr)		
None	15,100	14,250	8,500	7,100
R-19 Ceiling Only	11,500	10,250	5,800	4,800
Current State Code: R-11 Walls, R-19 Ceiling	6,500	4,750	2,300	2,150
Current Code Plus Double or Storm Windows	4,700	2,800	1,150	1,300
Double Glaze, R-11 Walls, R-30 Ceiling	4,500	2,600	1,100	1,150
Double Glaze, R-18 Walls, R-30 Ceiling	4,150	2,250	900	1,050

TABLE A3.6 - Our Estimates of Heating Loads in 1975

(Load/Number of Houses with Electric Heating)

(kwhr/yr)

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E	Statewide
All	9,950 (182,000)	8,820 (23,400)	3,760 (312,000)	3,330 (130,100)	3,610 (97,800)	5,330 (745,000)
Single Family	12,250 (102,000)	12,000 (6,500)	6,500 (86,100)	6,500 (25,400)	6,500 (24,600)	9,040 (244,600)
Multi-Family	6,500[1] (72,700)	7,500 (16,500)	2,550 (216,000)	2,550 (104,400)	2,550 (71,700)	3,320 (481,300)
Mobile	12,250[2] (7,200)	12,000 (380)	6,500 (9,560)	6,500 (300)	6,500 (1,520)	8,800 (19,000)

1. Derived by scaling current state code to R-7 ceiling and walls by the same factor as single family.

2. Assumed all mobile home loads are the same as single family loads.

the current State code can be scaled by the same percentage as in the single family case to calculate their loads,

3. that mobile homes have the same loads as do single family units (see Figure A2.1, noting that mobile homes are smaller than single family units, but have much worse thermal integrity[3]--see Appendix A2. Also, note that any errors in the mobile home estimate will have a small effect upon the final result),

4. that SMUD is represented by Travis, PG&E by the average of Travis and Oakland, and that LADWP, SCE, and SDG&E are represented by the average of Burbank and Los Angeles' airport.

While the accuracy of these estimates are limited by the available data, this type of careful weighting procedure is necessary, since electric heating is more prevalent in single family units in milder regions and in multi-family units more than in single family or mobile units with their higher thermal loads.

These results can be compared to PG&E's measurement[4] of 10,000 kwhr/year for single family units of comparable size in the Sierra Foothills and SCE's estimates[5] of 6400 kwhr/year for single family units and 2480 kwhr/year for multi-family units (this agreement with SCE seems remarkable, but it is unknown to us whether these numbers are completely comparable in terms of unit sizes for the SCE survey). PG&E clearly feels that this survey is only applicable to this one geographical location.

From Table A3.5 it is clear that one of the major determinants of heating loads (besides location and housing unit type) is the insulation level, which is a function of the time when the unit was built (through the State code and the relative price of energy at that time). Our estimates of the energy consumption of housing built in 1975 are shown in Table A3.7. These were derived using the State code thermal loads of TWOZONE, our numbers for the saturation rate in new construction (see Table A3.3), and our numbers, for the rate of new construction in 1975 (see Appendix A1). These calculations assume:

TABLE A3.7 - Our Estimates of Heating Loads for 1975 New Construction

(Load/Number of Houses with Electric Heating)

(kwhr/yr)

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E	Statewide
All	7,800 (12,300)	7,610 (2,100)	3,900 (10,400)	2,850 (5,890)	2,990 (7,160)	5,040[2] (37,900)
Single Family	10,300 (5,700)	10,400 (600)	5,400 (5,500)	5,400 (1,200)	5,400 (1,770)	7,500 (14,800)
Multi-Family	5,600 (5,300)	6,500 (1,400)	2,200 (3,500)	2,200 (4,700)	2,200 (5,300)	3,400 (20,300)
Mobile	5,600[1] (1,200)	6,500 (78)	2,200 (1,400)	2,200 (19)	2,200 (63)	3,810 (2,700)

1. Assumed all mobile home loads are the same as multi-family loads.

2. Note that this number is based upon the actual construction in 1975 and is not a measure of the effect of retrofitting the 1975 stock to this level.

1. that mobile homes (which have to meet the new State code) now have approximately the same thermal loads as multi-family units,

2. that the saturations in new construction listed in Table A3.3 also describe 1975 housing,

3. that SMUD is represented by Travis, PG&E by the average of Travis and Oakland, and LADWP, SCE, and SDG&E by the average of Burbank and Los Angeles' airport.

Our estimates for 1980 construction are shown in Table A3.8. These were derived by assuming:

1. that the thermal loads will be the average of the current State code with double glazing or storm windows and R-11 walls and R-30 ceilings with double glazing or storm windows,

2. that mobile homes will have the same thermal loads as multi-family units,

3. that the relative saturations remain the same as in Table A3.3,

4. that the construction rate is the same as in 1975 for each utility district, but apportioned among housing types as the average of 1970 through 1975 in each utility service area.

These numbers should only be considered illustrative, but it should be noted that the absolute values of assumptions 3 and 4 will not effect the UEC (but the relative values will). The UEC of the total stock will be affected by the absolute magnitude of these stocks of 1975 to 1980 construction.

Both Table A3.3 and A3.4 demonstrate the increased trend towards electric heating in recent years. It is also clear from Table A3.1 that multi-family units are much more likely to have electric heating than the other two housing types. There are two main reasons for this. The operating costs of an electric heating system are greater than the costs of a comparable gas system, and this economic disadvantage is most pronounced in larger, single family houses (with their larger demands for heating). Although costlier to operate, the installation costs of an electric system are comparatively lower, leading to more frequent installation of electric

TABLE A3.8 - Our Estimates of Heating Loads for 1980 New Construction

(Load[1]/Number of Houses with Electric Heating[2])

(kwhr/yr)

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E	Statewide
All	4,510 (14,700)	5,080 (2,310)	1,700 (12,320)	1,500 (6,280)	1,507 (8,490)	2,750 (44,100)
Single Family	6,550 (4,320)	7,000 (458)	3,100 (3,270)	3,100 (1,000)	3,100 (1,370)	4,700 (10,400)
Multi-Family	3,650 (9,190)	4,600 (1,740)	1,200 (7,880)	1,200 (5,260)	1,200 (7,060)	2,110 (31,100)
Mobile	3,650[3] (1,150)	4,600 (111)	1,200 (950)	1,200 (14)	1,200 (62)	2,480 (2,500)

1. Derived by averaging over Current Code plus double glaze or storm windows and R-11 walls, R-30 ceiling plus double glaze.

2. Derived using estimates of saturations in new construction, 1975 total construction rates, and 1970-1975 housing type fractions.

3. Assumed all mobile home loads are the same as multi-family loads.

TABLE A3.9 - SDG&E Contingent Saturation[1]

	Saturation (Percent)			
	Resistance	Supplementary	Portable	Heat Pump
All	15.7	23.1	1.2	.28
Single Family	6.4	27.6	1.3	.35
Multi-Family	35.9	15.9	.8	.3
Mobile	4.2	13.8	2.1	.7

1. Special cross-tabulations of MIRACLE I (February-March, 1974) data for LBL.

heating in multi-family housing which is commonly rented. It should also be noted that in mobile homes the saturation rate seems to be more similar to single family units than multi-family units, which again emphasizes the economic argument. Finally, it should be noted that the saturation of heat pumps seems to be small, but possibly fairly constant.

Unfortunately, PG&E, SCE, and the U. S. Census (which is the basic stock data source for both PG&E and LADWP) do not differentiate between heat pumps and resistance heaters, which introduces a small bias in some of these results towards higher saturations. Another bias is the mistaken inclusion of supplementary or portable electric heaters as central resistance heaters by survey respondents. This effect seems to have caused a large discrepancy between the SMUD billing data and their saturation survey. Only SDG&E asks a detailed question distinguishing among central resistance units, supplementary units, portable ones, and heat pumps (see Table A3.9). From their cross-tabulation shown in Table A3.4 it is clear that supplementary or portable heaters are more likely in older dwellings.

Not only should there be a detailed question of this type, but it should be a common question for all these surveys. The results should be compared to billing data (since SDG&E results indicate significant error in response) and then edited, and finally the results should be cross-tabulated by housing type and age of the structure. Also, the saturations of those with more than one type of heating device should be tabulated as contingent upon these other devices. It is particularly important that the Census question carefully distinguishes among heating devices and then presents the results adequately cross-tabulated.

There are several limitations to these present results. First, there is a need for good load surveys to measure these thermal loads as a function

of housing type, location, and insulation level. Moreover, the CAL-ERDA program (or similar modeling work) should also develop more comprehensive models for mobile homes and multi-family dwellings. These two measures would reduce the uncertainty in our estimates of thermal loads. Second, in the cases of PG&E and SMUD (where the saturations in mobile homes was approximated by that of single family dwellings) the various saturations are inconsistent. Either the overall saturation should be adjusted slightly upward (if mobile homes are not included in the calculation of the overall rate) or else the single family or multi-family saturations should be adjusted (depending upon which category includes mobile homes). Alternatively this inconsistency could arise from the differing stock estimates used by us and the utilities (and this disagreement could be caused by the effects of master-metering or incorrect commercial and residential allocation upon their part or the difference between our service areas and their operating district).

Third, both heat pumps and supplementary heating could bias these saturations towards high estimates. However, electricity is not only used in central systems for heating, but also in heat pumps, portable heaters, supplementary built-in systems, and furnace fans. (It would seem from SDG&E's 1971 cross tabulation of furnace type that about 45% of all units have furnace fans. This estimate can be derived since all the 42.7% of the units having central forced air heating and about a tenth of the 12.7% of the units with floor furnaces have furnace fans). Since neither the saturations nor the energy consumption of these devices are well known, we are forced to make the assumption that these contribute a negligible component to the electricity consumed. Fourth, we have not included the effects of changing operating practices due to the price of energy.

Thermostat cycling could further reduce these heating energy requirements substantially. Similarly, we have neglected the effects of retrofit upon the existing housing stock, which could also significantly reduce these heating loads.

Finally, we have not included the effects upon the stock energy consumption of the new State code. In practice it is difficult to arrive at a satisfactory technique for handling demolitions and construction during the operating year, since both processes occur throughout the year. Most of the new construction will not consume its "share" of electricity, but the removed housing units will also consume some of their share. We have used the year end stock estimate, which because of these somewhat canceling effects, will have some bias to be high in general; but in this particular year may be a better approximation than usual, due to the lowered consumption of the additions.

We have not attempted to construct a load curve for heating. At the most basic level this curve should be peaked during the night in terms of the daily cycle, and it should be peaked during the winter in terms of the annual cycle. However, to construct a statewide load curve, it would be necessary to weight the individual load curves and construct a statewide weighted average, since the load curves of each housing type in the various locations and with the various insulation levels will have different forms for each day. These load curves should be especially sensitive to operating practices and insulation levels, so that the present strong linkage of these load curves to the climate should be changing in time. Accordingly, these should be experimentally measured.

Footnotes and References A3

1. L. Wall, personal communication. TWOZONE is part of the CAL/ERDA building analysis program now under development at LBL. CAL/ERDA is being developed under the direction Professor A. H. Rosenfeld and is being sponsored jointly by the ERCDC and the U. S. Energy Research and Development Administration.
2. Dorothy K. Newman and Dawn Day in The American Energy Consumer (for the Energy Policy Project of the Ford Foundation, published by Ballinger Press, 1975, on pp. 47-48) found in a national survey that 85% of the households surveyed kept their thermostats on 70° or higher during the day, with only 12% at less than 70°. At night 80% kept their thermostats at 72° or less, with 45% at less than 70°. Thus, our assumption of a constant 70° thermostat setting is not unreasonable.
3. J. Tansil, "Residential Consumption of Electricity 1950-1970", ORNL-NSF-EP-51, pp. 13-14 and references therein.
4. Pacific Gas and Electric Company, "Residential Electric Space Heating; Load Research Project", March, 1967, for data on Sierra Foothill Communities.
5. SCE's estimates in All Electric Homes are based upon long term sub-metering tests.

A4 Air Conditioners

Our estimates of the saturation of air conditioners in 1975 are shown in Table A4.1. These data are based upon three types of information from the utility companies; first, the 1970 Census saturations allocated to utility districts; second, utility saturation surveys; and third, the saturation rate in new construction. This rate for new construction was either derived from the utility estimates or records of new additions (along with our estimates of new construction -- see Appendix A1) or calculated from the differences in the saturations at two points in time (in conjunction with our estimates of the stocks at these times and the construction in between these years -- see Appendix A1). These new construction estimates are of less utility than those of resistance heating, since air conditioners can be added at later points in time more easily than can resistance heating. (Indeed, the increase in the saturation in both SMUD and SCE has been greater than 100% for central air conditioning, which indicates that a significant amount of retrofit occurs).

Our first difficulty with the air conditioning data from the utility companies is that these data are of the penetration of room air conditioners (that is, the number of households with one or more units) rather than the saturation (the total number of room air conditioners associated with the housing stock). However, both SCE and SDG&E supplied cross-tabulations of the penetration rate of the various number of air conditioners in each housing type. From these data we have computed the scaling factor to convert these penetration rates into true saturation rates for the rest of the utilities (see part a) of Table A4.2). We have assumed these conversion factors will be a function of the housing type (and thus of unit size and

TABLE A4.1 - Our Estimates for Residential Air-Conditioning Saturations in 1975

(Percent)

Service Area (Date)	PG&E[1] (3/1975)	SMUD[2] (1/1975)	SCE[3] (3/1975)	LADWP[4] (7/1975)	SDG&E[5] (1/1975)
All					
Central	9.2	44.7	20.6	14.1	10.5
Room[6]	16.6	39.2	31.4	24.6	15.3
Heat Pumps	-	.5	-	-	.3
Evaporative Cooling	-	11.7	12.6	-	2.5
Single Family					
Central	(9.2)	(44.7)	19.2	(14.1)	8.1
Room[6]	-	-	31.4	-	15.4
Heat Pumps	-	-	-	-	.3
Evaporative Cooling	-	-	13.4	-	1.4
Multi-Family					
Central	(9.2)	(44.7)	21.0	(14.1)	10.1
Room[6]	-	-	31.2	-	14.9
Heat Pumps	-	-	-	-	.1
Evaporative Cooling	-	-	5.8	-	.4
Mobile					
Central	(9.2)	(44.7)	36.7	(14.1)	36.0
Room[6]	-	-	31.9	-	15.3
Heat Pumps	-	-	-	-	.7
Evaporative Cooling	-	-	39.5	-	25.0

1. PG&E submission to the CPUC concerning the Ten-Year Forecast of Electric Loads (March, 1975), p. 32.

2. SMUD Appliance Saturation Survey (1975).

3. SCE's Appliance Saturation Survey (1975). Note that the multi-family category was computed by combining their apartment and condominium classes. The mobile home category was calculated by removing the listed classes from the "total category". The remaining "other" category was assumed to be primarily mobile homes.

TABLE A4.1 (cont'd)

4. Based upon the LADWP conversion of the 1970 Census to their service area updated by their Power Services Division's Annual Reports (6/30/1970-7/1/1975) numbers for gross additions. Since these numbers were for both central and room units combined, we assumed that these units were twice as likely to be central.

5. SDG&E's MIRACLE I data was updated by assuming that the saturation rate in new construction between the 1971 and 1974 surveys (see Table A4.4) persisted in 1974 new construction.

6. All room air conditioner saturations have been converted from utility penetration rates to saturation rates by employing Table A4.1.

TABLE A4.2 - Procedure Used to Convert Room Air-Conditioner Utility Saturation Values to Our Saturation Definition

a) Scaling Factors Supplied by Utility Cross Tabulations

Service Area	SCE[1]	SDG&E[2]	Average
Single Family	1.27	1.21	1.24
Multi-Family	1.13	1.07	1.10
Mobile	1.30	1.16	1.26

b) Housing Type Fraction[3]

Service Area (1975)	PG&E	SMUD	SCE	LADWP	SDG&E
Single Family	.667	.671	.661	.528	.616
Multi-Family	.286	.290	.286	.466	.322
Mobile	.047	.039	.053	.006	.062

c) Weighted Scaling Factors

1.20	1.20	1.23	1.17	1.16

1. Special cross-tabulation of 1973 SCE Appliance Saturation Survey for LBL-ERCDC.
2. Special cross-tabulation of MIRACLE I (1974) Saturation Survey of SDG&E for LBL-ERCDC.
3. See Appendix A1 - Residential Building Stock.

thermal loads), and so for the other utilities, where the saturations of room air conditioners contingent upon housing type were unknown, we computed conversion factors weighted by the fraction of each housing type (shown for 1975 in part b) of Table A4.2) and these are shown in part c) of Table A4.2.

After this conversion of the room air conditioner data, the utility supplied information is shown in Table A4.3. Our estimates of the overall saturations for SCE and SDG&E were derived by weighting the saturations which were contingent upon housing type by our estimates of the percentage of single family, multi-family, and mobile homes (see Appendix A1). Since their surveys were under-represented in multi-family and mobile units, then the overall saturations are slightly higher than those reported by the utilities. SMUD's survey was also unrepresentative of their housing types, but the individual saturations for each housing type were not reported, so this correction could not be performed upon the SMUD data.

While the saturation rates in the individual housing types are important (since the thermal loads differ among these housing types), the only available data from PG&E, SMUD, and LADWP were system-wide estimates. For the purposes of energy consumption calculations we have assumed that the saturations are the same in each housing type in these utilities. From the SCE and SDG&E data, this assumption is a reasonable approximation for single family and multi-family units, but mobile homes are likely to have higher saturations (but since their fraction of the total housing fraction is small, this approximation should not lead to much of an error in the energy consumption estimates). All the estimated rates are in parentheses in Table A4.1.

TABLE A4.3 - Residential Air-Conditioning Saturations Supplied by Utilities

(Percent)

Service Area (Date)	PG&E[1] (3/1975)	SMUD[2] (1/1975)	SCE[3] (2-3/1975)	LADWP[4] (3/1970)	SDG&E[5] (2/1974)
All					
Central	9.2	44.7	20.6	9.7	8.9
Room[6]	16.6	39.2	31.4	24.6	15.3
Heat Pumps	-	.5	-	-	.3
Evaporative Cooling	-	11.7	12.6	-	2.5
Single Family					
Central	-	-	19.2	-	6.8
Room[6]	-	-	31.4	-	15.4
Heat Pumps	-	-	-	-	.3
Evaporative Cooling	-	-	13.4	-	1.4
Multi-Family					
Central	-	-	21.0	-	8.0
Room[6]	-	-	31.2	-	14.9
Heat Pumps	-	-	-	-	.1
Evaporative Cooling	-	-	5.8	-	.4
Mobile					
Central	-	-	36.7	-	35.3
Room[6]	-	-	31.9	-	15.3
Heat Pumps	-	-	-	-	.7
Evaporative Cooling	-	-	39.5	-	25.0

1. PG&E submission to CPUC concerning the Ten-Year Forecast of Electric Loads (March, 1975), p. 32.

2. SMUD's Appliance Saturation Survey (1975).

3. SCE's Appliance Saturation Survey (1975). Note that the multi-family category was computed by combining their apartment and condominium classes. The mobile home category was calculated by removing the listed classes from the "total" category to derive the remaining "other" classification (which was assumed to be predominately mobile homes).

TABLE A4.3 (cont'd)

4. LADWP's conversion of the 1970 Census into their service district.

5. SDG&E's MIRACLE I Saturation Survey in a special cross-tabulation by housing type for LBL-ERCDC.

6. All room air conditioner saturations have been converted from penetration rates by using Table A4.2.

It should be noted that while both SDG&E and SCE list both gas and electric central air conditioning saturations, it is highly unlikely that there are any gas central air conditioners in residential units. SDG&E[1] has checked some of these responses with billing data and concluded that this response is most likely arising from confusion when a house has gas heating and electric central air conditioning. Thus we have combined both the SCE and SDG&E gas and electric central air conditioning saturations into electric central air conditioners. In the cases of LADWP and SDG&E the saturations of central air conditioners in 1975 were computed by combining the data in Table A4.3 on saturations at one point in time with the data in Table A4.4 of the saturation rate among new construction to form the 1975 estimate. LADWP's data for the number of gross additions per year combines both central air conditioners and room air conditioners into one category. These were separated by assuming that central air conditioners were twice as likely to be added as room air conditioners, which is reasonable since these numbers are for additions before the time of service connection. However, for both SDG&E and LADWP we have assumed that the saturation rate of room air conditioners has remained the same as at the last measurement. In SMUD the saturation of room air conditioners (or at least the penetration) has decreased since 1970, while in PG&E and SCE it seems to have slightly increased. Within the accuracy of the available data the saturation of heat pumps has also seemed to remain constant, while evaporative coolers are either constant or slightly decreasing.

There has been only one load survey in California to determine the electricity used for residential space cooling, so that estimating the unit energy consumption of room and central air conditioners are difficult tasks.

TABLE A4.4 - Central Air-Conditioning Saturations Among New Construction

Service Area (Years)	PG&E[1] (1970-1975)	SMUD[2] (1970-1975)	SCE[3] (1973-1974)	LADWP[4] (1970-1975)	SDG&E[5] (1972-1973)
			(Percent)		
All	9.2	90.0	90.0	80.0	32.1

1. Based upon the difference in the product of the saturation times the stock size divided by our estimates of new construction in between these two points in time. These two points were the 1970 Census and the 1975 PG&E submission to the CPUC.

2. The difference in between the 1972 and 1975 saturation surveys would imply a significant amount of retrofit, since the saturation rate is greater than 100%. We are using Lynn E. Haunus' estimate of greater than 90% in new construction between 1970 and 1975. This estimate was contained in the cover letter from SMUD that accompanied the saturation surveys.

3. The difference between the products of the saturation times the stock divided by our estimate of new construction between the 1973 and 1975 saturation surveys is greater than 100%, which implies substantial retrofit. We are using the SMUD estimate for new construction in this case also.

4. The LADWP records for annual gross additions contained in the Power Services Division's Annual Reports. Since these records are for both room and central units, we have had to assume that central units are twice as likely to be installed as room units before service connection.

5. The difference in the product of the saturation times the stock size divided by our estimate of new construction in between these two points in 1971 and 1974. The 1971 and 1974 points were both appliance saturation surveys. The 1974 data were corrected to reflect the proper housing type proportions, but as the 1971 data were not available contingent upon housing type the uncorrected overall saturation was employed.

It is particularly difficult to derive this estimate for room air conditioners. These units do not cool an entire house, but only some unknown portion of the housing unit, as can be seen from the significant fraction of houses with more than one room air conditioner. The UEC is a function of the number of hours of use (which is related to the cooling load), the average size of a room air conditioner, and the average EER of a room air conditioner.

The number of hours is not well established. First, there are utility estimates of this number, but these are of uncertain origin and are not based upon load surveys, so they cannot be accorded much weight. Using these estimates, Science Applications[2] has derived a number of about 500 hours per year as the state average. However, the only existing load survey[3] (which was conducted by PG&E in 1963-1964 in the Fresno area) supports a number of about 700 equivalent compressor hours (which can be derived from their figures for the average energy use -- kwhr/year -- divided by the diversified demand --kw).

A further consideration is that a rational consumer should only use the unit when it is needed in his location (and Fresno is atypical of the state as a whole in terms of need, but perhaps representative of the regions with the highest saturations of room air conditioners, which are where the need is greatest). The number of hours per year in which the dry bulb temperature is above 80°F is shown in Figure A4.1 (which must be viewed with caution since it has a very coarse scale). More detailed estimates[4] have been published in tabular form. Using this information and the saturations of room air conditioners within the various divisions of PG&E, SCE, and SDG&E; we propose a rough weighting scheme of

$$.8 \times 700 + .2 \times 400 = 640 \text{ hours/year.}$$

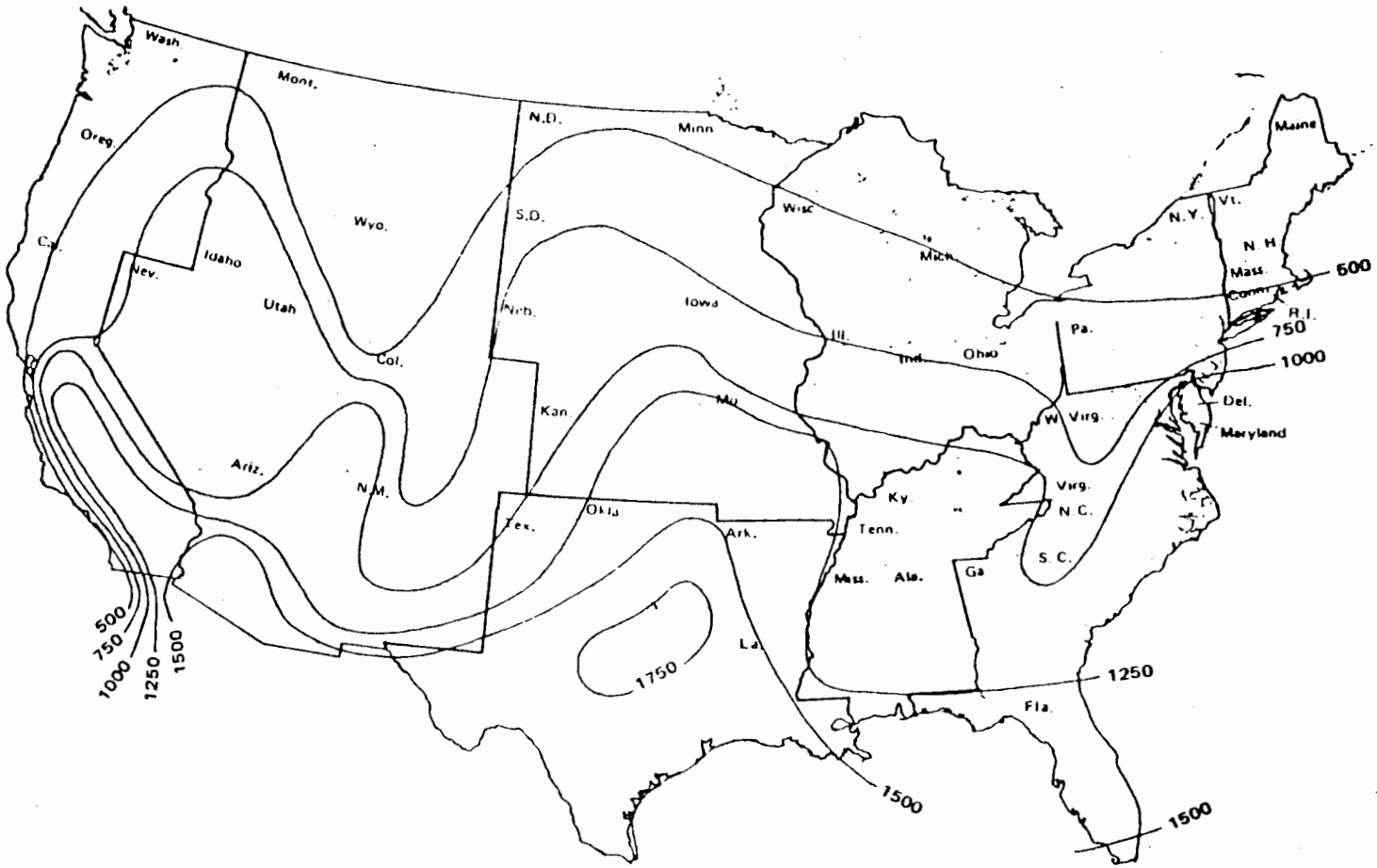


Figure A4.1 This figure is a rather coarse indication of the isocline lines for cooling hours, which has been reproduced from S. H. Dole, "Energy Use and Conservation in the Residential Sector: A Regional Analysis", R-1641-NSF (1976), p.

A final correction to the number of cooling hours is that the unit will not be used the entire time that the climate warrants it, since vacations, the fraction of homes with only one occupant (21%[5]), and the fraction of households with both members working (40% of all married couples[6]) should all reduce this total number of hours. The PG&E load survey measured this use factor as 91.7%, but as these sociological factors have all increased since this survey was performed, we will accept the estimate of 85%.[6] This use factor consideration will then reduce the number of cooling hours to about 550 hours.

It is possible to derive an average size of room air conditioners from the sales data for each size class published in "Merchandising Weekly".[7] This average is about 11,200 BTU/hr. However, this number is biased high, since many of the larger units will be used in commerical buildings. This bias cannot be corrected, but if one assumes all units above 15,000 BTU/hr were not used for residential cooling (since they require special wiring), then the size would be reduced to about 9,000 BTU/hr, so we will use 10,000 BTU/hr.

There are no similar data available to construct a sales weighted EER for room air conditioners. There is a wide range of values, as can be seen from the scatter plot in Figure A4.2. Because of the clustering of the available models around an EER of 6, it has been typically suggested[8] that the average sales occur near this value. It should be noted that these model data and the sales data used to estimate the average size and average EER are <u>nation-wide data</u>, but there are no similar data specifically for California. Similarly, it should be cautioned that the EER is the nameplate value, and may not reflect the actual operating conditions, since the balance between the sensible and latent heat in most areas of

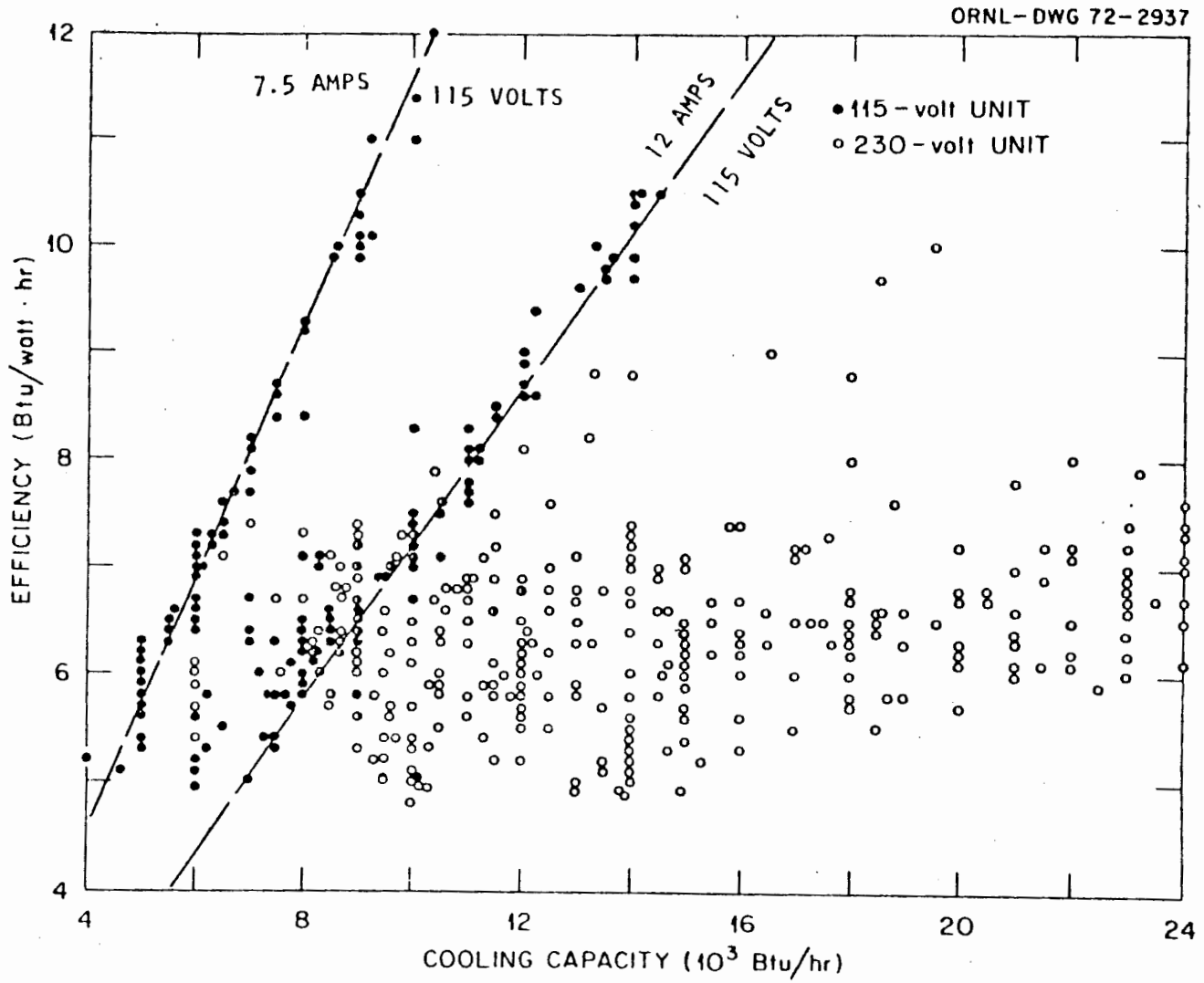


Figure A4.2 This scatter plot of EER versis size for room air conditioners has been reproduced from J. C. Moyers, "The Room Air Conditioner as a Consumer of Electricity", ORNL-NSF-EP-59 (1973), p. 6. The efficiency axis is the EER, while the other axis is the size.

California needing air conditioning is different from the test conditions. (This will be discussed in greater detail below in reference to central air conditioners).

Using these three factors we estimate that a typical unit uses 10,000 BTU/hr with an EER of 6 BTU/watt-hr, or 1670 watts, for a typical 550 hours, and therefore consumes 917 kwhr/year. This number compares well with the PG&E result for Fresno of 1025 kwhr/yr (it should be noted that when the size and EER averages are combined with the Fresno number of hours -- 700 x .85 or 600 equivalent compressor hours -- the result is 1000 kwhr/yr). (We have ignored the difference between rated wattage and diversified demand because of the extremely high -- 99.9% --coincidence factor measured by PG&E). Since all three of these factors are so poorly known for room air conditioners, it is not possible to use trend analysis to correct for any change in these values since the Fresno study (in 1963-1964) for a possibly better comparison with the experimental data. However, for the UEC of the 1980 contingent we assume that the appliance efficiency standards will change the average EER from 6 to 8.7, which would decrease the energy use by .7.

We must also note that this number, which agrees well with the PG&E load survey, is much higher than the estimates[9] used in the Eastern region of the United States, which are also based upon load surveys. Not only is the annual energy used for room air conditioners on Long Island only 500 kwhr/yr, but the peaks seem later (around 11 pm for a bedroom unit and around 4 pm if the unit is used in another room). While the latent loads are much higher in the Eastern regions, it could be that sociological effects cause the use factor to be much lower. Also there could be

pronounced regional differences in the sales either by size or by EER. It should be noted that in the Eastern region, because of the prevailing westerly winds, the local differences in climate are not as pronounced as in California. Clearly, this difference in energy estimates requires greater study and more load surveys to confirm the difference and explain its causes or to remove this apparent discrepancy.

Even less data is available on the energy consumption of evaporative coolers, but the PG&E load survey estimated that their UEC is about 300 kwhr/yr. This is consistent with rough estimates that they should use about ten times less electricity than compressor units.

The PG&E load survey is again the only experimental data on the UEC of central air conditioners, but it was for a very small sample size and in very specific circumstances. We have estimated more general cooling loads using the thermal load computer program TWOZONE.[10] TWOZONE is based in part upon the standard ASHRAE algorithms, but also includes the solar heat gain through windows, the internal load of the occupants, and the effects of the wind upon the infiltration rate. Moreover, TWOZONE employs weather data to construct an hourly thermal balance instead of the simple degree day or design basis temperature approach.

These cooling loads become less accurate as the insulation levels are increased. The cooling requirements are seen to stay relatively constant as insulation is increased beyond the current state levels (see Table A4.5). This is because, while increased insulation lowers the sensible cooling load, it also lets the house sit over ten degrees above the ambient temperature. This program has the air conditioning working even when the house could be cooled by natural ventilation, so that the effective

cooling season is lengthened. Actually, the load curves generated by this program for well insulated houses are not nearly as flat as expected. It is particularly important to conduct load surveys and to continue computer modelling work to improve the understanding of the effects of increased insulation upon the cooling loads.

To extract from these thermal cooling loads of TWOZONE the UEC for cooling, it is necessary to estimate a series of quantities. The most central are the insulation levels, the temperature setting, and the average central air conditioner's EER.

There is no direct data available from any source on the sales weighted average EER of central air conditioners; even the manufacturers claim to be unable to estimate the relative sales of high and low efficiency models. However, the Air Conditioning and Refrigeration Institute (ARI) lists[11] the EER of each type of model sold. The range of efficiency is large (see Figure A4.3), but the mean appears to be about 6.5 (note the absence of any information of sales on even the national level, much less for the state).

However, the actual energy efficiency may not be the same as the nameplate EER, because of differences in the sensible and latent cooling loads from the test conditions (which are 95° dry bulb and 75° wet bulb outdoors with 80° dry bulb and 67° wet bulb indoors). TWOZONE employs a performance chart of a General Electric air conditioner of EER 6.5 to construct the appropriate efficiencies for removing sensible and latent heat for each city and each level of insulation to estimate the kilowatt-hours per year.

There is also no direct data on the temperature settings, so we have assumed the mean of the two conventional settings (either 75° or 78°, so we employed 76.5°F). The results for the UEC's as a function of both

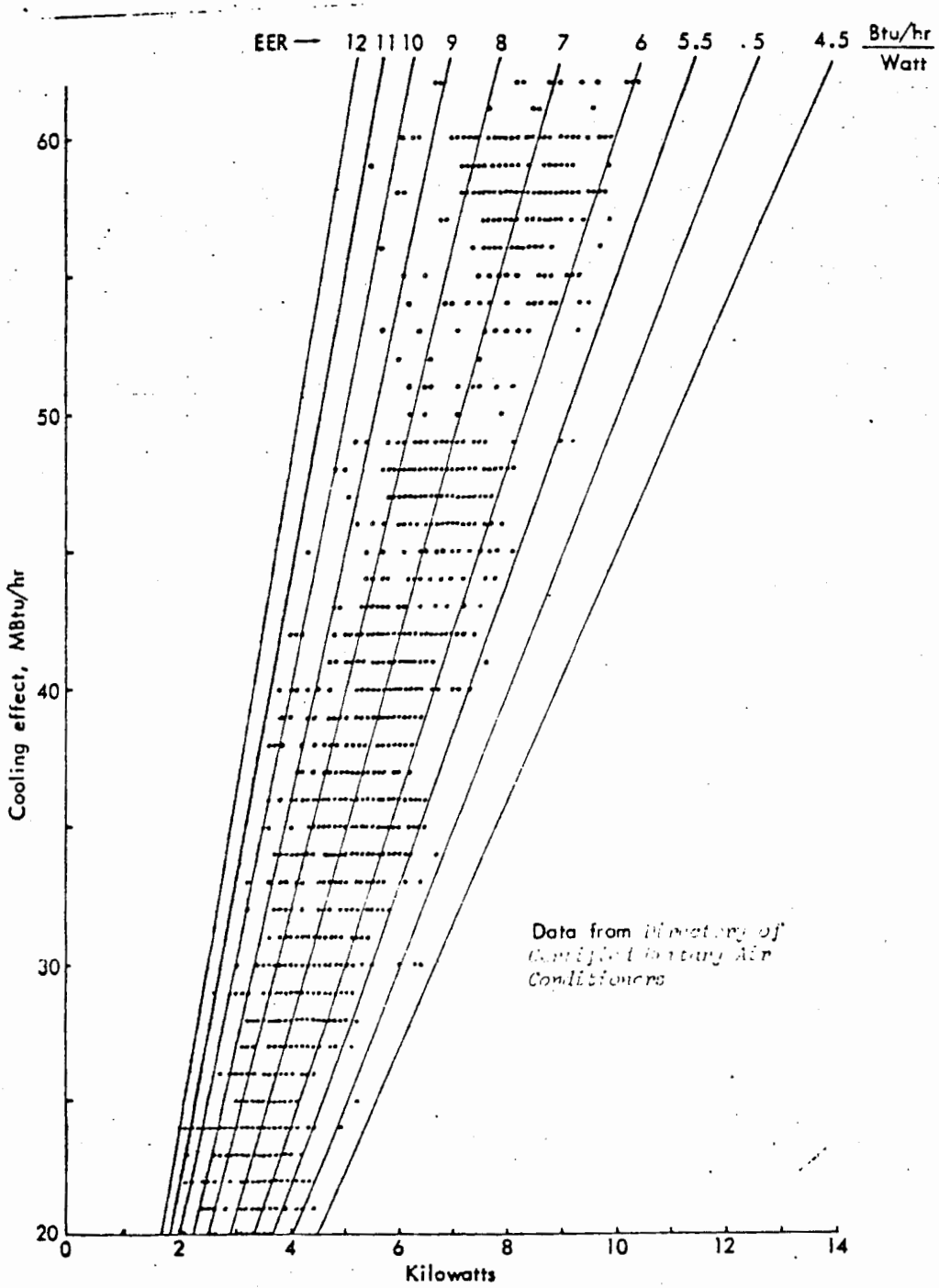


Figure A4.3 This scatter plot of the cooling effect versus the power has been reproduced from S. H. Dole, "Energy Use and Conservation in the Residential Sector: A Regional Analysis", R-1641-NSF (1976), p. 38. The EER in this plot consists of lines with a given slope (since the EER is the ratio of cooling/effect/power).

location and insulation levels are shown in Table A4.5. It should be noted that the power computed for the load curves is actually the diversified demand.

The computed energy requirement is 3000 kwhr/yr for a single family house with only ceiling insulation in the Travis Air Force Base weather region. This compares well with the PG&E load survey in the Fresno area. The typical houses in this load survey had only ceiling insulation, but were only about 1200 sq. ft. in comparison to the 1450 sq. ft. of the TWOZONE sample house. This study measured only 2400 kwhr/yr, but this was only the compressor energy, so to this should be added the energy to run the furnace fan (about 800 W) for the same number of hours as the compressor (600 hours per year). With these corrections for house size and for the furnace fan (which TWOZONE includes), then the load survey rate was 3000 kwhr/yr. Air conditioner power loads can be derived from the PG&E load survey curve shape in conjunction with the TWOZONE energy requirements.

There is little other data on the actual consumption of electricity by space cooling systems. The FPC report All Electric Homes[12] does provide estimates of the elctricity used for cooling by all electric homes with "total cooling systems," but these data are either based upon EEI estimates or are of unknown origin. The Eastern load surveys[9] indicate that central units use about 3224 kwhr/yr (which may not include the furnace fan).

It is necessary to estimate some more factors to derive the UEC's from these thermal loads. First, one must estimate the distribution of saturations of air conditioners with each cooling load. From the SCE, PG&E, and SDG&E saturation results by district, it is apparent that the saturations are much higher inland than in the coastal region (as was the case

TABLE A4.5 - Our Estimate of Cooling Energy Requirements

Single Family Detached, 1450 ft^2, Cooling, EER = 6.5, 76.5° Thermostat

Insulation	Travis	Oakland	Burbank	Los Angeles (Airport)
	(kwhr/yr)			
None	4,300	600	4,900	840
R-19 Ceiling Only	3,300	530	4,100	800
Current State Code: R-11 Walls, R-19 Ceiling	2,200	360	3,000	600
Current Code Plus Double or Storm Windows	2,000	340	2,700	530
Double Glaze, R-11 Walls, R-30 Ceiling	1,900	330	2,600	530
Double Glaze R-18 Walls, R-30 Ceiling	1,900	310	2,500	510

with room air conditioners). From these district saturations we estimate that these weighting distributions are roughly .9 for the higher load areas and .1 for the lower load region. Accordingly, we have approximated

1. PG&E by .9 Travis and .1 Oakland
2. SMUD by Travis
3. SCE, LADWP, and SDG&E by .9 Burbank and .1 Los Angeles's airport.

Note that this weighting is different from that of room air conditioners, since as expected room air conditioners have a higher relative saturation in more temperate regions. (This expectation is based upon the assumption that the most likely consumer response in more temperate coastal regions would be to buy a cheaper room air conditioner rather than a central unit to meet the lower needs for cooling). Next, the insulation level in air conditioned dwellings is not as easily determined as with electrically heated units (see Appendix A2). Accordingly, we have assumed a distribution among insulation levels. We have used

1. .5 have no insulation
2. .25 have R-19 ceiling insulation only
3. .25 have the present State code (R-11 walls and R-19 ceiling).

For the various housing types, we had to estimate the cooling loads in multi-family units and mobile homes. We have assumed that mobile homes have

1. the same cooling load as uninsulated single family units now.

but, 2. in the future the effect of the State code will be reduce this load to that of multi-family units (see Appendix A2).

The cooling loads of multi-family units are not well established, because of the uncertainties both in the magnitude and ratio of the internal and external loads. The floor space of a multi-family unit is about 75% of that of a single family dwelling. To estimate the ratio of the cooling loads of multi-family to single family units we performed a simple balance of the electricity demand of single family and multi-family units in both SMUD and SCE (the two utilities in which we have separate energy consumption figures for both single family and multi-family units). This check indicated that the cooling loads of multi-family units are about .4 in SCE and about .6 in SMUD, times those of single family dwellings, which were used for the southern and northern utilities respectively. (This result seems counter-intuitive for the north versus the south, but could be caused by the different internal and external loads, or apartment floor space, or surface area to volume effects, or insulation levels, or might just indicate the degree of uncertainty in these estimates).

With all these estimates it is clear that these numbers for the UEC's are uncertain. We have weighted these thermal loads by the saturations in each utility service area and then constructed a weighted average of all the service areas for the state (See Table A4.6). This number is higher than a simpler weighting scheme (such as one based solely upon population) would indicate. Finally, we have scaled this number by 85% to take into account that the unit will not always be used when needed,[6] since people take vacations during the summer, a significant fraction of all households have both adults working (40% of all married couples[6]), and a significant fraction of all households have only one occupant (21%[5]). This use factor is uncertain since central air conditioners are thermostat controlled and thus may operate regardless of the occupants' schedules. However, as

TABLE A4.6 - Our Estimates for Cooling Loads for Central Air-Conditions in 1975

(Load[1]/Number of Centrally Air-Conditioned Units[2])

(kwhr/yr)

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E	Statewide
All	2,550 (257,000)	2,825 (105,000)	3,190 (538,000)	2,730 (165,000)	3,230 (61,400)	2,945 (1,126,000)
Single Family	3,020 (171,000)	3,200 (70,600)	3,770 (330,000)	3,770 (87,300)	3,770 (29,300)	3,526 (688,000)
Multi-Family	1,220 (73,500)	1,520 (30,500)	1,525 (157,000)	1,525 (77,100)	1,525 (19,100)	1,462 (357,000)
Mobile	3,930 (12,100)	4,300 (4,140)	4,500 (50,900)	4,500 (1,040)	4,500 (13,000)	4,405 (81,200)

Weighted average is 2,945 kwhr/yr, so with an 85% use factor the result is 2500 kwhr/yr.

1. Loads were derived by SMUD = Travis; PG&E = .9 Travis + .1 Oakland; SCE, LADWP, and SDG&E = .9 Burbank + .1 Los Angeles (airport). (See PG&E district saturations evidence that about 10% of central air-conditioning is in the more temperate regions). Also, we used Single Family as .5 (no insulation) + .25 (R-19 ceiling only) + (.25 state standard); Multi-Family as .4 (Single Family) in SCE, LADWP, and SDG&E and as .6 (Single Family) in PG&E and SMUD (the method most consistent with total electricity sales data); Mobile homes were approximated by the un-insulated case.

2. The saturations used to derive these numbers were the total saturations for PG&E, SMUD, and LADWP, except for SCE and SDG&E where saturations contingent upon housing type were available.

central units are larger than room air conditioners (2 to 5 tons for a central unit compared to 0.5 to 2 tons for a room unit[13]), there is more incentive to be efficient about their energy consumption. In the absence of any data on these use factors, we will assume that central units have the same 85% use factor as room air conditioners.

To construct the UEC for the additions to the housing stock in 1975, we have used the same weighting scheme among locations for each utility and the same multi-family to single family ratio of thermal loads (but the mobile home load is now equal to that of multi-family units). The saturations were assumed to be the same in each type of housing as the overall saturation rate in recent new construction (see Table A4.4). Once more the final result was scaled by the 85% use factor.

To derive the 1980 construction UEC we estimated that better insulation will be required by higher fuel costs and assumed the same insulation level as in the heating case (see Appendix A3). These future thermal loads were estimated to be the average of the present State code plus storm windows or double glazing and R-18 walls, R-30 ceiling plus double glazing. The efficiency of the air conditioner was assumed to increase from EER of 6.5 to 8.7 due to appliance efficiency standards. The housing additions were estimated by using the 1975 construction rate in each utility and the average housing proportions from the 1970 to 1975. Once more we assume an 85% use factor.

It should be recognized that these UEC's for the 1975 and 1980 new construction contingents are more uncertain than those of the entire stock in 1975. This is because of not only the number of estimated quantities, but also because of the increased uncertainty in the cooling loads with better insulation and the increased uncertainty in the scaling ratios

TABLE A4.7 - Our Estimates for the Cooling Load of Central Air-Conditionings in 1975 Construction

(Load/Number of Additions with Central Air-Conditioning)

(kwhr/yr)

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E	Statewide
All	1,835 (5,770)	1,826 (6,990)	2,388 (39,700)	2,555 (9,490)	2,140 (5,290)	2,290 (67,200)
Single Family	2,016 (3,700)[1]	2,200 (3,550)	2,760 (24,700)	2,760 (4,060)	2,760 (2,860)	2,640 (38,900)
Multi-Family	1,210 (1,310)[1]	1,320 (2,980)	1,100 (8,920)	1,100 (5,370)	1,100 (1,970)	1,140 (20,600)
Mobile	2,016 (764)[1]	2,200 (464)	2,760 (6,120)	2,760 (64)	2,760 (457)	2,650 (7,870)

The weighted average is 2,290 kwhr/yr, so with an 85% use factor the result is 1950 kwhr/yr.

1. Assumed the saturation in each housing type equals the total's saturation type for every value in this row.

TABLE A4.8 - Our Estimates for Cooling Load of Central Air-Conditioning in 1980 Construction Using EER = 8.7

(Load[1]/Number of Additions with Central Air-Conditioning[2])

(kwhr/yr)

Service Area	PG&E	SMUD	SCE	LADWP	SDG&E	Statewide
All	1,063 (5,760)	1,105 (6,990)	1,131 (39,700)	1,119 (9,500)	1,186 (5,300)	1,126 (67,200)
Single Family	1,340 (2,780)	1,460 (2,710)	1,820 (14,600)	1,820 (3,390)	1,820 (2,200)	1,730 (25,700)
Multi-Family	804 (2,240)	880 (3,620)	730 (19,900)	730 (6,060)	730 (2,620)	751 (34,400)
Mobile	804 (738)	880 (658)	730 (5,210)	730 (47)	730 (455)	752 (7,110)

The weighted average is 1,126 kwhr/yr, so with an 85% use factor the result is 957 kwhr/yr.

1. These are derived as in Table A4.6 by averaging current state code with double glazed or storm windows and double glazed windows with R-11 walls and R-30 ceiling.

2. These numbers were derived using the saturation rates in 1975 constructions, the 1975 construction rate, and the 1970-1975 housing type fractions.

between the single family cooling loads and those of multi-family and mobile units as the insulation increases. Moreover, these saturations will not be the same in all housing types and may not be the same as the saturation in the utilities in recent construction (if either the market for central units saturates or the new construction becomes more focused inland).

However, the available saturation data contingent upon housing type indicates that this procedure may be reasonable for single family and multi-family units and with the present State code (which will reduce the cooling loads in mobile homes) the saturation in new mobile homes should be reduced to closer to the other housing types. From these data, and from the time series data in Table A4.9, it seems that the increased saturation rate for cooling devices is mostly in central systems and that heat pumps, room units, and evaporative coolers have fairly stable saturations. There are no available data to perform a time series analysis of the size and EER of room and central units. This type of data would be very useful.

The largest areas of uncertainty in these data on cooling energy are in the energy consumption. There is a need for load surveys, especially within different climatic regions of the state and for different housing types. These load surveys should also investigate the effect upon the energy consumption and load curves of one unit if another is added. Finally, these studies should focus upon the differences in load of various levels of insulation, especially the State code and any more stringent standards. A simple "on/off" measuring device would be a cheap means of determining the cooling hours in a variety of California climates.

There is also a need for data on the sizes and efficiencies of air conditioners sold in California. An important component of this data

TABLE A4.9 - SDG&E Time Series Data for Air Conditioning (1971)

			(Percent)	
Year Built	None	Central	Room[1]	Evaporative Cooling
Don't know	87.3	3.7	7.6	1.3
Before 1955	83.7	3.5	10.6	2.2
1955-1959	81.4	5.5	11.6	1.5
1960-1964	81.6	6.5	9.8	2.0
1965-1971	80.3	10.4	7.7	1.6
Total	82.9	5.6	9.7	1.8

1. The percentage of households with one or more air conditioners since the scaling factor to the percentage of households with a room air conditioner is not known as a function of the age of the structure.

would be the measurement of the actual EER under California conditions and the development of a procedure to convert nameplate EER's to operating EER's. This type of data on the operating EER's and the distribution of sales by EER's will be important for judging the effects and effectiveness of State efficiency standards. Finally, there is also a need for determining the lifetimes of the various types of cooling devices.

There is also much that can be done to improve the usefulness of the saturation surveys. First, the Census question of air conditioning specifically excludes evaporative coolers. It also does not differentiate between central units and heat pumps. Also it does not have an adequate number of categories dealing with the number of room air conditioners. This question should be expanded from none, one, two or more to: none, one, two, three, four, five or more. Similarly, the utility surveys should distinguish between types of cooling devices and number of room units adequately. The utility data should be compared with billing data to improve the accuracy of the responses. All of these surveys should cross-tabulate the responses versus the type and age of the structure.

All of these inadequacies in the available cooling data limits the accuracy of these results. We have also not included the effects of the better insulation in the 1975 housing additions in the 1975 stock consumption. These additions will not consume their full "share" of energy in 1975, because of the time needed for construction and then occupancy during the year (this effect will be in part balanced by the removed components of the stock using some energy during this year). Similarly, we have not included the effects of increased prices upon operating practices.

Footnotes and References

1. Private communication, Richard English, Marketing Department, SDG&E, 1976.
2. R. J. Rettberg et al., "Appliance Efficiency Program--Final Report", prepared by Science Applications for ERCDC under Contract 4-0034, SAI-551-LJ., (March, 1976).
3. Commercial Operations--Market Research and Sales Control, Pacific Gas and Electric Company, "Residential Electric Air Conditioning Load Research Project, Years 1964-1963-1962" (1965).
4. NAHB Research Foundation, Inc., "Insulation Manual Homes and Apartments", (1971), available from NAHB Research Foundation, Inc., Rockville, Maryland.
5. Department of Housing and Development, "California Statewide Housing Element Phase II", (1973), p. 19.
6. S. H. Dole, "Energy Use and Conservation in the Residential Sector: A Residential Analysis", R-1641-NSF (1976), p. 31.
7. "Merchandising Week", A Billboard Publication, 1 Astor Plaza, New York, several Annual Statistical Issues.
8. J. C. Moyers, "The Room Air Conditioner as an Energy Consumer", ORNL-NSF-EP-59 (1973), p. 10.
9. H. G. (Mike) Jones and Naresh Bhagat, "Residential Energy Consumption and Income: A Methodology for Energy Policy Analysis Applied to the Greater New York City Region", BNL-18818 (1974) p. 56 and references therein.
10. L. Wall, personal communication. TWOZONE is part of the CAL/ERDA buildings analysis program now under development at LBL. CAL/ERDA is being developed under the direction of Professor A. H. Rosenfeld and is sponsored jointly by the ERCDC and the U. S. Energy Research and Development Administration.
11. Air-Conditioning and Refrigeration Institute, "Directory of Certification, Unitary Air-Conditioners", (1976).
12. Federal Power Commission, "All Electric Homes".
13. S. H. Dole, R-1641-NSF (1976), p. 35.

A5 Lighting

The lighting energy calculation is different from the calculations for appliances. The basic form for the lighting energy calculation is to multiply the sales of light bulbs by the energy consumption. The amount of energy used by a lamp over its lifetime can be calculated from the wattage of the bulb, times the average lifetime of the bulb, which has been measured by the manufacturers. Published data on lamp sales are not ideal for calculating energy consumption. The number of different types of lamps is very large ($\sim 10^4$) so sales data[1] is aggregated into very large blocks of types of lamps. The energy consumption of these blocks is roughly estimated. In general, for incandescent bulbs, which make up the bulk of the residential market, wattages vary inversely with lifetimes so energy consumptions are fairly stable within classifications.

General Electric[1] has used the 1973 sales data plus inhouse estimates of; 1) the fraction of sales to the residential market and 2) the detailed breakdown by type of bulb within the aggregate classes reported by the Census of Manufacturers, to arrive at a total energy consumption of 78×10^9 kwhr for residential lighting in 1973. This is approximately 1130 kwhr/household for the 68×10^6 households in 1973. The inhouse data is proprietary so the General Electric estimate cannot be directly checked.

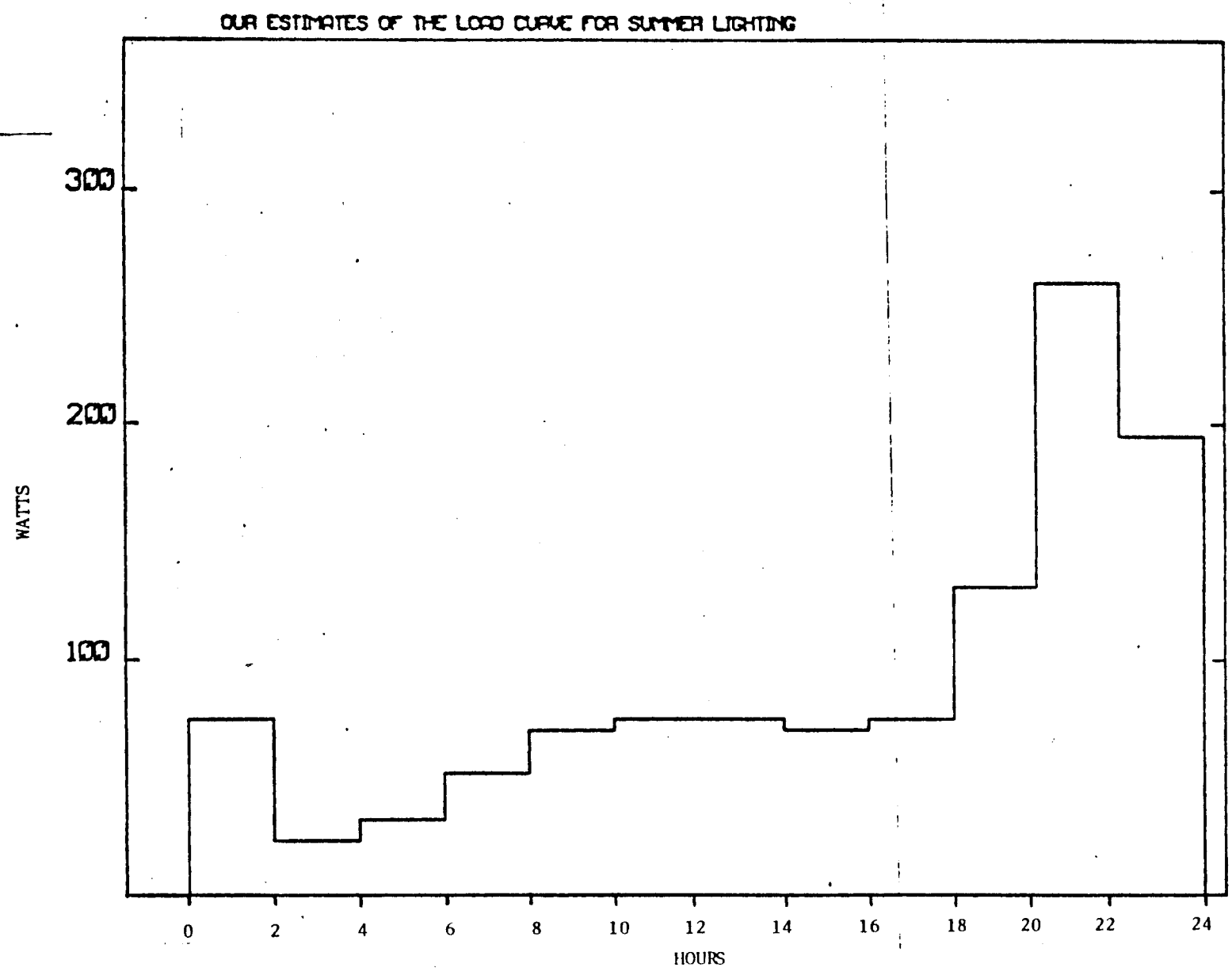
PG&E[3] estimates 1200 kwhr/year for lighting, in reasonable agreement with the General Electric estimate. However, both these estimates may be high for 1975. Conservation in lighting is the most readily available of all the consumer energy options. Unfortunately, there are no data on lamp sales which have been analysed since the energy crisis (1974).

Lighting load curves[4] were measured in the 1950's. Figures A5.1 and A5.2 show the summer and winter load curves scaled to 1130 kwhr/yr. The winter curve is higher overall, as the lighting energy consumption on the average winter day is 1.24 times larger than the lighting energy consumption for the average day, while the lighting energy consumption on a summer day is but .73 times as large as the energy consumption on the average day.

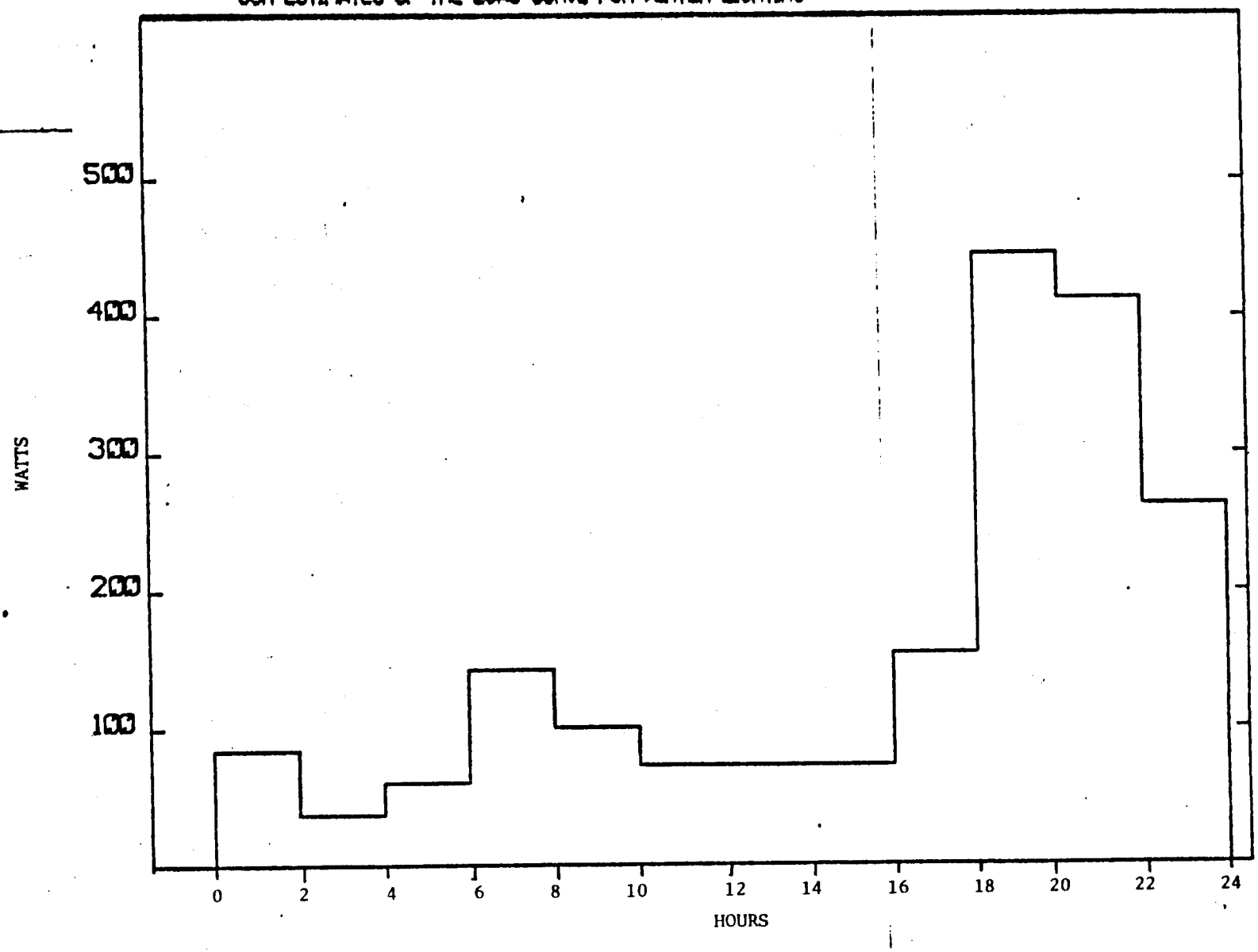
There are no data on the effect of conservation efforts on residential lighting practices so 1980 consumption cannot be predicted. Furthermore, there are at present no guidelines for lighting in new construction nor any standards on the efficiency of present light bulbs. Fluorescent lights in new buildings would save substantial amounts of energy. In old building a shift to Krypton filled bulbs (no longer being retail marketed[5]) could save approximately 10% of the energy now being used.

Lighting is a major fraction of electrical energy use in houses. Much better data could be gathered by keeping a yearly record of retail sales of light bulbs in California by type of bulb. By limiting the data collection to those types of bulbs which are sold to the residential market, and by lumping bulbs of similar wattages and lifetimes (e.g. 25 watts standard, Flair, and colored bulbs) the data collection problem can be made manageable. This would give by far the most accurate available method of estimating lighting consumption in California, by year.

Figure 5.1


OUR ESTIMATES OF THE LOAD CURVE FOR SUMMER LIGHTING
300
200
100
WATTS
0
2
4
6
8
10
12
14
16
18
20
22
24
HOURS

OUR ESTIMATES OF THE LOAD CURVE FOR WINTER LIGHTING



Footnotes and References A5

1. 1972 Census of Manufacturers U. S. Census.
2. Communication from R. T. Dorsey, Manager. Lighting Development, Lamp Marketing Department of General Electric Company, Nela Park Cleveland, Ohio (216--266-2363).
3. PUC Docket #75-FOR-5.
4. Personal communication with Robert K. Weatherwax Center for Environmental Studies, Princeton Engineering, Quadrangle, New Jersey. The load curves are from the AEIC.
5. General Electric test marketed these bulbs over a year ago, but they are no longer stocked by the Bay Area distributor. The bulbs cost more, but are cost effective over the life of the bulb.

A6 Water Heaters

The water heater is the largest single consumer of energy in the household after space heating; in fact, with current home insulation standards and energy management by the householder, water heating often requires more energy than space heating.

Currently, over 85% of the water heaters in the state are gas (or bottled gas) fired, so that electric water heaters do not represent a large fraction of total electricity use. However, a rapid increase in their saturation could result in greatly increased electricity demand.

Despite their importance, the exact saturation of electric water heaters may be hard to find. SDG&E has found that a significant fraction of its survey respondents listed their water heating fuel incorrectly, and that 21% of the respondents in multi-family dwellings could not even answer whether their water heater was gas or electric and another 12% claimed they had no heater. In addition, the Census lists more households with hot water than households which have water heaters.

This is not surprising, since many residents of multi-family units do not pay for their hot water and water heaters for such units are generally installed by the original contractor, rather than purchased directly by the consumer (especially renters). However, this poses significant problems in modeling residential electricity demand. One of these problems (which is analogous to the problems faced with laundry facilities) is that the energy for a building-sized hot water system may be billed to a commercial, rather than a residential account.

To obtain saturation estimates for hot water heaters, first we went through the 1970 Census by counties and inflated the saturations of households with gas or electric water heaters by the ratio of households

TABLE A6.1 - Utility Supplied Saturation or Water Heaters by Housing Type and Our Estimates for 1975 Saturations

	PG&E	SMUD	SCE	LADWP	SDG&E
Year	1970	1975	1975	1970	1974
All					
Gas	83.2	-	85.0	92.3	85.8
Electric	10.9	16.0	11.1	5.8	10.7
Single Family					
Gas	-	-	92.2	-	89.5
Electric	-	-	6.5	-	10.0
Multi-Family					
Gas	-	-	63.5	-	71.1
Electric	-	-	25.1	-	15.0
Mobile Home					
Gas	-	-	90.5	-	88.2
Electric	-	-	9.5	-	10.4
Our Estimate (1975)					
Gas	83.2	81.7	83.6	92.3	86.3
Electric	10.9	16.0	11.6	5.8	11.7

having hot water to households having some sort of water heaters (often more respondents had piped hot water than used any kind of fuel (including "other") for water heat). We assigned these county-by-county saturation estimates to utility districts, and then used these saturations (for 1970) to inflate utility survey responses such that there were at least as high a saturation of electric and gas water heaters in 1975 as 1970. The utility estimates and our results for each districts are shown in Table A6.1.

Again the multi-family figures for SCE and SDG&E point out the problems with using utility surveys to accurately calculate the water heater saturations. The multi-family figure for SCE was calculated from the weighted average of their apartment and condominium/townhouse classifications.

Much background information is required before one can assess the economics and consumption effects of conservation standards for electric water heaters. We discuss some of the determinants of electric water heater energy usage below.

Most of the energy input into an electric water heater emerges as useful heat; therefore, the purely technical approaches to reducing electricity consumption (e.g. by increasing tank insulation or lowering water temperature) can save at most 20% unless the resistance heating method is replaced. However, substituting solar energy for electric energy is presently feasible in most areas of California; this is discussed in more detail in the section on solar energy. Solar assistance can reduce the impact of electricity to about 30% of its usual amount.

In addition, levels of hot water demand are quite variable, both in terms of quantity and temperature. The hot water use by an average

California household of 2.85 persons is about 30 (140°F) gallons per day, not including the consumption of dishwashers and clothes washers. Adding a dishwasher adds roughly another 10 (140°F) gallons of demand per day, and a clothes washer adds roughly another 15.[1]

So what is really needed to model electric water heater usage is not just an average saturation times an average consumption, but rather a set of contingent saturations, (e.g. the fraction of those people with electric water heaters who also have a dishwasher). These contingent saturations may be obtainable from SDG&E data; however, for the present, we had had to assume that the contingent saturations are no different than the overall saturations.

The effect of consumer choices on hot water demands should be investigated. We have no California data on the temperatures used in water heaters or the fraction of laundry loads done in cold or warm water instead of hot water. Such information is very helpful in studying policy alternatives, as the reduction in the energy consumption of water heaters due to changing use patterns may be as large or greater than the reduction resulting from purely technical approaches to energy conservation.

Using the typical water consumptions previously listed, we calculate the following energy consumptions. For a household without a clothes washer or dishwasher, 3025 kwhr/yr. A dishwasher adds 695 kwhr/yr, while a clothes washer adds 1045. Thus, a family with both appliances would consume 4765 kwhr/yr.

The statewide saturations of clothes washers and dishwashers is 65% and 37% respectively. These saturations give an average energy use of about 4000 kwhr per year.

We have no high-quality data on load curves, but the data we have suggests that a good approximation for an average day would be constant power (690 watts) from 6:00 a.m. to 10:00 p.m. except for a dip to 270 watts from 2:00 p.m. to 4:00 p.m. and 100 watts to compensate for make-up losses at night.[2,3] Summer usage should be about 20% lower and winter usage about 20% higher than average.

Footnotes A6

1. Numbers derived from gas use measured in the PG&E Residential Gas Appliance Load Research Project, 1967-1969 and adjusted for family size variations. Manufacturers data on dishwasher water use and SDG&E data on mean number of cycles per month were also used. See the specific appliance appendix for more detail. The base load of 30 gallons/day is roughly consistent with water use studies from the fifties and sixties after correcting for the average family size of the period and the average clothes washer saturations. These studies are listed in the ASHRAE 1970 Guide and Data Book, Systems Volume, page 557.
2. Richard S. Quinn Jr., The Effects of Increased Capital Expenditures As a Method of Reducing Electricity Demand for Hot Water Generation in New Homes, Msc Thesis, University of Tennessee, Knoxville, Tennessee, August, 1972.
3. Summer Air Conditioning and Appliance Use Patterns: A Graphical Analysis, Jeffrey A. Robinson and Johnny Yeung, Center for Environmental Studies Report, No. 22V (NSF/RANN S1A 72-03516-A02), May, 1975.

A7. Refrigerators

Saturation data exists only for the three utilities (SMUD, SCE, and SDG&E) which run surveys. PG&E and LADWP rely on the Census which lists penetrations (the number of households that own one or more of the appliance) rather than saturations (number of appliances per household). The utility surveys ask questions designed to determine the number of multiple refrigerator owners. The survey data is shown in Table A 7.1 along with the calculated saturations and penetrations.

Table A 7.2 lists the utility saturation data along with our estimate of the 1975 saturations for all the utility districts. The first step in deriving these 1975 saturations was to estimate a 1973-1974 saturation for PG&E and LADWP. The saturations by housing type for SDG&E and SCE are averaged and then multiplied by the fractions of these housing types in the PG&E and LADWP area, to produce an overall saturation estimate for these two districts. To update these saturations to 1975 we use sales data for a six county region[1] in southern California along with our estimate of 1973 saturations for LADWP and SCE in an exponential stock decay model (see Appendix A13) to estimate a growth rate of 0.6% per year in saturations. The SCE saturation is updated by 2 years growth, LADWP and PG&E are updated by 1½ years, and SDG&E is updated by 1 year.

The SMUD data did not have to be updated, but it does need adjustment to compensate for the over representation of single family homes in the survey. The SMUD survey was modeled by updating the SCE and SDG&E saturations by housing type to 1975 and multiplying by fractions of

these housing types in the survey. The model result was within 0.3% of the SMUD survey result. We then calculated the model saturation using the correct housing saturations for the SMUD area. The difference between the two model calculations was used to correct the survey result.

Refrigerators are the appliance category which accounts for the largest average percentage of residential energy use. The variation in energy demand between models is tremendous, from about 500 kwhr/yr for some fairly small single-door manuals to over 3000 kwhr/yr (or about ½ of a typical California household's total electric bill) for the largest side-by-side automatic defrost refrigerator/freezer. Not only does the electricity use of current models vary with brand and type, but the model mix has changed with time, causing a sharp increase in the energy use of new models during the 1960's. A proper accounting of refrigerator energy demand requires constructing a picture of the age distribution of the existing stock and the average energy usage of each cohort of refrigerators.

The energy consumption of domestic refrigerators manufactured since 1975 is reported yearly in the AHAM Directory. We used this data by assuming that the energy consumption for a given volume and type (single-door manual, two-door partial defrost, two-door no-frost, and side-by-side no-frost) of refrigerator would be substantially the same over time.[2]

A rough market share estimate for each model of refrigerator was derived from the L.A. Times Survey[3] data on purchases. The relative market share for a given model was assumed to approximately equal the brand market share divided by the number of models produced by the manufacturer. These relative weights were used to give a weighted average energy consumption within each type and volume block. The results of this calculation are presented in Table A7.3.

There is much less data on the sales of imported refrigerators by type and size. In Table A7.4 we present a table of the estimated energy consumptions for the classifications used in the most recent import tabulations[4].

Fairly extensive data exists on the breakdown of the domestic[5] refrigerator sales by type and volume. Tables A7.5 and A7.6 give our estimates of these breakdowns by year. Table A7.3 shows that each type of refrigerator comes only in a limited size range. A computer program was written to utilize this information. Where more than one type of refrigerator was produced for a given volume, the saturations for each, in that volume, were related to the overall saturations. A self-consistent set of assumptions were made to give a unique answer for each cross tabulation.

This procedure gives a complete cross tabulation of the volume and type data. The energy consumption of domestic refrigerators was computed from this cross tabulation and the data in Table 7A.3.

The data for sales of imports is presented in Table A7.7. This information was not directly usable. In particular, it appears likely that many of the small refrigerators end up in recreational vehicles and boats. In addition AHAM[7] counts a small fraction of the sales of the refrigerators with less than 6.5 cu. ft. volume in their tables, which we used for domestic sales. Table A7.8 presents our estimate of the import refrigerators going to the household market which are not counted by AHAM.

From 1971 to 1974 data exists for the volume breakdowns; the average energy consumption for the year can be computed from Table A7.4. Prior to 1971, no detailed information was recorded. We used a smooth extrapolation towards the average energy consumption of 1950 domestic refrigerators, to fit this data. As the fraction of pre-1971 import sales is very small, these assumptions are rather unimportant.

To compute the average energy consumption for the existing stock the sales for each year have to be known. Total shipments including exports, but not most imports[7], are tabulated by Merchandising Week[8] as far back as 1922. In Table A7.9 we present exports from 1945 to 1974. Table A7.10 presents the corrected domestic sales and imports and the average energy consumptions by year. A total sales figure and average energy consumption is displayed in the last column. Finally, in Table A7.11 the sales are decayed according to our exponential decay model, (see Appendix A13) and a stock weighted average energy consumption is computed.

Uncertainties exist in each step of the above calculations. Most of the errors are random and appear small. For example, the yearly energy calculation is not very sensitive to the assumptions used in calculating average energy consumption by type and volume, or the calculation of the sales fractions by type and volume. The worst case error seems to be of the order of 10%.

In addition to the random errors, there are four counterbalancing systematic biases in the calculation procedure; 1) the calculated energy consumption of pre-1960 refrigerators is too high, 2) the exponential decay model probably overcounts the pre-1950 refrigerators, 3) the exponential decay model definitely undercounts the post-1970 refrigerators, and 4) the California average energy consumption should be higher than the national average due to the greater number of new refrigerators in the California stock. We have no precise way of correcting the first three errors. However, we can roughly estimate the possible magnitudes of the errors which are as follows: 1) -10%, 2) +3%, 3) +2%, and 4) +4%. The errors appear to cancel. From Table A7.11 we estimate the average energy consumption to be 1200 kwhr/year. From the discussion above we expect that the accuracy of the estimate is within 100 kwhr/year.

There is little data on load curves. Data from the Princeton study[9], where the average variation in temperature over the day was 15°F, indicates that, during the night hours from 10 p.m. - 8 a.m., the refrigerator consumes 91% of the average, while during the day the refrigerator consumes 106% of the average. A more detailed analysis is not justified in view of the available data and the possible differences

between California and Princeton. Seasonal load curves have been measured by the AEIC[10]. For the PG&E area the swing in energy consumption from summer to winter is 13% of the average. Combining these numbers, we get an average load of 155 watts during the summer peak and 135 watts during the winter peak. Off peak loads are 135 and 115 watts respectively.

A 30% reduction in energy consumption by 1980 from the 1972 average, is implicitly required[11] by Federal law. We assume that the reduction affects the California market in the same manner as it affects the national market. Using our estimate of the energy consumption of a 1972 refrigerator (Table A7.10) we estimate an average consumption of 1050 kwhr/year in 1980. There is considerable evidence that lower energy use is feasible, especially since one manufacturer (Philco) is very close to meeting the standard and has not improved the compressor or thickened the insulation in the walls.

The average service life for refrigerators is 20 years (see Appendix A13).

1) AHAM Industry Sales Statistics (sales to dealers by county). SCE graciously provided us with this data which is proprietary.

2) In general the industry has tended to maintain acceptable operating costs while minimizing first cost. For instance, foam insulated refrigerators have thinner walls, thus maximizing volume per dollar, but not substantially changing the energy consumption. Two trends are missed by this assumption; 1) early refrigerators had no or very small freezer compartments, therefore we overestimate their energy consumptions, and 2) we do not include the energy consumption of accessories in any of the calculations. Robert Bilek, Project Planning, General Electric (Appliance Park, Bldg. 5 - Rm. 247, Louisville, Kentucky 40225) informs us that these extras can add up to 100 kwhr/year.

3) Los Angeles Times, Continuing Home Audit Market Research Department (213-625-2345, ext. 1771). The survey covered 6000 people annually for 3½ years. Total number of respondents who had purchased refrigerators was about 1500.

4) U.S. Customs. See In-146 for the most recent data.

5) Merchandising Week Annual Statistical Issues, Billboard Publication, 1 Astor Plaza, New York, New York. Merchandising Week compiles data from AHAM and other sources. The AHAM statistics include a small number of imports.

6) The volume data from Merchandising Week (footnotes) was aggregated with the end intervals being open and the interior intervals covering $2ft^3$ blocs. The energy consumption calculated from the volume and type information was not critically dependent on the assumptions we used to estimate the sales by cu.ft.

7) Personal communication with Paul Roman at AHAM. We assumed that 20% of the imports above 6.5 ft^3 were counted by AHAM. The fraction may be smaller, but the error introduced by this assumption would remain very small. AHAM hopes to include more imports in the future; see also footnote 5.

8) The most recent numbers are AHAM statistics. Earlier numbers came from a variety of industrial sources; see also footnote 5.

9) Summer Air Conditioning and Appliance Use Patterns: A Graphical Analysis; Jeffrey A. Robinson and Johnny Young, May 1975, Center for Environmental Studies, Report #22, NSF/RANN S/A 72-03516 HO2, The Engineering Quadrangle, Princeton University, Princeton, N.J. 08540. Only 3 refrigerators were measured.

10) Frost-Free Refrigerator-Freezer Use Study, 1971 to 1972, supplied by PG&E.

11) The Energy Policy and Conservation Act (PL 94-163, section 325) mandates an overall savings of at least 20% for a group of appliances. This is equal to the voluntary target which was set earlier by the Department of Commerce. The Department of Commerce set goals for each appliance in the group, so that the overall savings would be 20%. The target for refrigerators was a 30% savings (see the Appliance Efficiency Program, Progress Report #1, pages 12 & 13, Science Application, Inc. for a complete summary of the D.O.C. goals.)

TABLE A7.1

UTILITY SURVEY DATA ON THE NUMBER OF REFRIGERATORS PER HOUSE

District & No. of Refrig. \ Housing Type	Single Family	Multi Family	Mobile Home	All[1]
SMUD (1975)				
1	-	-	-	82.5
2	-	-	-	16.0
3+	-	-	-	0.7
Penetration	-	-	-	99.2[2]
Saturation[3]	-	-	-	116.7
SCE (1973)[5]				
1	83.2	95.0	84.8	86.7
2	15.1	3.2	13.9	11.6
3+	1.0	0.7	0.5	0.9
Penetration[3]	99.3	98.9	99.2	99.2
Saturation[4]	116.5	103.6	114.0	112.7
SDG&E (1974)[6]				
1	77.5	95.0	89.2	83.9
2+	21.8	4.1	10.1	15.4
Penetration[3]	99.3	99.1	99.3	99.3
Saturation[7]	122.7	104.0	109.8	115.9

1) SCE and SDG&E report the survey average. The number listed here for these utilities is the household weighted average of the housing type saturations.

2) Only .1% answered no refrigerator on the question asking for refrigerator type, however .7% did not answer this question, and .8% did not answer the question asking for how many refrigerators there were (0 was not a possible answer).

3) Calculated by assuming that a non-response was equivalent to no refrigerator. See footnote 2 for the rationale behind this procedure.

4) Calculated assuming that 3 or more is equal to 3.1 refrigerators.

5) The SCE survey reports list penetrations of frost-free and regular refrigerators, not saturations. However, the survey (1973 & 1975) questions ask for numbers of refrigerators, and SCE was able to send us figures for for the 1973 Survey. The 1975 Survey had not yet been analyzed in this manner.

6) SDG&E lists penetration and percentage of homes with refrigerators that have more than one. The entries were calculated from this data.

7) Calculated from the average number of refrigerators owned by people with more than one, in the SCE survey (see note 3), single family 2.07, multi-family 2.20, and mobile home 2.04.

TABLE A7.2

REFRIGERATOR SATURATIONS FROM UTILITY SURVEYS

AND OUR ESTIMATE OF SATURATIONS IN 1975

Housing Type / District	PG&E	SMUD	SLE	LHDWP	SDG&E
Year of Survey	--	1975	1973	--	1974
All[1]	--	1.17	1.154	--	1.179
Single family	--	--	1.165	--	1.227
Multi-family	--	--	1.036	--	1.040
Mobile Home	--	--	1.14	--	1.098
Our estimate for all types	1.16	1.16[2]	1.14	1.13	1.165

1) Utility submission. These numbers are not corrected for overcounting of single family units.

2) Corrected downward from the survey result to compensate for the overcounting of single family units.

TABLE A 7.3 - Average Energy Consumption of Refrigerators by Size and Type. ( ) indicates estimate

Volume/Type	Single-Door	Top-Freezer		Side-by-Side
ft^3	Manual	Partial	No-Frost	No-Frost
1 - 1.9	523	-	-	-
2 - 2.9	438	-	-	-
3 - 3.9	827	-	-	-
4 - 4.9	620	-	-	-
5 - 5.9	426	-	-	-
6 - 6.9	(548)	-	-	-
7 - 7.9	657	986	-	-
8 - 8.9	(645)	-	-	-
9 - 9.9	633	1326	-	-
10 - 10.9	669	-	-	-
11 - 11.9	620	1144	-	-
12 - 12.9	633	1180	1874	-
13 - 13.9	815	1326	1776	-
14 - 14.9	(694)	1460	1691	-
15 - 15.9	-	973	1813	-
16 - 16.9	-	(1582)	1703	2154
17 - 17.9	-	(1667)	1874	1947
18 - 18.9	-	-	1776	1752
19 - 19.9	-	-	2020	2166
20 - 20.9	-	-	1801	2032
21 - 21.9	-	-	1910	2032
22 - 22.9	-	-	1716	2190
23 - 23.9	-	-	-	2105
24 - 24.9	-	-	-	2494
25 - 25.9	-	-	-	2859
26 - 26.9	-	-	-	2446
27 - 27.9	-	-	-	2446

TABLE A7.4 - Energy Consumption for Imported Refrigerators

	6.5 ft^3 or below	6.5 ft^3 to 9.5 ft^3	9.5 ft^3 to 13.5 ft^3	13.5 ft^3 and above
kwhr/year	608[1]	799[2]	927[3]	1582[4]

1. The unweighted average of the energy consumptions of refrigerators greater than 3 ft^3 and less than 6.5 ft^3 in volume.

2. The unweighted average of the energy consumptions of single door manual and top-freezer partial defrost refrigerators from 6.5 ft^3 to 9.5 ft^3.

3. The unweighted average of the energy consumptions of single door manual and top-freezer partial defrost refrigerators from 9.5 ft^3 to 13.5 ft^3.

4. The unweighted average of the energy consumption of 14.5 ft^3 top-freezer partial and automatic defrost refrigerators.

TABLE A 7.5 - Breakdown of Domestic Refrigerator Sales by Type and Year. ( ) indicates an estimate.

Year/Type	Single-Door	Two-Door: Top or Bottom freezer		Side-by-Side
	manual (%)	partial (%)	no-frost (%)	no frost (%)
1950	100	0	0	0
1951	(99)[1]	(1)[6]	0	0
1952	(98)[1]	(2)[6]	0	0
1953	(96)[1]	(4)[6]	0	0
1954	(92)[1]	(8)[6]	0	0
1955	(84)[1]	(16)[6]	0	0
1956	(68)[1]	(32)[6]	0	0
1957	(66)[1]	(34)[6]	0	0
1958	(64)[1]	(35)[6]	(1)[6]	0
1959	(61)[2]	(37)[2]	(2)[6]	0
1960	(51.8)[3]	(44.2)[3]	(4)[6]	0
1961	(42.7)[2]	(49.3)[2]	(8)[6]	0
1962	(42.2)[2]	(41.8)[2]	(16)[6]	0
1963	38.8	28.5	32.7	0
1964	32.8	31.0	(35.2)[8]	(1)[8]
1965	27.6	24.8	45.6	2
1966	22.7	20.4	49.9	7
1967	(21.3)[4]	(18.8)[4]	(46.9)[4]	(13)[4]
1968	(21.4)[2]	(15.7)[7]	44.9	18
1969	(21.5)[2]	(16.7)[7]	42.8	19
1970	(20.4)[2]	(16.8)[7]	43.8	19
1971	(16.9)[2]	(18.9)[7]	46.2	18
1972	(14.6)[2]	(17.9)[7]	50.5	17
1973	12.9	18.1	49	20
1974	(11.6)[5]	(17.4)[5]	(49)[5]	(22)[5]
	1-14.9 [illegible]	7 [illegible]	12-22.9 [illegible]	16-22.9 [illegible]

1. Estimates of two-door partial and no-frost refrigerators subtracted from the total to give an estimate for single-door manual.

2. All single door refrigerators were assumed to be manuals.

3. Average of 1959 and 1961 with a small adjustment to account for our estimate of two-door, no-frost refrigerators.

4. Only the number of single-door refrigerators known -- the other values are estimated from 1966 and 1968.

5. Estimated for 9 months data.

6. No data; estimate smoothly extrapolated to zero.

7. The fraction of manual and partial defrost refrigerators was known. The fraction of partial defrost refrigerators was estimated by substracting all single-door models (see footnote 2) from the total.

8. The fraction of no-frost refrigerators was known. The fraction of side-by-sides was estimated by averaging 1963 and 1965 and deducted from the total to give the function of top and bottom freezers.

TABLE A7.6 - Estimated Domestic Refrigerator Sales by Volume[1] in One Thousandths

VOLUME \ YEAR	47	48	49	50	51	52	53	54	55	56	57	58	59	61	62	63	64	65	66	67	68	69	70	71	72	73	74
3	11	12	14	12	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	24	26	30	24	20	15	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	36	39	45	35	30	31	15	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	48	52	60	47	40	47	23	12	8	7	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
7	543	289	237	125	116	122	160	69	33	23	10	4	3	11	0	0	0	10	8	8	0	0	6	7	0	0	0
8	148	300	312	340	325	247	150	240	217	189	161	155	94	16	10	4	4	21	18	15	9	8	13	13	4	0	0
9	93	127	130	150	144	171	198	173	138	114	42	55	69	76	73	68	58	31	27	23	19	16	20	20	8	8	3	2
10	93	128	136	151	145	171	199	173	139	115	153	77	78	77	74	68	58	42	40	34	32	30	22	17	14	11	10	11
11	4	18	21	46	68	78	82	109	132	158	168	249	197	193	99	45	49	22	40	35	33	30	23	17	15	11	11	11
12	0	9	14	35	51	59	66	87	110	131	268	249	248	181	197	231	226	247	161	136	117	121	122	123	123	111	173	177
13	0	0	7	23	34	39	49	65	88	105	77	70	104	292	320	249	195	140	161	136	118	121	123	124	123	112	173	177
14	0	0	0	12	16	20	33	44	66	79	58	56	83	60	76	112	117	329	185	164	148	137	137	135	141	141	95	44
15	0	0	0	0	0	0	17	22	44	53	39	42	62	45	61	89	98	63	186	164	149	138	138	136	141	141	96	44
16	0	0	0	0	0	0	0	0	21	26	19	28	41	30	45	67	78	47	54	91	107	103	89	100	101	91	98	109
17	0	0	0	0	0	0	0	0	0	0	0	15	21	14	30	45	59	32	54	91	108	103	89	101	102	91	99	109
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	22	39	16	33	41	64	77	73	69	76	94	81	106
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	22	31	48	58	58	55	61	75	65	84
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	21	32	39	44	41	46	57	48	63
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	16	19	29	28	30	38	32	42
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	15	19	16	21
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1) Data taken from Merchandising Week where the data covered a two ft^3 interval the number was averaged over the two intervals. Data for end intervals was extrapolated smoothly to produce a weight for each volume class.

TABLE A7.7 - Import Data Refrigerators and Freezers

Year	Refrigerators by Size (ft^3)					Freezers	Refrigerators and Freezers
	6.5 or below	6.5-9.5	9.5-13.5	13.5 or above	Total		
1974	198,203	20,423	55,626	2,558	276,812	44,429	-
1973	251,986	76,509	121,134	6,390	456,019	79,008	-
1972	408,118	102,127	192,817	24,377	727,439	288,905	-
1971	395,547	146,025	157,761	87,462	786,795	159,002	-
1970	-	-	-	-	-	-	691,892[1]
1969	-	-	-	-	-	-	520,206[1]
1968	-	-	-	-	-	-	200,949[1]
1967	-	-	-	-	-	-	112,690[1]
1966	-	-	-	-	-	-	99,453[1]
1965	-	-	-	-	-	-	64,629
1964	-	-	-	-	-	-	57,511
1963	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	(36,000)[2]

1. Includes commercial and industrial refrigerators and freezers (code 25 of Import tables). The corresponding totals for 65 and 64 (code 10 and code 20) are 64,828 and 57,800.

2. Estimated from dollar value of imports.

TABLE A 7.8 - Our Estimates of Refrigerator Imports not counted in AHAM statistics.

Year/Imports x 10^3 by volume	$6.5ft^3$ [1] and below	$6.5ft^3$ [2] to $9.5ft^3$	$9.5ft^3$ [2] to $13.5ft^3$	$13.5ft^3$ [2] and above	Total
1974	99	16	45	2	162
1973	126	61	97	5	289
1972	204	82	154	20	460
1971	196	117	126	70	509
1970 [3,4]	138	(←	221	→)	359
1969 [3,4]	104	(←	167	→)	271
1968 [3,4]	40	(←	64	→)	104
1967 [3,4]	22	(←	37	→)	59
1966 [3,4]	20	(←	32	→)	52
1965 [3]	13	(←	31	→)	44
1964 [3]	12	(←	18	→)	30
1963 [5]	9	(←	15	→)	24
1962 [3]	7	(←	12	→)	19
1961 [6]	6	(←	10	→)	16
1960 [6]	5	(←	8	→)	13
1959 [6]	4	(←	6	→)	10
1958 [6]	3	(←	4	→)	7
1957 [6]	2	(←	2	→)	4
1956 [6]	1	(←	1	→)	2
1955 [6]	0	(←	0	→)	0

1. 50% of all imports $6.5ft^3$ or smaller are assumed to go to the recreational vehicle market.

2. AHAM counts a small and unspecified fraction of imports greater than $6.5ft^3$ in size in their statistics. We assumed 80% of the refrigerators had not been counted.

3. Refrigerator imports were estimated from refrigerators and freezer imports by multiplying by 0.8, the unweighted average of the fraction of refrigerator and freezer imports from 1971 to 1974 which were refrigerators. The fraction of refrigerator imports that was below $6.5ft^3$ was taken to be 0.5, the fraction in 1971.

4. The fraction of commercial and industrial refrigerators and freezers was assumed to be 0.003, the fraction to this market in 1964 and 1965.

5. Average of 1964 and 1962 estimates.

6. No data - Our estimate is a simple smooth extrapolation to zero.

TABLE A 7.9 - Exports of Refrigerators and Freezers x 10^3 ( ) Indicates Estimate

Year	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965
Refrigerator	343	192	127	118	117	133	125	155	155	148
Freezer	55	19	12	13	15	17	15	16	28	36
Total	398	211	139	132	132	150	140	171	183	185

Year	1964	1963	1962	1961	1960	1959	1958	1957	1956	1955
Refrigerator	163	217	187	207	234	265	308	299	318	304
Freezer	36	31	31	35	47	57	63	54	56	57
Total	199	248	218	242	281	323	371	352	374	361

Year	1954	1953	1952	1951	1950	1949	1948	1947	1946	1945
Refrigerator	290	363	374	(368)[2]	(198)[2]	(166)[2]	(103)[2]	(274)[2]	(271)[2]	(0)
Freezer	32	40	22	(9)[1]	(2)[1]	(0)[1]	(0)[1]	(0)[1]	(0)[1]	(0)
Total	322	403	396	377	200	166	103	274	271	(0)[3]

1. Freezer exports were extrapolated smoothly to zero by using the trend in fraction of exports 1952 to 1955. Total freezer shipments are smaller before 1950 as this industry began in 1946.

2. Estimated by simply subtracting the freezer estimate from total exports.

3. The very limited output at the end of the war was assumed to go only to the domestic market.

TABLE A 7.10 - Sales and Energy Consumption by Year

Year	Domestic[1] Sales covered by AHAMx10[3]	Average[2] Energy use kwhr/yr	Importsx10[3] not counted by AHAM	Average[3] Energy Use kwhr/yr	Total Sales x10[3]	Average Energy use kwhr/yr
1940 census[4]	15380	608	-	-	15380	608
1940	2600	608	0	-	2600	608
1941	3500	608	0	-	3500	608
1942	520	608	0	-	520	608
1943	0	-	0	-	-	-
1944	0	-	0	-	0	-
1945	264	608	0	-	264	608
1947	3126	641	0	-	3126	641
1948	4663	638	0	-	4663	638
1949	4284	636	0	-	4284	636
1950	6002	640	0	-	6002	640
1951	3707	651	0	-	3707	651
1952	3196	657	0	-	3196	657
1953	3287	674	0	-	3287	674
1954	3310	703	0	-	3310	703
1955	3896	759	0	-	3896	759
1956	3382	850	2	645	3384	850
1957	3051	850	4	657	3055	850
1958	2809	869	7	657	2816	869
1959	3520	905	10	669	3530	903
1960	3241	975	13	669	3254	973
1961	3273	1060	16	681	3289	1058
1962	3588	1106	19	694	3607	1104
1963	3908	1202	24	706	3932	1199
1964	4382	1258	30	718	4412	1254
1965	4782	1349	44	730	4826	1343
1966	4819	1441	52	742	4871	1434
1967	4558	1481	59	767	4617	1472
1968	5026	1509	104	791	5130	1494
1969	5163	1506	271	815	5434	1472
1970	5169	1518	359	840	5528	1474
1971	5573	1546	509	865	6082	1489
1972	6188	1576	460	791	6648	1522
1973	6582	1606	289	772	6871	1571
1974	5639	1634	162	728	5801	1609

1. Total Shipments (listed by Merchandising Week) minus exports.

2. Computed from our estimates of the fraction of sales by volume and type and our estimates of the energy consumption by volume and type (see Table A7.5 and A7.6). The estimates for pre-1960 refrigerators are too high as our procedure does not properly estimate the energy consumption of the freezerless refrigerators. The energy consumption

of early 1950 refrigerators is probably in the range 250-500 (average 350) based on tests by Consumers' Union (1947, 1948) and 1954 GE's Service Manuals. We purposely leave this error in the table until we can fix the compensating bias introduced by our exponential decay model and until we can properly account for the transition between pre- and post-1960 units.

3. The energy consumption of 1971-1974 imports is computed from Table A7.4 and A7.8. The energy consumption of the pre-1971 imports was smoothly extrapolated towards the energy consumption of 1950 refrigerators--see footnote 2 above.

TABLE A7.11 - National Table

Refrigerators in Stock (January 1975) by Age and Energy Consumption

Year	Number in Stock x 10^3 [1]	Percentage of Stock (%)	Average Energy Use kwhr/yr
1940 (Census)	2,673	3.5	608
1940	475	0.6	608
1941	672	0.9	608
1942	105	0.1	608
1943	0	0	-
1944	0	0	-
1945	62	0.1	608
1946	451	0.6	608
1947	810	1.0	641
1948	1,271	1.6	638
1949	1,227	1.6	636
1950	1,808	2.3	640
1951	1,174	1.5	651
1952	1,064	1.4	657
1953	1,150	1.5	674
1954	1,218	1.6	703
1955	1,578	2.0	759
1956	1,376	1.8	850
1957	1,306	1.7	850
1958	1,265	1.6	869
1959	1,667	2.2	903
1960	1,616	2.1	973
1961	1,717	2.2	1,058
1962	1,980	2.6	1,104
1963	2,269	2.9	1,199
1964	2,676	3.5	1,254
1965	3,077	4.0	1,343
1966	3,265	4.2	1,434
1967	3,254	4.2	1,472
1968	3,800	4.9	1,494
1969	4,232	5.5	1,472
1970	4,526	5.9	1,474
1971	5,235	6.8	1,489
1972	6,015	7.8	1,522
1973	6,536	8.4	1,571
1974	5,801	7.5	1,609
Overall U.S. Figure	77,351	100.1	1,235 [2]

1. Calculated with an exponential decay model (see Appendix A13). The model probably overestimates the number of refrigerators surviving from the 1940's and certainly underestimates the number of new (1970-1973) refrigerators. This bias is compensated by the overestimate of the energy consumption of pre-1960 refrigerators.

2. We use 1200 kwhr/year in the main report as we feel that our estimate is only accurate to within 100 kwhr/year.

A8 Cooking

Saturation data for ranges were based on utility company submissions which we present in Table A8.1 together with our estimate for the saturations in 1975.

The data from two of the utilities, SCE and SMUD were already 1975 estimates. We recalculated the overall saturation of ranges for SCE by weighting the saturations of ranges for each housing type by our estimate of the fraction of each housing type. The SCE survey undercounts both multi-family and mobile home units. For ranges the error form is of the opposite sign for the two types of housing units and so the difference between our weighted estimate and SCE's unweighted estimate is fairly small. A similar correction should be applied to the SMUD data, but we lack the data on saturations by housing type necessary for the correction.

The data from the other three utilities were updated to 1975 using a simple building stock model. The 1975 building stock was broken into two classes: 1) the old stock consisting of buildings which existed at the time of the original estimation of range saturation, and 2) the new stock consisting of additions to building stock since that date.

For the old stock, we assumed that the saturations of ranges were unchanged from the original estimates. For the new additions, we used the saturation of ranges in 1971-1973 houses as measured in the SDG&E survey for the new additions (59.3% for single family units, 78.9% for multi-family units, and 16.7% for mobile homes). The overall saturations in Table A8.1 are weighted averages of the saturations in the two building classes.

Two assumptions are implicit in the use of the original estimate for the saturation of ranges in the old building stock: 1) people who replace ranges buy the same type of range, or at least shifts from electric to gas are

TABLE A8.1 - Utility Supplied Saturation Data for Ranges by Housing Type and Our Estimate for 1975 Saturations

Housing Type	District (year of survey)	Saturation (Percent) PG&E (1970)[1]	SMUD (1975)	SCE (1975)	LADWP (1975)[1]	SDG&E (1974)
All						
Single Family		42.7	58.9	30.9	13.9	42.0
Multi-Family		-	-	29.4	-	41.5
Mobile Home		-	-	37.0[2]	-	47.1
Our Estimate		-	-	13.0	-	8.9
For All Types 1975		46.3	58.9	30.7	18.0	41.3

1. 1970 Census Data
2. Calculated by combining the SCE apartment and condominium/townhouse classification.

balanced by shifts from gas to electric and 2) the saturation of electric ranges in housing that was removed from stock was the same as the saturation of electric range in the remaining old stock. Only about 20% of the ranges in the old stock should have to be replaced over the five year update period[1] for PG&E and LADWP, and only 4% have to be replaced over the one year update period for SDG&E. This bounds the possible error from deviations in our assumptions. The actual error should be substantially smaller than the maximum possible error.

The SDG&E survey results on range saturations in new housing were used for all three utilities as there are no other data of this sort. We found no evidence that San Diego differed greatly from the other utilities. The maximum possible error is again bounded by the limited fraction of housing affected. New additions to 1975 were 20% of the housing stock for PG&E, but only 7% for LADWP and 3% (1974 to 1975) for SDG&E.

As a check on the PG&E estimate, we updated their 1970 saturation data with PG&E's sales estimates and an exponential stock decay model. This method of updating gave a result[2] within 0.5% of the estimate in Table A8.1.

Our estimate of the unit energy consumption of ranges is based on the EEI[3] tables which have listed 1200 kwhr/yr, or slightly higher, for ranges since at least 1948. The original estimates appear to have been based on load studies, but there are no recent reliable load studies to confirm them. However, the estimate of 1200 kwhr/yr is consistent with the preliminary statistical fitting done at SDG&E on appliance energy consumption.[4] It is also consistent with the estimates of energy use for gas ranges.

Gas ranges use[5,6] somewhere from 95 to 106 therms/year. Deducting the pilot light consumption[7] of 28 therms/year leaves 67-78 therms/year for cooking. This is equivalent to 1950-2290 kwhr/yr, but electric units are generally considered[5] to be almost twice (1.9) as efficient as gas units. The estimate of electric range use from this analysis is, therefore, 1042-1210 kwhr/yr.

PG&E[8] and two other utilities conducted a load study recently that found a much lower usage than our estimate of 1200 kwhr/yr: 786 kwhr/yr. However, the sample was biased and we believe that the result is incorrect. The average annual electricity consumption for the houses measured was 9400 kwhr; the average household usage for PG&E's whole system was less than 6500. The other utilities participating in the study also chose anomalously high consumers; for one of them, average use of the households tested was 30,000 kwhr/yr, five times California average consumption. These unusually high users of electricity may differ from typical users in two ways: 1) Higher users of electricity are likely to have higher than average incomes and can, therefore, be expected to eat out (barbecue) more often and perhaps to eat fewer hot lunches and breakfasts than average. The latter hypothesis may be supported by the study's load curves, which show almost no cooking around lunch time and very little in the morning, in contrast to the Princeton CES study[9]; 2) Higher users of electricity probably have more small electrical cooking devices, such as broilers, toaster-ovens, frying pans, rotisseries, coffee pots, etc., and so their full cooking electricity consumption doesn't show up when only the range energy is metered. EEI estimates of small appliance electricity use suggest that a household that owned one of each of the common small

cooking appliances could use an additional 800 kwhr in cooking.

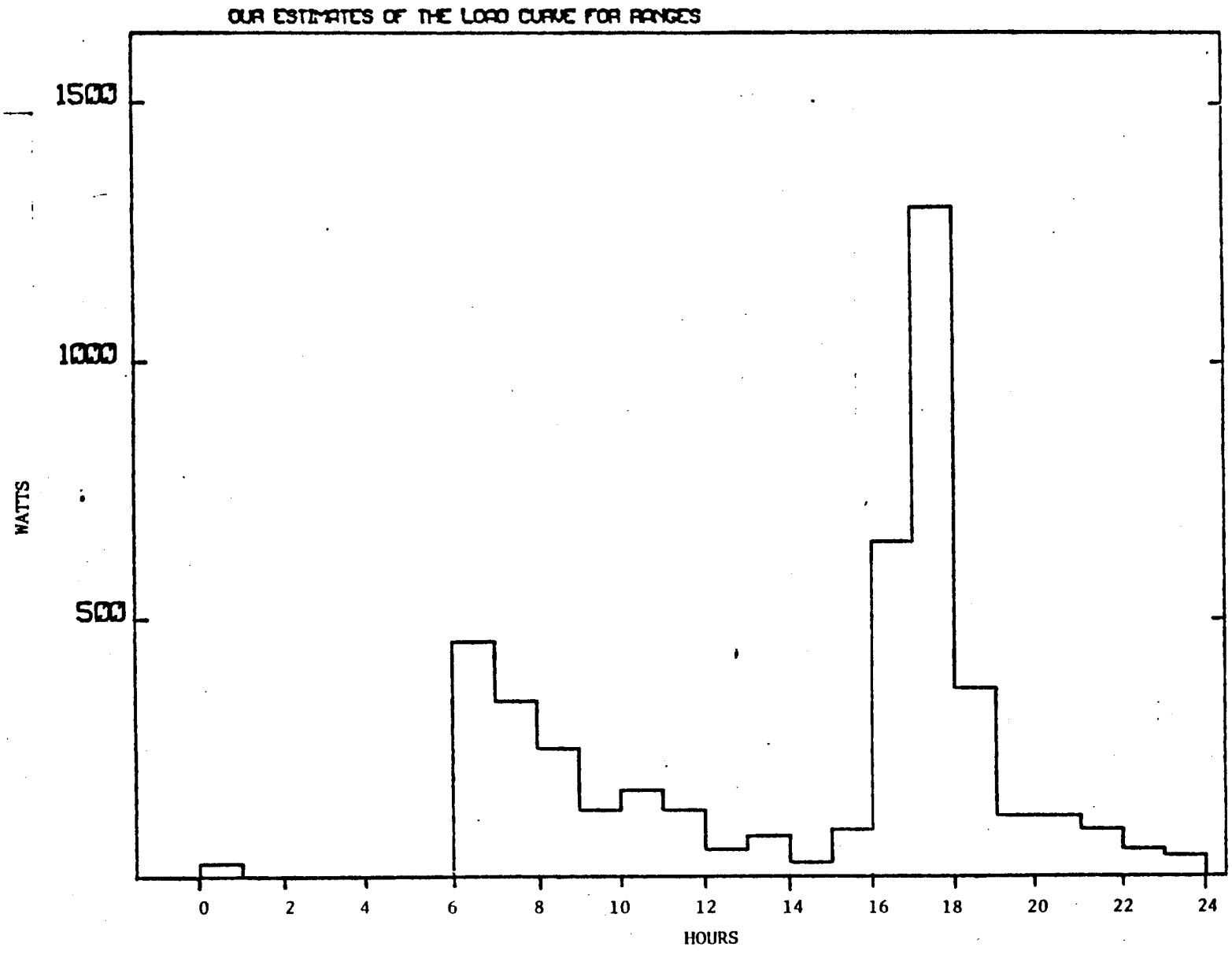
The actual use for small appliances is probably in direct proportion to the use diverted from the range. In general, the small cooking appliances do not appear to change cooking energy very much. For example, crockery cookers tend to increase energy use, while microwave ovens can use more or less depending upon how they are used.[10]

At the time of the original EEI estimate of range use, there were few small cooking appliances. To the extent that the recent load surveys measure the influence of these small cooking appliances it would appear reasonable to assume that the energy actually used for the range has declined. Properly speaking 1200 kwhr/yr is probably a better estimate of cooking (crock pot, electric skillet, microwave oven, etc.) requirements than range requirements.

Since our estimate of energy consumption is higher than the utility figures, we cannot use their load curves directly. The simplest assumption to correct the PG&E load curve for higher overall energy consumption is to scale the curve by 1200/786. This yields a winter peak at 5:00 p.m. of 1.3 kw, or approximately 800 watts at SDG&E system peak at 5:30 p.m. See figure A8.1 for the load curve scaled in the fashion discussed above.

There are two assumptions implicit in this direct scaling; 1) any difference in energy consumption between PG&E's measurement and our estimate due to families eating dinners out is balanced by fewer hot lunches and breakfasts; and 2) the use of small cooking appliances will produce a load curve similar to the equivalent use of a range. Specifically the crock pots with their extended load curves are not a major fraction of the cooking load and tend to be balanced by the microwave ovens.

Figure 8.1


OUR ESTIMATES OF THE LOAD CURVE FOR RANGES
1500
1000
500
WATTS
0
2
4
6
8
10
12
14
16
18
20
22
24
HOURS

The maximum possible error in the peak arising from our assumption can be estimated by assuming that either none of the extra energy is used at dinner time or that all of it is used in the three hour bloc covering the dinner cooking. The first assumption returns PG&E's peak of 850 watts (∿500 at SDG&E's system peak), while the second assumption yields 1500 watts (∿950 watts at the SDG&E peak).

The maximum energy consumption for ranges in 1980 should be no more than 1080 kwhr/yr. This is the calculated energy consumption assuming the minimum reduction in energy consumption of 10% implicitly required by federal law.[12] The major inefficiencies in ranges (aside from the new glass cook tops which do not appear to be as efficient as the standard burner unit[13]) is in heat loss from the oven. Considering the potentially large contribution to peak load from ranges, it would seem reasonable to heavily insulate the oven compartment to gain more than just a 10% savings.

Ranges are important contributors to both overall energy consumption and peak demand. They are, therefore, an important candidate for an improved load study. To get useful information the sample will have to be random and fairly large. Furthermore, the presence of small cooking appliances should be accounted for; and if possible, their effect measured.

The average lifetime of a range is 16.9 years (see Appendix A13).

Footnotes and References

1. Based on an exponential decay model (see Appendices A13 for more detail).
2. PG&E collects sales data from major appliance dealers. The data is not inclusive and, therefore, for most appliances it undercounts. For ranges it may overcount because of sales to the recreation vehicle market. The errors in the decay model are discussed in Appendix A13. The magnitude of these errors is unknown so we have used this method as a check instead of a primary estimate.
3. "Annual Energy Requirements of Electric Household Appliances". Edison Electric Institute, 90 Park Avenue, New York, New York 10016. The latest issue is EEI-Pub #75-61. The issues from 1948 to 1969 are reproduced in "A Methodology for Projecting the Electrical Energy Demand of the Residential Sector in California", C. C. Mow, W. E. Mooz, and S. K. Anderson, R-995-NSF/CSRA, March, 1973, Rand Corporation, 1700 Main Street, Santa Monica, California 90426.
4. Personal Communication with Richard English of the Market Research Division, San Diego Gas and Electric. Mr. English has analyzed the bills of the respondents to the SDG&E appliance surveys to arrive at preliminary estimates of energy consumption per appliance.
5. "Energy Use and Conservation in the Residential Sector: A Regional Analysis", Stephen H. Dole, R-1641-NSF, The Rand Corporation, 1700 Main Street, Santa Monica, California 90426.
6. "Residential Gas Appliance Load Research Project", Marketing Research and Services Department, Pacific Gas and Electric Company, 1970. Gas consumption for 14 ranges was measured at 101 therms/year.
7. "Energy Consumption of Contemporary 1973 Range Burners and Pilots Under typical Cooking Loads", D. W. Dewerth, American Gas Association Laboratories, Report #1499, December, 1973, referenced by Stephen H. Dole. See footnote 4.
8. PG&E provided us with Appendix A; Residential Customer Load Study, Homes with Electric Ranges. This was a joint study compiled by Walter Blumst of PG&E from data collected by the Arizona Public Service Company, PG&E and the Utah Power & Light Company from October, 1972 to December, 1973.

Footnotes and References (cont'd)

9. "Summer Air Conditioning and Appliance Use Patterns: A Graphical Analysis", Jeffrey A. Robinson and Johnny Yeung, Center for Environmental Studies Report No. 22, NSF/RANN, S1A72-03516-A02, May, 1975.

10. Crockery Cookers Consumer Reports, November, 1975 or The Inside Energy Story On Microwave Cooking by June Batel for Electrical World, also published in the Journal of Home Economics, November, 1975; and "Microwave Comparison Cooking", Home Economics Department, Pacific Gas and Electric, November 1974.

11. San Diego Gas and Electric is the states only winter peaking utility.

12. The Energy Policy and Conservation Act (PL 94-163, section 325) mandates an overall savings of at least 20% for a group of appliances. This is equal to the voluntary target which was set earlier by the Department of Commerce. The Department of Commerce set goals for each appliance in the group so that the overall savings would be 20%. The target for ranges was a 10% saving (see the Appliance Efficiency Program, Progress Report #1, pages 12, 13; Science Application Inc., for a complete summary of the D.O.C goals).

13. See "Microwave Comparison Cooking" Home Economics Department, Pacific Gas and Electric, November, 1974. The comparison of cooking frozen green beans shows a distinctly higher consumption for glass top units against standard units.

A9 Television

Television energy use is an area where the simple equation

energy use = (average power) x (number of hours the set is on)

is meaningful. Accurate data on these factors can perhaps be constructed, but not without the use of detailed viewer surveys.

Census data is not meaningful for TV energy consumption, since the Census does not distinguish between monochrome and color TV's, despite the fact that color sets use more energy. Further, the Census does not list the number of sets owned, except in the categories: none, one, and two or more.

The independent utility studies do not give the correct number of TV sets either since their sample categories are ambiguous (e.g. "color only, black and white only, both").

We have constructed an estimate of television sets in use by employing sales data from 1940 to 1974 for both color and black and white sets in order to calculate average power. The color set model gives 74.0% saturation of color TV's, which is consistent within 10% with survey results from SCE, SDG&E and SMUD. We use the utility data where available, otherwise we use 74.0% for the color set saturation.

For monochrome sets, our model predicts 111.1% saturation. This is too high; since when added to color set saturation, it produces 183.5% saturation of TV's. Actual saturation statewide is about 155% and is certainly no higher than 161%.[1] (157% in SMUD's survey and 147% in the SCE survey). The difference between our model and the saturation data is probably due to the large number of TV's which show up in the non-residential sector, i.e. motels, hotels, and bars. A fair number of small TV's are also showing up in recreational vehicles and boats. Another possible

small contributing factor is that we used national data. Since Californians view TV less (1900 hours[2] versus 2200 hours nationwide), they may actually have fewer TV's. We assume that the difference between either 155% (or the actual saturation of TV's in an area as measured by a utility survey) and the saturation of color sets is the saturation of black and white sets. For the utilities with no survey data, this is 80%.

The model also calculates the weighted average power consumption of a TV receiver. According to Electronic Industries Association Data, TV power use averaged about 310 watts for color and 200 for black and white in the early 60's. These numbers dropped precipitously in the early 70's following the introduction of large fractions of TV production using solid state components. By 1975, average power was down to 150 watts for color and 75 for black and white, with solid state units averaging 131 and 42 watts respectively.[3] The overall stock average TV power consumption is 250 watts for color sets and 1975 for monochrome.

Fortunately, it is not necessary to know the saturation of TV's to arrive at their energy consumption. Arbitron[2] collects surveys on the average number of television-hours per household for different time periods. Even if we don't know how many TV's are owned, we can get the number in use at any time. Then the only problem is to apportion the viewing hours between monochrome and color sets (and between tube and solid state sets). An overall result of this survey is a statewide average of 1900 set-hours per California household. This is much lower than the EEI estimate of 2200 hours per TV since our saturation data says there are 1.55 TV's per household. This implies only 1200 hours of use per TV! The energy consumption per household can be calculated if we assume that about 2/3 of the viewing hours are on color sets (utility

surveys indicate that more families are likely to have a color set as their only TV) and 1/3 on monochrome sets giving 450 kwhr/family-year. Energy consumption per TV using these viewing hour estimates are 420 kwhr/yr and 140 kwhr/yr for color and black and white TVs respectively. These numbers are lower than Edison Electric Institute[4] numbers due to the smaller estimate for viewing hours.

Footnotes A9

1. Based on personal communication with Arbitron to obtain the number of TVs per multi-set household and the Arbitron Television Census for Fall 1975 for the fraction of households with one set and with more than one. The Arbitron number is probably an upper limit as it may include some responses for non-functional TVs.
2. Viewing hours were tabulated for 1975 from the 1975 County Coverage (California) put out by Arbitron Television. The complete survey for the state is published yearly and can be obtained from the American Research Bureau (San Francisco Office at 425 California Street, San Francisco, California 94104 (415) 391-1702). The actual survey is a diary survey of viewing hours per family. The survey only under counts if the same station is watched on two TVs simultaneously, otherwise, viewing of two TVs would count as two viewing hours.
3. Television Power Consumption Survey, letter from E. M. Tingley, Staff Engineer Consumer Electronics Group of the Electronic Industries Association, 2001 Eye Street N. W., Washington, D.C. 20006 (202) 659-2200, to their Television Receiver Group, forwarded to us by G. F. along with the results of a EIA marketing survey, and a graph of power consumption of models to 1960 from EIA data.
4. The Edison Electric Institute, 90 Park Avenue New York, N.Y. 10006 publishes the "Annual Energy Requirements of Electric Household Appliances". The number is an average of submissions from member utilities and generally represent current practice. A stock wattage can be derived by averaging over years. The current publication is EEI-Pub #75-61, the 1973 publication was EEA 201-73. Earlier tabulations

Footnotes (cont'd)

can be found in the Rand report R-995, "A Methodology for Projecting the Electrical Energy Demand of the Residential Sector in California", C. C. Mow, W. E. Mooz and S. K. Anderson, March, 1973. Their estimated annual energy requirement uses the average family viewing hour figure for each TV, which is an overestimate.

TABLE A9.1 - Historical Sales and Power Use of TVs

Year	Black & White Sales	Black & White Power	Color Sales	Color Power
1960 CENSUS	60,420,000	200 W	200,000*	310 W
1960	5,638,000	200	119,000	310
1961	6,060,000	200	145,000	310
1962	6,349,000	200	432,000	310
1963	7,041,000	200	740,000	310
1964	7,999,000	200	1,448,000	310
1965	8,309,000	200	2,598,000	310
1966	7,175,000	195	5,064,000	310
1967	5,035,000	190	5,726,000	310
1968	5,728,000	185	5,922,000	310
1969	5,210,000	180	5,904,000	310
1970	4,777,000	175	4,580,000	310
1971	4,774,000	170	6,261,000	300
1972	5,525,000	150	7,759,000	277
1973	7,198,000	100	9,856,000	180
1974	6,751,000	78	8,209,000	160
Overall, 1974	78,847,300	173	50,894,600	257

*Estimated by Extrapolating 1965-60 Sales Data

A10 FREEZERS

Saturation data for freezers were based on utility company supplied information. This information is shown in Table A10.1 together with our estimates of saturations in 1975. Although much of the utility supplied information was not for 1975, it was assumed to be valid for that year. This seemed reasonable since an examination of past surveys by SCE, SMUD and SDG&E did not reveal any time trend over the past five years. Also, a cross tabulation of age of house versus freezer saturation for SDG&E did not provide evidence of recent changes in the saturation percentages.

Our estimates of the overall saturations for SCE and SDG&E were derived by weighting the saturations which were contingent on housing type by our estimates of the percentages of single family, multi-family, and mobile homes (See Appendix A1). Since their surveys undercount multi-family units, our overall saturations are slightly lower than those reported by the utilities. A similar correction is probably appropriate for the SMUD data, but is not possible in the absence of contingent saturation data.

Refrigerators and freezers are similar appliances, often made by the same manufacturer. However, as we discuss later, the data for freezers are insufficient to support a detailed stock-use model like the one used for refrigerators (See Appendix A7). Our average unit energy consumption for freezers is based on a more simple model.

The average energy consumptions of freezers broken down by volume and type were computed by using the sales weights from the L.A. Times survey for freezers[1] in conjunction with the energy consumptions (scaled

TABLE A10.1 - Utility Supplied Saturation Data on Freezers by Housing Type and Our Estimate for 1975 Saturations

Housing Type \ District (year of survey)	PG&E (1970)[1]	SMUD (1975)	SCE (1975)	LADWP (1970)[1]	SDG&E (1974)
			Saturation (Percent)		
All	25.4	36.0	20.0	12.5	37.3
Single Family	-	-	25.0	-	43.6
Multi-Family	-	-	5.0[2]	-	18.7
Mobile Home	-	-	19.6	-	33.9
Our Estimate for All Types (1975)	25.4	36.0	19.0	12.5	35.0

1. Based on Census data.

2. Calculated by combining the SCE apartment and condominium classes.

by 0.9) for each model and brand as listed in the AHAM directory.[2] There was no strong linear trend of energy consumption versus volume. Instead, it was found that freezers could be roughly divided into five energy using classes. Chest freezer 12 ft^3 and smaller, and manual defrost uprights 14 ft^2 and smaller used less energy than the bigger counterparts. Automatic defrost freezers were in a class by themselves. Unit energy consumptions for each of the classes are shown in Table A10.2.

Three different sources were used to determine the fraction of freezers in each class. The number of no-frost units was estimated from the results of the SDG&E and SCE surveys. The fraction of chest freezers was estimated from the AHAM state sales tables[3] ($\sim$20% with little trend for the last ten years). The ratios of small freezers to large freezers were estimated from the tables listing percent national sales by volume in Merchandising Week.[4] In addition the AHAM directory showed that there were no automatic chest freezers and very few automatics 14 ft^3 or smaller.

Two major problems with the data forced us to use the method outlined above instead of a stock flow model. First, we have no data prior to 1972 on the percentage of freezers sold with the no-frost feature, an important determinant of energy use. Second, the California market for freezers is dissimilar to the national market. Californians buy fewer freezers per household than Americans in general; they also buy different types. While about 40% of all freezers sold nationally are chest type units, in California typically less than 20% are chest freezers. Nationally 23-24% of all freezers sold recently are frost-free, while in California utility surveys 30% of the stock is frost-free.

The high level of aggregation and uncertainty in the inputs for the freezer stock model gives a higher uncertainty in the energy consumption

TABLE A10.2 - Unit Energy Consumption of the Freezer classes and the Fraction of Stock in Each Class

	Chest		Upright			Total
	Large	Small	Small Manual	Large Manual	No-Frost	
Percent of Stock[1]	7	13	18	32	30	100
Unit Energy Consumption (kwhr/yr)[2]	850	1,460	975	1,280	1,825	1,400

1. See text

2. Freezers were divided into three types (chest, upright, and upright no-frost). Each type was further divided into volume groups in 1 ft^3 increments. A sales weight for each freezer in the AHAM directory (reference 2 in the text) was estimated by dividing the market share for each manufacturer as given by the L.A. Times Survey (reference 1 in the text) by the number of models produced by the manufacturer. All models of a given manufacturer receive equal weights in this procedure. [In the final results, these weights are replaced by saturation data. The weights are used here as a proxy for market share by type and volume since we were unable to obtain this proprietary data.] Using these sales weights and the energy consumptions listed in the AHAM directory, a weighted average unit energy consumption ($\overline{UEC}$) was computed for each type and volume. The data were divided into volume blocks within which the fluctuations in $\overline{UEC}$ from volume to volume appeared to be random. The $\overline{UEC}$ for each block was taken to be the average of the $\overline{UEC}$s of all the volumes in the block. The final step was to scale these results by 0.9 to bring the AHAM directory figures into agreement with the results of the AHAM Field Use Test (supplied by Robert Bilek, Project Planning, General Electric Co. Appliance Park, Bldg. 5 - Room 247, Louisville, Kentucky 40225).

than our refrigerator estimate. In particular, the L.A. Times sales weights are estimated on a much smaller survey sample size. Furthermore, the energy consumptions are more sensitive to errors in the sales weights for freezers than refrigerators due to the very high level of concentration in the industry and the considerably higher than average consumption of the major brands.

The load curve of a freezer is probably even flatter than that of a refrigerator since the unit is opened less frequently and thus has a a lower infiltration working load, and also since the range of ambient temperatures around the unit is a smaller fraction of the temperature difference between the inside of the freezer and the outside. The refrigerator load curve is almost flat; hence, we assume that the load curve is approximated by a constant demand of 161 watts (1400 kwhr/year 8700 hours/year).

The reduction in energy consumption by 1980, implicitly required by federal law is 25%.[5] Assuming that the reduction affects the California's market in the same manner as it affects the national market, the unit energy consumption will be approximately 1050 kwhr/year for freezers sold in California by 1980.

More conservation would appear possible. The minimum standard for refrigerators is tighter (30%), yet a freezer has a larger fraction of its external heat load in conduction. Insulation should, therefore, be more important in freezers, and at the same time, there is less of a restriction or external dimensions for freezers than refrigerators.

The average service life of a freezer is estimated to be 24.5 years (See Appendix A13).

Footnotes and References for Appendix A10.

1. The Los Angeles Times Continuing Home Audit (Home Audit Section (213) 625-2345, ext. 1771) began to audit purchases of freezers in 1975.
2. September 1975 Directory of Certified Refrigerator/Freezers, Association of Home Appliance Manufacturers, 20 N. Wacker Drive, Chicago, Ill. 60606. The energy consumptions listed for freezers all have to be scaled by 0.9 before use (See Footnote 2, Table A10.2).
3. AHAM (see above) publishes tables of "Appliance Sales by Distributors - States". Many freezer sales are not reported by State, so these numbers have to be scaled by total sales before being used.
4. Annual Statistical Issue, February 24, 1975 and earlier issues, Merchandising Week, 1. Astor Plaza, New York, N.Y., 10036 (212) 764-7300.
5. The Energy Policy and Conservation Act (PL 94-163, section 325, paragraph 13 (1)) mandates an overall savings of at least 20% for a group of appliances. This is equal to the voluntary target which was set earlier by the Department of Commerce. The Department of Commerce set goals for each appliance in the group so that the overall savings would be 20%. The target for freezers was a 25% savings (See the Appliance Efficiency Program, Progress Report #1, pages 12, 13. Science Application Inc., for a complete summary of the D.O.C. goals).

A11 Home Laundry Facilities

Saturation data for home laundry facilities was based on utility surveys or the Census, where there was no utility survey. There is an added potential for error in the multi-family and mobile home sectors due to the presence of common laundry facilities. The surveys attempt to minimize this source of error by asking for laundry facilities owned or exclusively used by the family. Unfortunately, each survey asks a somewhat different question so there may be errors in comparing the results. Furthermore, there have been no follow-up studies to determine the size of the inaccuracy. The single family sector does not share the above bias. Since this sector accounts for almost 70% of the family units the overall saturations should not be greatly worse than those for other appliances. The LADWP was updated to 1975 by using a simple addition and removal model based on building stock changes (see Appendix A1). Housing removals are multiplied by the 1970 saturation of the appliance to give a removal from stock. The surviving stock of 1969 houses is assumed to have an unchanged saturation of the appliance. Finally new additions to the housing stock are multiplied by a new addition saturation to get additions to the stock of appliances. The resultant stock of appliances is divided by the 1975 building stock to give the 1975 saturation.

We used the contingent saturations of the appliances in new buildings from the 1974 San Diego Gas and Electric Survey for the new addition saturations. This is intrinsically more accurate than using the SCE time series of saturations to compute a contingent saturation as that involves taking the difference of two large numbers. Table A11.2 presents the SDG&E contingent saturations.

TABLE A11.1 - Utility Supplied Saturation on Home Laundry Facilities and Our Estimates for 1975 Saturations

Year	PG&E 1970[1]	SMUD 1975	SCE 1975	LADWP 1970[1]	SDG&E 1974
All					
Clothes Washers	65.4	80.0	66.9	52.4	73.5
Clothes Dryers	34.4	66.9	19.3	12.8	28.9
Single Family					
Clothes Washers	-	-	80.8[2]	-	87.6
Clothes Dryers	-	-	22.3	-	33.6
Multi-Family					
Clothes Washers	-	-	22.2[3]	-	32.7
Clothes Dryers	-	-	9.1[3]	-	15.9
Mobile Home					
Clothes Washers	-	-	98.6	-	51.2
Clothes Dryers	-	-	32.4	-	33.1
Our Estimates (1975)					
Clothes Washers	66.1	80.0	66.4	53.0	67.7
Clothes Dryers	41.8	66.9	19.1	14.3	27.9

[1] 1970 Census data

[2] This number appears to be a statistical fluctuation, as it is the lowest saturation reported in the last six years. The saturations for 1969 and 1970 were both 83.1% and 1973 was 85.2%. It is very unlikely that the saturation declined so much from 1973 to 1975. We used 83% in our calculations in place 80.8%.

[3] Derived from the weighted average of apartments and condominium/townhouses.

TABLE A11.2 - Saturations of Clothes Washers and Dryers in 1971-1973 Homes for SDG&E

	Single Family	Multi-Family	Mobile Homes
Clothes Washer	95.1	41.1	55.1
Clothes Dryer	44.3	28.6	36.7

PG&E supplied us with yearly sales data in addition to the Census submission so we estimated the saturations with this data in addition to using the addition removal method described above. The sales data is used in a decay model by assuming that the stock decays exponentially (see Appendix A1) with a mean life of 12.3 years for the clothes washer and 15.3 years for the clothes dryer (see Appendix A13). In general the sales data may not be complete; hence, this method will tend to underestimate and is, therefore, primarily used as a consistency check with the addition and removal results being entered into Table A11.1. However, for clothes dryers the decay model gives a higher estimate than the addition removal model so we use it instead (41.8% vs 34.9%). For this particular case there is good reason to suspect that the San Diego data is not representative for the PG&E area. 1) The milder climate for San Diego resulting in lower overall sales, and 2) the traditionally higher proportion of electric dryers in both stock and sales in the PG&E area as opposed to the San Diego area. Table A11.3 presents the sales model calculation.

The San Diego Gas and Electric data was updated to 1975 in a similar manner to the updating of the LADWP data, except that stock removals were calculated for each housing sector. Our estimate for the total saturation is calculated by multiplying the contingent saturations for each housing sector by the saturation of households in that housing sector (see Appendix A1) and summing. This same procedure was used in our estimate of the overall saturation for SCE. In both cases, the undercounting of multi-family units in the utility survey shifts our results below the equivalent utility estimate.

The SMUD data was used uncorrected because we do not have contingent

TABLE A11.3 - 1975 Stock from Sales and Census

Year	Sales or Stock	# Surviving to 1975
Census (1969)	868,564	626,434
1970	106,913	82,317
1971	122,448	100,646
1972	131,972	115,801
1973	124,075	116,225
1974	111,401	111,401
Total	1,465,373	1,152,824

Saturations assumming 2,760,494 customers December, 1974

53%	41.8%

saturations for each housing. The 1970 SMUD survey was higher than the Census so the 1975 numbers are probably biased high.

The two laundry appliances appear to use roughly comparable amounts of energy, 1120 kwhr/year for the clothes washer and 950 kwhr/year for the clothes dryer. There is fairly good data on energy consumption by clothes dryers, conversely the data for clothes washers is much less accurate. The direct use of energy by the clothes washer is easily estimated, but is fairly small, approximately 70 kwhr/year, the remainder of the energy use is the indirect use resulting from increased hot water demand which is much harder to estimate.

The data for estimation of dryer energy use consists of two load surveys, a survey of laundry load as a function of family size, and a cross tabulation from the SDG&E Miracle data giving the average size of families with dryers.

The PG&E[1] load survey for dryers measured 1400 kwhr/year for an average family size of 4.5 people. The OG&E[2] load survey measured 1320 kwhr/year for an average family size of 4.8 people. Two-thirds of the OG&E families use their dryers in a heated space, which makes a 200 kwhr/year difference. The energy consumption of the dryers located outside the heated area would be directly comparable to the PG&E data.

The difference between the energy consumed by a dryer in a heated space versus an unheated space must be made up by the space heating equipment. Therefore, it makes more sense to use the PG&E numbers or the OG&E numbers for dryers in unheated areas, which are directly equivalent to the PG&E numbers on a per capita basis.

The 1972 SDG&E[3] appliance saturation shows that the number of laundry loads is a highly linear function ($r^2 = .99$) with respect to family size.

The OG&E study, which is limited to only 64 customers, tends to confirm the linearity both for loads/year and kwhr/year. That is, the per capita loads/year was approximately 108 in the OG&E study (∿98 for SDG&E, ∿118 for PG&E study), and the average load was approximately 2.5 kwhr/load regardless (pretty much) of family size[4]; hence, the energy consumption/year is fairly closely a function of family size. Where deviations from constant kwhr/load existed they tended to be compensated for by opposite deviations in the loads/year leaving the per capita energy consumption per year as the most stable index.

Since the energy consumption is almost directly a function of family size, we used the SDG&E MIRACLE I data base to get the average family size of families with dryers. The resultant figure, 3.1 people/family, scales the PG&E data to 950 kwhr/year.

The EEI figure of 993 kwhr/year is close enough to our figure to be consistent with it given variations in family size and climate.

The load curve is calculated from the PG&E study in the following manner: we used PG&E's load curve shapes for both summer and winter, but averaged over one hour instead of ½ hour, and adjusted the peak power load to give the correct energy use.

The study claims that the dryer load in January is 1.22 times as large as an average month's load, or (950/365) x 1.22 = 3.2 kwhr/day. June load is 0.9 times average load or (950/365) x 0.9 = 2.3 kwhr/day.

PG&E's peak load on an average weekday was 620 and 380 watts for winter and summer respectively. (There is a factor of two errors in the original PG&E writeup).[5] The load curves integrate to 4.46 and 3.62 kwhr/day respectively (again twice the reported values).

We adjust the peak powers to account for the difference in household size between the PG&E study and the average user from the SDG&E MIRACLE data, by the ratios of the energy use per day. For winter the ratio is 3.2 kwhr/4.46 kwhr = 0.717 and for summer it is 2.3 kwhr/3.62 kwhr = 0.635. Finally, we correct the curves for the peak day (Monday) which is 20.8% of the week's load, by multiplying both winter and summer peak wattages by 0.208/(1/7). Our final results with these corrections are 650 watts for the winter peak, and 350 watts for the summer peak.

An important point for all the laundry and dishwashing equipment data is that the energy consumptions and peak of demands are tied to the size of the family (e.g. 305 kwhr/person for a clothes dryer). This implies that as saturations climb the total energy consumption and peak demand will become a function of population rather than number of households; and if present trends for family size continue, energy consumptions and peak demand per appliance will decline.

The direct energy use for clothes washer is calculated from the energy consumption per load times the estimated number of loads per year. Franklin Manufacturing Corporation[6] estimates .25 kwhr/load. This number is a bit lower than the .35 kwhr/load derived from the recent EEI tables for wattage and the average wash time derived from the CU[7] data on washers. However, EEI typically quotes maximum corrected load so the lower number appears reasonable. The number of loads was calculated from the 1972 SDG&E appliance study using the average family size of families with washers (3.06) from the MIRACLE I data base. The number of loads, 270 loads/year is smaller than the average number of dryer loads/year (305) calculated from the same source because some washer owners with lower laundry demands use clothes lines instead of dryers. That is, the people who own clothes

dryers tend to do more laundry. Noting that there was a 20% spread in number of per capita dryer loads/year between PG&E and SDG&E (neatly bracketing OG&E) we estimate the accuracy of the direct energy use of 70 kwhr/year to within 25%.

Much less data exists to calculate the indirect (hot water) energy use of a washer. Two approaches are possible. The first is given the number of loads/year from the previous section determine the quantity and temperature of the hot water used per load, plus any added energy consumption due to possible thermostat changes in the water heater to get higher wash temperatures. The second is to study water heater energy consumption and compare the energy consumption of houses with and without washing machines.

Not enough data was found to use the second method directly. For example, the PG&E study on gas water heaters only sampled two houses without washing machines. Nor is it possible to compare the PG&E results for clothes washers with earlier studies[8] on hot water use without knowing the saturation of clothes washers in the earlier study, and the number of people who reused wash water.

Proctor and Gamble[9] studied laundry practices and among other things reported water temperatures. The average temperature per load (108°F), including warm and cold wash, can be used with the total amount of hot water used by a clothes washer (33 gallons for hot wash, warm rinse) as measured by CU[10] to compute 20 (140°F) gallons of hot water/load. This yields approximately 15 gallons (140°F)/day.

The 20-gallon figure straddles the range of 11-33 gallons of hot water use possible from going to warm wash or cold rinse and, hence, seems on the face at least plausible, although, it is very hard to estimate its accuracy. The 15-gallon/day figure is also at least roughly

consistent with the results from the second method. PG&E's water use for families with clothes washers scales to 49 gallons for families of average size 3.1, while earlier studies would scale to 33-41 gallons. The 41-gallon figure would imply a 50% saturation of clothes washers with no reuse of wash water or a 75% saturation with every fourth load reusing wash water. These saturations are consistent with saturation estimates in the 1950's.

The indirect energy use of clothes washers and dishwashers which were discussed in Appendix A12 is included in our estimates of energy use by water heaters (Appendix A6) instead of being allocated to the appliance.

Footnotes and References A11

1. Residential Electric Laundry Dryer Load Research Project, January-June 1965. Prepared by the Market Research and Sales Control Department, PG&E.
2. Field Study; Electric Clothes Dryer Energy Consumption. Oklahoma Gas and Electric Company.
3. The San Diego Gas & Electric Appliance Saturation Survey (1971) asked for the number of laundry and dryer loads per week and presented this information in a table versus family size. The trend is almost linear with a roll-off for families above six members in size and a dip for two person families.
4. This implies that the average load is about six pounds, instead of the 8-11 pounds that most modern household machines can handle. The OG&E study showed a range of uses of 2.4-2.8 kwhr/load with an average of 2.5 while the Consumers Reports estimates are 3.5 kwhr/load for an eight pound load (.44 kwhr/lb) and 4.5 kwhr/load for 11 pounds (.41 kwhr/16).
5. Personal communication with Walter Blumpst at PG&E.
6. The Franklin Laundry Manufacturing Company has reported the results of its tests on clothes washers to NBS. The data section is reproduced by FEA in the "Technical Background Information For Appliance Efficiency Target for Clothes Washers".

Footnotes and References (cont'd)

7. Consumer Reports; October, 1974; Consumers Union, 256 Washington Street, Mt. Vernon, N. Y. 10550.

8. The results of several studies in the fifties and sixties are listed in the 1970 ASHRAE, Guide and Data Book, Systems Volume, page 557.

9. Laundry Practices of Normal and Large Capacity Automatic Washer Owners, The Proctor and Gamble Company Product Development Division, January, 1971.

10. The water use was averaged from data in the following issues of Consumer Reports; July, 1970; August, 1971; September, 1972; October, 1973 and October, 1974.

A12 Dishwashers

Dishwashers consume electricity directly and indirectly in residences with electric water heaters. Direct energy use is easier to estimate, but probably smaller than indirect use.

The direct use of 250 kwhr/year was calculated from the energy consumption per load times the number of loads/year. General Electric[1] estimates an industry wide average of .7 kwhr/load for dishwashers manufactured in the last seven years. This number is consistent with the .5-1.0 kwhr/load measured by CU[2] for a number of machines. Estimates of the number of loads/year range from 275 loads/year for a 1974 telephone survey in San Diego[3] to 415 loads/year from General Electric.[1] San Diego Gas and Electric[4] did a mail survey of appliance use as part of their 1971 appliance saturation survey. The number of loads/year was reasonably linear with respect to family size. Using this data as a function of family size and the average family size of families with dishwashers (3.0 people/family vs. 2.86 people/family for all families) from the MIRACLE 1[5] data base gives 330 loads/year, for an energy consumption of 230 kwhr/year.

An informal communication with General Electric indicated that booster heaters for "sanitary" cycles or to bring water temperatures up to 150°F for general washing purposes are not common now and never were very common in the past. Assuming a conservative 15-20% of past machines with this feature operable raises the energy consumption of dishwashers to 250 kwhr/year.

The variation in loads/year data may arise from differences in the average family size of the survey. For example, the General Electric load data would correspond to almost four people/family in the SDG&E survey, which for many years has been the size of the prototypical family. Since the San Diego data was measured in the state and can be directly corrected

for family size, it is the most reasonable source to use.

Our estimate of 250 kwhr/year is considerably lower than the EEI[6] estimate of 390 kwhr/year. In an effort to determine the reason for the difference, we noted that at .7 kwhr/load the EEI figure would imply 520 loads/year or 1.4 loads/day, which seems unreasonably high. On the other hand their estimated wattage (1.2 kw) times the nominal operating time of one hour as measured by CU[2] would produce a high energy consumption per load (1.2 kwhr/load), but a reasonable use (320 loads/year).

Wattages listed by EEI are maximum wattages, not average wattages. The EEI figure can be reproduced by assuming an intermediate use (400 loads/year consistent with General Electric estimates) and 1 kwh/load. This higher energy use per load would be reasonable for a dishwasher with a sanitizer cycle. At 330 loads/year for California the EEI estimate would give an upper limit of 330 kwh/year to compare with our estimate of 250 kwh/year (which assumes only moderate use of sanitizer cycles).

The 250 kwh/year is the energy consumption of the stock of dishwashers. The energy consumptions of the present additions to stock is harder to assess due to the introduction of two user controllable features. Consumer Reports[7] indicates that the no-heat dry feature saves about .4 kwh/load (.25-.5) while the new pots and pan cycle adds 1 kwh/load. If these features were each used 50% of the time, we would again average 1 kwh/load total or 330 kwh/year. No data exists for how these new machines are being used.

The energy demand on the hot water system because of the dishwasher is intrinsically a much more user dependent parameter. The direct use of 14.85 gallons of hot water per load[1,2] has to be balanced against the hot water used in hand dishwashing, hot water which may be used as a pre-rinse before the dishwasher operation and the possible increase in water supply

temperature to get the best performance out of the dishwasher.

The PG&E[8] Residential Gas Load Study (1967-1968) indicates that a family with a dishwasher and clothes washer may use the energy equivalent of 15 (140°F) gallons/day of hot water more than families with only a clothes washer. However, the sample size is only twenty-five, the average family size was four, and the effect of raised supply temperature is different for gas and electric appliances. Correcting for the last two factors gives 5-12 (140°F) equivalent gallons/day added use. The high end of the range assumes that dishwasher is actually demanding more water, while the low end assumes that stand-by losses have gone up due to increased supply temperature. Since water supply temperatures are sometimes set up for clothes washers the higher part of the range would appear more reasonable. Because of this uncertainty in arriving at a use number, our estimate of 10 (140°F) equivalent gallons/day (700 kwhr/year) is no better than 30% average.

The utility estimates and our 1975 estimate for saturations are given in Table A12.1. The PG&E and LADWP census figures were updated to 1975 with a simple addition and removal model based on housing stock data (Appendix A1). House removals were multiplied by the 1970 saturation of dishwashers to get a removal of stock for dishwashers. The remaining stock of houses was assumed to have an unchanged saturation of dishwashers. New additions to the housing stock were assumed to have the same saturation of dishwashers as the new houses in San Diego Gas and Electric survey: 80.4% for single family units, 64.2% for multi-family units and 51% for mobile homes. This procedure is less accurate for dishwashers than for most appliances due to purchases of dishwashers for homes that did not previously have them. However, a preliminary check using sales data supplied by PG&E,

TABLE A12.1 - Dishwasher Saturations

	PG&E	SMUD	SCE	LADWP	SDG&E
Year	1970	1975	1975	1970	1974
All	28.1	54.7	40.6	20.9	41.0
Single Family	-	-	42.8	-	47.3
Multi-Family	-	-	35.0	-	33.2
Mobile Home	-	-	28.3	-	32.0
Our Estimate (1975)	36.1	54.7	39.8	24.4	41.9

our estimate of appliance life and an exponential decay model gave an answer only 1.5% higher, or at most a 5% relative error. PG&E is 1975 estimate[9] of 46% seems high and appears to be a direct addition of the dishwasher sales to 1970 stock without any correction for removal of old dishwashers.

Our estimate for San Diego Gas and Electric is performed in substantially the same manner as that described for PG&E and LADWP. The additions and removals are performed individually on the different housing types and the individual dishwasher saturations are weighted by our estimate of the saturations of the types of housing stock. This weighting is also used on the SCE data to produce a slightly different total than survey total. Both these surveys tend to overcount single family housing, biasing their totals a little high.

The SMUD data is probably biased high by overcounting of single family dwelling units in the survey. However, we cannot correct it because we lack contingent saturations. From experience with the SCE numbers the correction should be less 1%.

The lifetime of dishwashers is almost 14 years (see Appendix A13 for the derivation of this result).

Footnotes A12

1. Letter from Robert Bilek at General Electric in response to a request for information or appliance energy consumption.
2. Consumer Reports, May 1974. The article also attempts to evaluate the possible energy differences between hand and machine washing dishes. However, no attempt was made to determine the pattern of actual wash practices so the figures are of little value for forecasting purposes.

Footnotes (cont'd)

3. The Appliance Usage Study by Pat Duncan at San Diego Gas and Electric asked for hours of operation during the day and during the week. The survey covered 451 households and was conducted during the summer.
4. The San Diego Gas and Electric Appliance Saturation Survey (1971) asked for the number of dishwasher loads per week versus family size.
5. Miracle I is a name for the 1974 San Diego Gas and Electric appliance survey. The data is on tape at SDG&E. We were sent a listing cross tabulating family size versus appliance ownership. Energy consumption cross tabulations are not being released, but a paper fitting these cross tabulations will be published soon by Richard English of San Diego Gas and Electric.
6. The Edison Electric Institute publishes a small pamphlet entitled "Annual Energy Requirements of Electric Household Appliances". The numbers are basically averages of utility submissions.
7. Consumer Reports, May, 1976.
8. Number derived from gas use measured in the PG&E Residential Gas Appliance Load Research Project, 1967-1969 and adjusted for family size variations. The gas use was converted to water use by subtracting stand-by loss (usually about 105 therms/year) and converting the remaining heat at 70% efficiency to raising water from the measured cold water temperature to 140°F. The actual use of water may be higher or lower depending upon temperature, but it is all equivalent to 15 (140°F) gallons/day.
9. Written testimony of PG&E. Docket # 75-FOR-5 State Energy Resources Conservation and Development Commission, June 13, 1975.

A13. Appliance Lifetimes

Estimates of appliance lifetimes are necessary for any stock-use model forecast of electricity consumption. Several studies have been made which estimate the retention times of appliances—the length of time that an owner keeps a unit—but we have seen none which estimate actual equipment lifetimes. It is the latter which is most relevant to energy modelling, since an appliance will continue to draw energy as long as it is in service, regardless of how many owners it has had.

As we shall see, accurate estimates of equipment lifetimes are very difficult to obtain. However, because of the importance of these lifetimes, we have developed a model from which approximate values can be obtained using data on retention times for new and used appliances. We begin first with a formal analysis of the problem. This analysis is somewhat complicated but the result [Eq. (12)] is quite straightforward and intuitively reasonable. We then make a number of simplifying assumptions in order to use this result with the existing data.

Consider a cohort of appliances sold new in the year 0. Let $x_o(t)$ be the number of appliances in this cohort surviving to the year t. The mean lifetime of appliances in this cohort is given by the formula,

$$\bar{x}_o = [\sum_t^{\infty} x_o(t)\ \Delta t]/x_o(0). \qquad (1)$$

In this formula the total unit years are divided by the number of units originally sold to give the average years per unit. (The terms Δt is taken to be equal to one—it is not included explicitly in subsequent expressions.)

Now, let $N_o(t)$ be the number of appliances in the zeroth cohort still retained by the original (new appliance) purchaser in the year t. Further,

let $U_{o,j}(t)$ be the number of appliances in the zeroth cohort sold used in the year j and still retained by the (used appliance) purchaser in the year t. Then,

$$\sum_{t}^{\infty} x_o(t) = \sum_{t}^{\infty} [N_o(t) + \sum_{j=1}^{t} U_{o,j}(t)]. \qquad (2)$$

Notice that no distinction is made between used appliances that have been resold once and those that have been resold more than once.

Following Eq. (1), retention times for new and used appliances from the zeroth cohort are given by,

$$\overline{N}_o = [\sum_{t}^{\infty} N_o(t)]/N_o(0), \text{ and} \qquad (3)$$

$$\overline{U}_o = [\sum_{t}^{\infty} \sum_{j=1}^{t} U_{o,j}(t)]/\sum_{j=1}^{\infty} U_{o,j}(j). \qquad (4)$$

Note that equation Eq. (4) still represents the number of unit years divided by the total sales, but the sales now occur over many years and some units may be sold more than once.

Assuming that only one transaction can occur per appliance per year $[N_o(0) = x_o(0)]$, and substituting Eqs. (2), (3) and (4) in Eq. (1), we get the following result:

$$\overline{x}_o = \overline{N}_o + \overline{U}_o[\sum_{j=1}^{\infty} U_{o,j}(j)]/N_o(0). \qquad (5)$$

These results can be extended to the determination of the average lifetime of a group of cohorts, $x_i (i=0,1,2,\ldots,m)$. Let $\overline{x}$, $\overline{N}$ and $\overline{U}$ be the mean lifetime, new retention time, and used retention time respectively. Then,

$$\bar{x} = [\sum_{i}^{m} \sum_{t}^{\infty} x_i(t)]/\sum_{i}^{m} x_i(i),$$

$$x_i(t) \equiv 0 \text{ for } t < i, \tag{6}$$

$$\bar{N} = [\sum_{i}^{m} \sum_{t}^{\infty} N_i(t)]/\sum_{i}^{m} N_i(i),$$

$$N_i(t) \equiv 0 \text{ for } t < i, \text{ and} \tag{7}$$

$$\bar{U} = [\sum_{i}^{m} \sum_{t}^{\infty} \sum_{j=1}^{t} U_{i,j}(t)]/\sum_{i}^{m} \sum_{j=1} U_{i,j}(j),$$

$$U_{i,j}(t) \equiv 0 \text{ for } j \leq i. \tag{8}$$

If we define

$$U_j(t) \equiv \sum_{i}^{m} U_{i,j}(t), \tag{9}$$

and change the order of summation in Eq. (8) then,

$$\bar{U} = [\sum_{t}^{\infty} \sum_{j=1}^{t} U_j(t)]/ \sum_{j=1} U_j(j) \tag{10}$$

It follows that

$$\sum_{i}^{m} \sum_{t}^{\infty} x_i(t) = \sum_{i}^{m} \sum_{t}^{\infty} N_i(t) + \sum_{t}^{\infty} \sum_{j}^{t} U_j(t), \text{ and} \tag{11}$$

$$\bar{x} = \bar{N} + \bar{U}[\sum_{j=1}^{\infty} U_j(j)]/\sum_{i}^{m} N_i(i). \tag{12}$$

The result in Eq. (12) can be stated as follows: The mean lifetime of an appliance sold new during the year zero through m is equal to the mean new retention time plus the mean used retention time multiplied by a weighting factor. The weighting factor is given by the total number of times that the appliances are sold used divided by the total number of appliances.

In practice, the data needed for direct application of Eq. (12) are not available. At present, studies of appliance retention time obtain information on new and used cohorts at two points in time. In surveys conducted for these studies, respondents are asked:

1) Do you have a (appliance)?

   If "yes" then,

   a) Did you acquire it new or used?

   b) How long have you had it?

2) Did you dispose of a (appliance) this year?

   If "yes" then,

   a) Was it new or used?

   b) How long did you have it?

This procedure gives data points of the form $Y_i(t)$, $Y_i(t-1)$ where Y_i is either U_i or N_i. That is, the number of appliances sold in the year i surviving to the survey year (year t) is determined from the answer to question 1. The number surviving to the year t-1 is determined by adding the number of appliances sold in the year i,disposed of in the year t (determined from question 2) to the number of appliances still surviving.

To determine retention times, it is necessary to assume that the survival behavior of new and used appliances is independent of the year of sale. That is,

$$\frac{Y_i(t)}{Y_i(t')} = \frac{Y_{i+j}(t+j)}{Y_{i+j}(t'+j)} \quad \text{for all } t,t' \geq i \qquad (13)$$

Note that this assumption is stronger for the U_i than for the N_i unless the distribution of appliance ages in the used market is independent of time.

Next, a survival ratio of defined:

$$S_i(t) = Y_i(t)/Y_i(t-1), \; S_i(i) \equiv 1. \qquad (14)$$

It follows from Eqs. (13) and (14) that

$$\overline{Y} = \sum_{i}^{\infty} \prod_{j=i}^{\infty} S_j(\infty) \simeq \sum_{i=1}^{t} \prod_{j=i}^{t} S_j(t). \qquad (15)$$

The sum limit t is determined by the number of years for which $S_j(t)$ can be determined from the data with reasonable accuracy. The approximation biases $\overline{Y}$ low and should not be used unless t-1 is significantly larger than $\overline{Y}$.

The above procedure gives us estimates of $\overline{N}$ and $\overline{U}$; we must now estimate the weighting factor in order to estimate $\overline{x}$. We make the following approximation:

$$[\sum_{j=1}^{\infty} U_j(j)]/\sum_{i}^{t} N_i(i) \simeq \sum_{i=k}^{t} U_i(i)/\sum_{i=k}^{t} N_i(i). \qquad (16)$$

This approximation is only valid when the years k through m are ones in which the appliance market is in equilibrium (i.e., the number per capita of new, used once, used twice,..., appliances is constant). In an expanding market this approximation will bias the result low. An estimate of the right hand side of Eq. (16) is given by

$$\sum_{i=k}^{t} [U_i(t)/ \prod_{j=i}^{t} S_{j(used)}(t)]/ \sum_{i=k}^{t} [N_i(t)/ \prod_{j=i}^{t} S_{j(new)}(t)]. \qquad (17)$$

We have used Eq. (12) together with estimates based on Eq. (15) and (17) to estimate the lifetimes of a number of appliances. The results are given in Table A13.1. We note that the approximations we have made tend to bias these results low. We do not know whether this bias is within the uncertainties introduced by errors in the sample on which the results are based.

Table A13.1

Lifetimes of Appliances

Appliance	Lifetimes[1] New	Lifetimes[1] Used	Weighting factor[2] for used lifetimes	Service lifetime
Electric range	12.1	5.6	0.86	16.9
Clothes washer	10.8	4.5	0.33	12.3
Freezer	20.4	9.3	0.44	24.5
Refrigerator	15.2	7.4	0.65	20.0
Electric dryer	13.7	5.1	0.31	15.3
Dishwasher	11.1	6.8	0.37	13.6
B&W TV	10.7	5.4	0.57	13.8
Color TV	12.0	--	--	15.5[3]

1) From M.D. Ruffin and K.S. Tippett, "Service-Life Expectancy of Household Appliances: New Estimates from the USDA," Home Economics Research J., March 1975, Vol. 3, No. 3, p. 159.

2) Derived from data from M.D. Ruffin and K.S. Tippett, "Life Tables for Major Household Appliance, July 1972 Survey (18 Tables," Consumer and Food Economics Institute, Agricultural Research Service, U.S. Department of Agriculture, Federal Building, Hyattsville, MD 20782

3) There was no estimate for the used life of a color TV. We estimated the service life by scaling the B&W TV life by the ratio of new lifetimes; 15.5 = 13.8X(12.0/10.7).

APPENDIX B

Residential Solar Hot Water Heating and Space Conditioning Systems in Northern California: A Brief Survey

Prepared by B. A. Greene
with assistance from P. Caesar and Y. Howell

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SUMMARY

The great variation in estimates of probable contribution of solar energy towards meeting California's energy needs is partially due to the lack of hard data. Within the residential sector, this data has been unavailable, simply because there were very few systems in operation in the state. Estimates had therefore to be made on the basis of intelligent guesswork - specifically as to (1) Cost of solar heating/cooling/hot water heating systems, and (2) adequacy (performance) of such systems.

Some hard data is now available. Within the last two years, a (surprising) number of residential systems for solar heating, for solar heating and cooling and/or for solar hot water heating have been built within the state. Therefore, data for these systems, for cost, and in some cases for measured performance, can now be obtained. Data was obtained for approximately 60 systems located within the general Bay Area/Northern California. Where possible this data included detailed information on the initial costs of systems built, and the performance to date of the systems built.

All systems located had been built within the last two years, and represented a wide spectrum of the possible technologies and a wide spectrum of costs. It became evident during the period of this brief survey that a considerable evolution of the technology involved in solar space heating, space cooling, and hot water heating for the residential sector has occurred, with resultant decreases in system costs.

AVAILABILITY OF SOLAR ENERGY FOR SOLAR SPACE HEATING, COOLING, AND HOT WATER HEATING IN CALIFORNIA

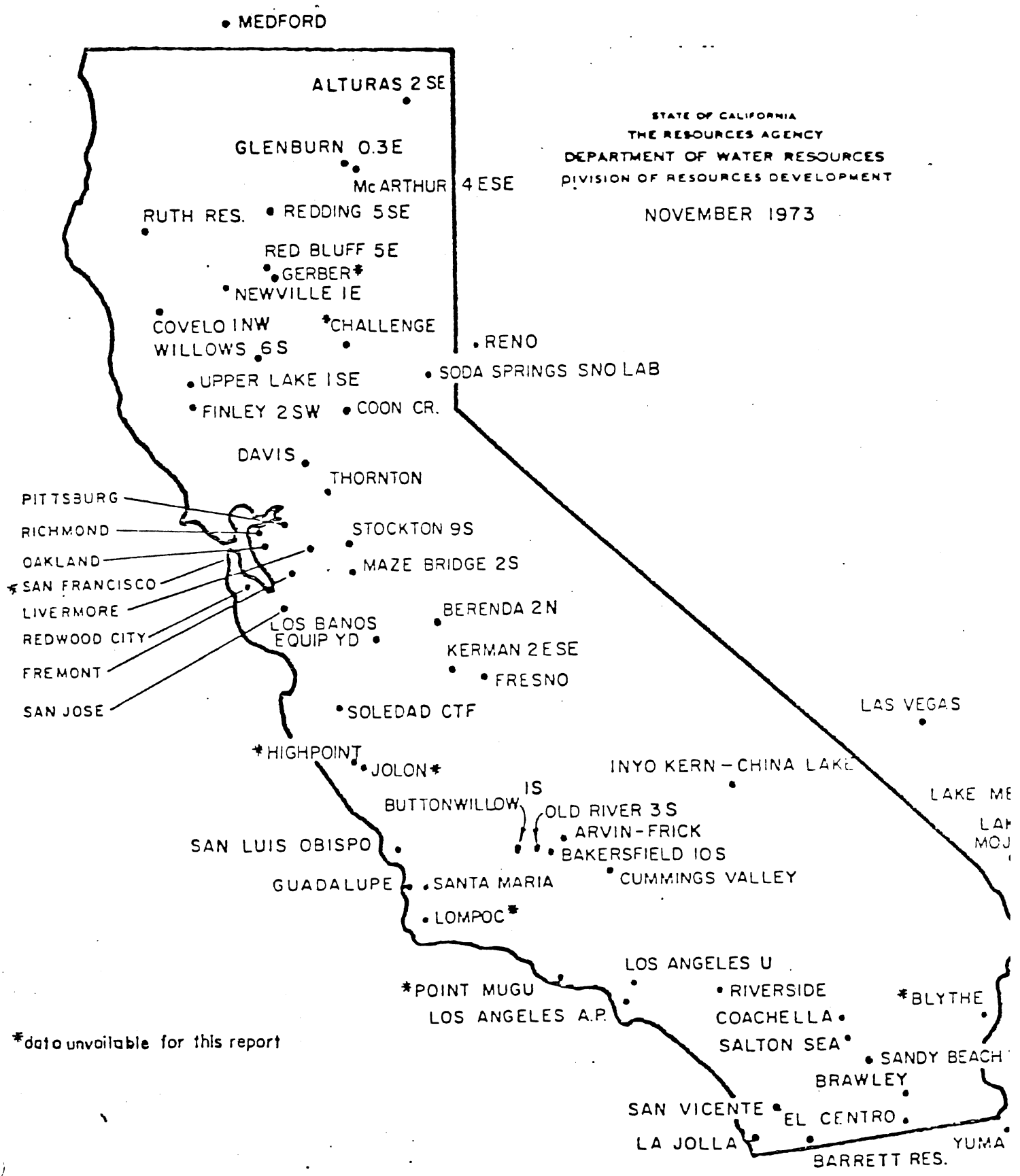
Available information on measurements of solar radiation in California (insolation data) has been compiled by the Department of Water Resources Division of Resources Developement (Solar Radiation Measurements in California, January 1974). Data is available for 55 stations, and varies in both quality and duration. Considerable additional data is now being collected.

For the purpose of design of a residential solar space heating/cooling/hot water heating system, insolation and climatological data is of importance, both in sizing the system (collector and storage) and in the initial decision as to whether a system should be installed (probable payback period).. Considerable research is now underway on sizing of a system as a function of climate and available insolation with direct application to specific areas of California. As this data becomes available, both the initial decision on whether to install a system, and the subsequent decisions on what type of system to install, and how large a system to install, can be made more easily and with greater accuracy.

At present, very reasonable guesses can be made on system sizing on the basis of the existing climatological and insolation data, where measured data exists for a given location. Where a site is distant from any measuring station, extrapolation on the basis of climatological maps may provide reasonably accurate data, within an accuracy sufficient for system sizing. Such climatological maps (see Sunset Garden Book climate zone map for the general Bay Area) are of particular use along the coastal regions of California, where fog patterns are accurately delineated.

FIGURE I

LOCATION OF SOLAR RADIATION STATIONS IN CALIFORNIA



*data unavailable for this report

ORGANIZATION OF THE SOLAR DATA BASE

Data on the solar systems in this study were collected directly from the owners and/or builders of the system, with some contributions from secondary sources. The sources are listed at the bottom of each data sheet. No independent check was made on the accuracy of the information: in particular, data on performance has not been checked by Lawrence Berkeley Laboratory, and represents the estimate of the individual quoted.

Data Sheets: From the data collected during the survey, we have compiled a single data sheet on each of the systems in the survey (60). Each data sheet contains a brief summary of key information on the system, followed by more detailed information on the building, solar system, collector, storage, auxiliary (backup), costs, and performance to date. Data sheets are arranged in alphabetical order by an identifying code used to protect the privacy of the owners. Format of the data sheets is summarized on page 29.

Index: For reference purposes, key information on each system in the two major categories (solar hot water heating and solar space heating and cooling) has been summarized in an Index section, and cross-referenced by page. Indices are alphabetical by identifying code.

Summary Tables: Cost data with a breakdown into materials and labor components were abstracted for the summary tables, in order to facilitate direct comparison of system costs. Summary Tables also include cost figures on a per-square-foot basis, and system size.

Because of time constraints, all systems located could not be included in the data base. A blank sheet is included at the end of the Data Sheets section for additional information.

COSTS

Costs of systems located vary widely: where possible a cost breakdown (materials, labor, collector, storage, other) was obtained. In several cases (as with passive systems) the cost of the solar system is difficult to isolate from the cost of the building: in these cases the cost of the solar system is considered to be the cost of all components not essential to the basic building envelope (an added-on cost).

The primary variable in system costs is the labor component: owner-built systems are invariably less expensive than contractor built or partially contracted systems, and form a special grouping. Materials costs were isolated from total systems costs for contractor-built systems wherever possible to enable a straight-across comparison of the non-labor component of system costs. Where this has been possible, a clearer evaluation of the relative merits of different technologies represented in the sample can be carried out.

The convention of evaluating systems cost on a cost per square foot basis ($\frac{\text{cost of system installed}}{\text{square foot of collector}}$) is widely accepted. This convention enables a comparison of different size systems but ignores efficiency factors, thus discriminating against the smaller but more efficient (and usually more expensive per square foot) systems. The convention becomes especially sticky in the consideration of passive-type systems, where square footage of collector is taken to be square footage of south-wall glass or south-roof skylight area and the cost per square foot figure becomes highly sensitive to glass area.*

Where possible, systems cost is expressed as cost per ft^2 (whole, installed system cost), cost per ft^2 (materials cost only) and cost per ft^2 (labor cost only).

*A more realistic comparison figure would be cost per KBTU collected, or cost per KBTU collectible under various typical insolation conditions. In many cases this figure could be computed without great difficulty, to fairly good accuracy, and would provide a more sophisticated figure-of-merit for comparison of different systems.

Most cost effective of the systems located were the so-called passive-type systems, whether owner or contractor built. In some cases, the solar heating/cooling system was so integral to the house structure that add-on cost was $0 or nominal. The simplest kinds of passive system were difficult to distinguish from a well-designed, (solar-tempered or climate-oriented) structure, and it became evident that buildings could be ranged on a continuum (energy conserving buildings, solar tempered buildings, passive-type solar heated/cooled buildings, active-type solar heated/cooled buildings) with the line distinguishing solar-tempered or climate-oriented buildings from solar heated/cooled buildings difficult to draw.

LIFE-CYCLE-COSTING

Considerable diversity exists in analyses of the "value" of an installed solar system, both in assumptions and in methodology. Clearly, first cost, system lifetime, lifetime maintenance costs, displaced fuel costs (variously estimated over the system lifetime), and capital costs are of importance in evaluating "true value" of an installed system. Beyond this point, however, analyses diverge.

Two factors emerged from this brief study which cast some light on the controversy:

(1) system owners surveyed in the sample who considered economics of the purchase or construction of a system to be of relatively high importance expected a payback of the system within a time period relevant to them. <u>This time period varied greatly</u>.

(2) Any life-cycle costing for solar systems must be quite dependent on the technology considered, as the various technologies differ, clearly and significantly in first cost as well as in efficiency (fuel displaced), probable system lifetime, probable system-lifetime-maintenance cost, and probable resale value.

TECHNOLOGY

It is evident that solar technology has been applied with increasing sophistication and success in building (climate) control. Almost all of the systems within this sample were built within the last two years, and within the two year period, systems technology seems to have improved (as better information became available) and systems costs seems to have decreased.

Evaluation of effectiveness of competing technologies for solar space heating, cooling, and hot water heating was beyond the scope of this study: considerable data necessary to such an evaluation is becoming available - quite a few of the systems located were being instrumented for study and/or being studied.

SOLAR HOT WATER HEATING SYSTEMS

System Location Date Built:	Owner Built/ Contractor Built	New/ Retrofit	Auxiliary System	Ft^2 Collector/ Gallons Storage	Cost: System	Cost: Materials	Cost: Labor	Cost/ Ft^2	Cost/ Ft^2 Materials	Cost/ Ft^2 Labor
Scotty's Castle Death Valley 1929	CB	N								
GRBR Walnut Creek 11/75	CB	R	Gas & Electric	50 60	$1,000	$ 550	$ 450	$20	$11	$ 9
Mills Valley* Center 5/75	CB	N	Electric	500						
FRLNS Occidental 10/75	OB	N	Wood	32 120	$100-200	$100-200				
EAO Modesto 1/76	OB	R	None	24 80	$ 160	$ 160		$ 6.67	$ 6.67	
DFF Tomales 6/75	OB	R	Electric	12 15	$	$		$ 2.08	$ 2.08	

SOLAR HOT WATER HEATING SYSTEMS

System Location Date Built:	Owner Built/ Contractor Built	New/ Retrofit	Auxiliary System	Ft^2 Collector/ Gallons Storage	Cost: System	Cost: Materials	Cost: Labor	Cost Ft^2	Cost/ Ft^2 Materials	Cost/ Ft^2 Labor
RDBS Sausalito 4/76	OB/CB	N	Gas	80 120	$ 720	$ 720		$ 9	$ 9	$
TRK Santa Rosa	CB	R	Electric	50 120	$ 1,200			$24		
NHSR Occidental 5/76	OB	N	Electric	40 120	$ 600	$ 600		$15	$15	
IRIS Mill Valley 4/76	CB	R	Gas	640 360	$11,240			$17.56		
FRTR Bodega Bay 5/76	CB	N	Electric	330						
HCHC Winters Late 1976	CB	N	Electric	70 80	$ 1,000			$14.29		
Farallones Berkeley 8/75	OB	R	Electric	86.4 120	$ 1,058	$1,058		$12.25	$12.25	

SOLAR HOT WATER HEATING SYSTEMS

System Location Date Built:	Owner Built/ Contractor Built	New/ Retrofit	Auxiliary System	Ft^2 Collector/ Gallons Storage	Cost: System	Cost: Materials	Cost: Labor	Cost Ft^2	Cost/ Ft^2 Materials	Cost/ Ft^2 Labor
RTN Davis 12/75	CB	N	Electric	100 82	$1,500	$1,066	$ 434	$15	$10.66	$ 4.34
FT Napa 12/75	CB	R	Electric	50 100	$1,400	$ 550	$ 850	$28	$11	$17
ADMN Berkeley 10/74	OB	R	Gas	32 40	$ 500	$ 500		$15.63	$15.63	
BYL Sebastopol 5/75	OB	R	Electric	32 40	$ 40	$ 40		$ 1.25	$ 1.25	
CSEF Fetters Hot Springs 5/75	OB	R	Electric	32 40	$ 35	$ 35		$ 1.09	$ 1.09	
HSR-MFR Davis 4/76	CB	N	Gas	60 82	$ 950	$ 627	$ 323	$15.83	$10.45	$ 5.38
GDE Sonoma 6/76	CB	N	Electric	40 120	$1,240	$ 560	$ 680	$31	$14	$17

SOLAR HOT WATER HEATING SYSTEMS

System Location Date Built:	Owner Built/ Contractor Built	New/ Retrofit	Auxiliary System	Ft^2 Collector/ Gallons Storage	Cost: System	Cost: Materials	Cost: Labor	Cost/ Ft^2	Cost/ Ft^2 Materials	Cost/ Ft^2 Labor
IRVG Cotati 10/74	OB	R	Electric	15 20	$ 45	$ 45		$ 3.00	$ 3.00	
SMT Aptos 7/75	CB	R	Electric	56 100	$2,060	$1,260	$ 800	$36.79	$22.50	$14.29
SPHS Berkeley 6/76	CB	N	Electric	60 120	$1,200	$ 700	$ 500			
LNDQT Davis 3/76	CB	N	Gas	60 82	$ 950	$ 627	$ 323	$15.83	$10.45	$ 5.38
JFFR Kentfield 3/76	CB	N	Electric	54 100	$1,200	$ 700	$ 500	$22.22	$12.96	$ 9.26
CRBT Davis 3/76	CB	N	Gas	100 82	$1,519	$1,050	$ 469	$15.19	$10.50	$ 4.69
HFCR Davis 9/76	CB	N	Gas	80 82						

INTEGRATED SYSTEMS FOR SOLAR SPACE HEATING/COOLING AND SOLAR HOT WATER HEATING

System Location Date Built:	Owner Built/ Contractor Built	New/ Retrofit	Auxiliary System	Ft^2 Collector/ Gallons Storage	Cost: System	Cost: Materials	Cost: Labor	Cost Ft^2	Cost/ Ft^2 Materials
WTMN* Sacramento 1/76	CB	R	Gas	381	$6,000			$15.75	
WRD* Davis 7/74	CB	N	Gas	200	$3,510			$17.55	
MCF* San Jose 5/75	OB	R	Gas	533					
HNMN* Sunnyvale 10/75	CB	R	Gas	350					
BSH* Livermore 1/75	OB	R	Gas	400	$1,500	$1,500	0	$ 3.75	$ 3.75
BNE* Palo Alto 11/75	CB	R	Gas	640					
LKS* Sacramento 6/76	OB	N		400					

*Integrated Systems for Solar Space Heating/Cooling and Hot Water Heating

SOLAR SPACE HEATING AND COOLING

System ocation te Built:	Owner Built/ Contractor Built	Active/ Passive	New/ Retrofit	Auxiliary System	Ft^2 Collector	Cost: System	Cost: Materials	Cost: Labor	Cost/ Ft^2	Cost/ Ft^2 Materials	Cost/ Ft^2 Labor
FRTR dega Bay 5/76	CB	A	N	Electric	330						
HAY tascadero 1973	CB	P	N	Electric	1200						
BLKNS erkeley 4/76	OB/CB	P	N	Electric	600						
ISC Various Various		A		Various	96	$3,100	$2,600	$ 500	$32.29	$27.08	
					128	$3,690	$3,140	$ 550	$28.83	$24.53	
					160	$4,380	$3,780	$ 600	$27.38	$23.63	
WTMN* cramento 1/76	CB		R	Gas	381	$6,000				$15.75	
WRD* Davis 7/74	CB	A/P	N	Gas	200	$3,510				$17.55	

SOLAR SPACE HEATING AND COOLING

System ocation te Built:	Owner Built/ Contractor Built	Active/ Passive	New/ Retrofit	Auxiliary System	Ft^2 Collector	Cost: System	Cost: Materials	Cost: Labor	Cost/ Ft^2	Cost/ Ft^2 Materials	Cost/ Ft^2 Labor
RYN Jenner 8/76	CB	A/P	N	Electric	400						
SCRec nta Clara Spring 1976	CB	A	N	Gas	6500	$436,000			$67.08		
GDE Sonoma 6/76	CB	A	N	Electric	360	$ 6,080	$3,040	$3,040	$16.88	$ 8.44	$ 8.44
RDBS ausalito 4/76	OB/CB	A	N	Electric	640	$ 4,160	$4,160		$ 6.50	$ 6.50	
TRKL nta Rosa	CB	A	R	Electric		$ 1,200					
NHSR cidental 5/76	OB	P	N	Electric	192	$ 400	$ 400		$ 2.08	$ 2.08	
HTN erkeley	OB	A	R	Gas	288	$ 900	$ 900		$ 3.12	$ 3.12	

SOLAR SPACE HEATING AND COOLING

System ocation te Built	Owner Built/ Contractor Built	Active/ Passive	New/ Retrofit	Auxiliary System	Ft^2 Collector	Cost: System	Cost: Materials	Cost: Labor	Cost/ Ft^2	Cost Ft^2 Materials	Cost/ Ft^2 Labor
elf-Help terprises Visalia ate 1976	OB/CB	P	N		1200	$ 4,000				$ 3.33	
SHWD Winters 4/75	CB	P	N	Gas	400	$ 4,000			$10		
HCHC Chico ate 1976	CB	P	N	Wood	300	$ 4,000			$13.33		
DSCL Davis ite 1976	CB	P	N		250						
ewlett P nnyvale ll 1973	CB	A	R	Gas	7000	$18,000	$18,000		$ 2.57		
HMND Winters mmer 1974	OB	P	R	Gas & Wood	200	$ 500			$ 2.50		

SOLAR SPACE HEATING AND COOLING

System ocation te Built:	Owner Built/ Contractor Built	Active/ Passive	New/ Retrofit	Auxiliary System	Ft^2 Collector	Cost: System	Cost: Materials	Cost: Labor	Cost/ Ft^2	Cost/ Ft^2 Materials	Cost/ Ft^2 Labor
LNDQT Davis Summer 1976	OB/CB	P	N	Gas	155	$ 600	$ 400	$ 200	$ 3.87	$ 2.58	$ 1.29
JFFR entfield 11/75	CB	A	N	Gas	900						
CSCS Rohnert Park 5/75	OB	P	N	Wood	220	$ 200	$ 200		$ .91	$ .91	
GMBL etaluma 12/74	OB	A	R		300	$1,600	$1,600		$ 5.33	$ 5.33	
GSPRS Tomales	OB/CB	P	R		120	$ 500	$ 150	$ 350	$ 4.17	$ 1.25	$ 2.92
cotty's Castle ath Valley 1929	CB	A	N								
HFCR Davis 9/76	OB/CB	P	N	Gas	162	$1,000	$1,000		$ 6.17	$ 6.17	

FORMAT FOR DATA SHEETS

Systems are identified by key, to protect the privacy of owners. Additional information may be available from architect (see Source(s) at bottom of data sheet.)

There is one data sheet for each system: a brief summary of key information can be found at the top of the page, followed by more detailed information on the system.

Building: includes building type and size, with additional information where available. New/retrofit refers to when system was installed, whether at the time of construction of the residence, or as an addition to existing residence.

System: briefly describes system in terms of basic components, particularly with reference to active/passive systems, air/water systems, transfer and control mechanisms.

Collector: Describes collector portion of the system in greater detail, including materials used, size, number of glazing surfaces, coatings used.

Storage: Describes size and type of storage, location in building

Auxiliary: Describes type of backup system (electric, gas, wood, other) and size. In some cases storage tank and auxiliary are identical.

Costs: Where possible, a very detailed description of costs was obtained, in particular as regards labor costs vs materials costs. Costs identified under Solar column represent costs of entire system (added on cost where costs are ambiguous). Costs identified under collector and storage columns represent portion of total cost of system entailed in collector and storage portions of the system. Costs identified under Aux/Other column represent cost of pumps, controls, transfer system, and design or other fees, where so identified. Where costs are in parenthesis, quantities represent estimated labor cost for contractor built system (when originally owner built) and estimated materials cost for new materials (when recycled materials used).

Performance: Indicates estimated performance, where indicated by owner or builder (% of needs or fuel saved) and measured performance where such information is available. Notes systems which have been or are being instrumented for quantitative study.

Additional Info: References or other interesting information on system.

Sources: Identifies sources of data

SOLAR HOT WATER HEATING SYSTEMS

B-30 ADMN/Berkeley/Solar hot water heating ($500) October 1974

Retrofit/single family residence/owner built/gas backup. Tube on plate flat plate collector/thermosiphon/with water storage. Preheater/pressurized system.

B-32 BNE/Palo Alto/Solar space and hot water heating/($) November 1975

Retrofit/single family residence/contractor built/gas backup. Tube-in-plate flat plate collector/pumped/water circulating/with water storage. Integrated space heating and hot water heating system.

B-33 BRKYL Builders/Berkeley/Solar hot water heating ($1145) March 1976

New construction/single family residence/contractor built/electric backup. Tube-on-plate collector/pump/water circulating/with water storage.

B-34 BUSH/Livermore/Solar space heating and hot water heating ($1500)-Jan. 1975

Retrofit/single family residence/owner built/gas backup. Trickle type system flat plate collector/water circulating/pumped/with water storage. Integrated space heating and hot water heating.

B-35 BYL Residence/Sebastopol/Solar hot water heating ($40) May 1975

Retrofit/single family residence/owner built/electric backup. Free-standing tank-type collector/thermosiphon/water circulating/with water storage.

B-36 CRBT duplexes/Davis/Solar hot water heating ($1519 for two) Mar. 1975

New construction/duplex/contractor built/gas backup/roof mounted tube-on-plate flat plate collector/water circulating/with water storage.

B-38 CSEF Residence/Fetters hot springs/Solar hot water heating ($35) May 1975

Retrofit/single family residence/owner built/electric backup. Free-standing tank-type collector/thermosiphon/water circulating/ with water storage.

B-39 DFF Residence/Tomales/Solar hot water heating ($25) summer 1975

Retrofit (portable)/single family residence/owner built/no backup. Free-standing/flat plate collector/thermosiphon/water circulating/ with water storage.

B-41 Ecology Action Office/Modesto/Solar hot water heating ($160) January 1976

Retrofit/office building/owner built/free standing roll bond brand/ flat plate collector/thermostat activated pump/water circulating with water storage.

B-42 Farallones Urban House/Berkeley/Solar hot water heating ($1,058) August 1975

Retrofit/residence and classroom/built by staff/electric backup. Roof mounted tube-on-plate flat plate collector/thermosiphon/water circulating/with water storage.

B-43 FRLNS (Farallones Rural Center)/Occidental Solar hot water heating ($100-$200) Fall 1975

New construction/bath house for school/owner built/wood-burning backup. Roof-mounted tank collector (breadbox)/water circulating/ with water storage.

B-45 FRTR/Bodega Bay/Solar hot water heating ($) May 1976

New construction/single family residence/owner-contractor built/ electric backup. Sandwich-type flat plate collector/pumped water circulating/with water storage. Integrated solar space heating and hot water heating system.

B-46 FT/Napa/Solar hot water heating ($1,400) December 1975

Retrofit/single family residence/contractor built/electric backup. Copper tube on plate/flat plate collector/thermosiphon/water circulating/with water storage.

B-47 GDE/Sonoma/Solar hot water heating ($1,240) Summer 1976

New construction/single family residence/contractor-built/electric backup. Tube on plate/flat-plate collector/pumped water circulating/ with water storage.

B-50 GRBR/Walnut Creek/Solar hot water heating ($1,000) November 1975

Retrofit/single family residence/contractor built/gas and electric backup/tube on plate flat plate collector/thermosiphon/water circulating with water storage.

B-53 HCHC/Chico/Solar hot water heating ($1,000 estimated) late 1976

New construction/single family residence/contractor built/electric backup. Flat-plate collector/water circulating/thermosiphon/with water storage.

B-57 HFCR/Davis/Solar hot water heating ($) Sept. 1976

New construction/single family residence/contractor built/gas backup/ roof mounted flat plate collector/thermosiphon/water circulating/ with water storage.

B-59 HNMN/Sunnyvale/Solar space and hot water heating ($) October 1975

Retrofit/single family residence/contractor built/gas backup. Tube-in-plate flat plate collector/pumped/water circulating/with water storage. Integrated space heating and hot water heating system.

B-60 HSRMFR Houser-Mecfesser/Davis/Solar hot water heating ($950) April 1976

New Construction/Single Family Residence/Contractor built/Gas backup. Roof mounted tube on plate/flat plate collector/ thermosiphon. Water circulating/with water storage.

B-62 IRIS Images/Mill Valley/Solar hot water heating ($11,240) April 1976

Retrofit/commercial: film processing/contractor built/gas backup. Roof mounted tube-on-plate/flat plate collector/pumped water circulating/with water storage. Designed to provide large quantity of 100 degree hot water for immediate daytime use in film processing.

B-63 IRVG Residence/Cotati (Sonoma County)/Solar hot water heating ($40) October 1974

Retrofit/mobile home/owner built/flat plate collector/electric backup/thermosiphon/water circulating with water storage.

B-66 JFFR/Kentfield/Solar hot water heating ($1,200) March 1976

New construction/single family residence/contractor built/electric backup. Roof mounted flat plate collector/water circulating/with water storage.

B-67 LKS/Sacramento/Solar space heating and cooling and hot water heating ($) July 1976

New construction/single family residence/owner built/combination passive type system (south-facing Thermopane windows with concrete slab floor storage) and active type system (air type collector with rock storage). Separate water circulating flat plate collector with water storage for domestic hot water.

B-69 LNDQT Residence/Davis/Solar hot water heating ($950) March 1976

New construction/duplex/contractor built/gas backup/roof mounted copper tube on plate/flat plate collector/thermosiphon/water circulating/with water storage.

B-71 MCF/San Jose/Solar hot water heating ($) May 1975

Retrofit/single family residence (owner built)/gas backup. Integrated system for space heating, hot water heating, and heating of swimming pool.

B-72 MLS/Valley Center/Space heating and cooling and hot water heating ($) May 1975

New/single family residence/contractor built/electric backup. Roof-mounted flat plate collector/pumped-water circulating/with water storage. Integrated solar system for space heating, space cooling, and hot water heating (heat exchanger in storage tank).

B-74 NHSR/Occidental (Sonoma County) Solar hot water heating ($600) May 1976

New construction/single family residence/owner built/electric backup. Tube-on-plate flat plate collector/water circulating/with water storage.

B-75 RDBS Residence/Sausalito/Solar hot water heating ($930) April 1976

New construction/single family residence/owner and contractor built/gas backup. Combined space and hot water heating. Tube-on-plate flat plate collector/pumped water circulating/with water storage.

B-77 RTN Residence/Davis/Solar hot water heating ($1,500) December 1, 1975

New construction/single family residence/contractor built/electric backup. Tube on plate flat plate collector/thermosiphon/water circulating/with water storage.

B-80 Scottys Castly/Death Valley/Solar heating and solar hot water heating ($) 1929

New construction (1929)/Residence/backup not specified. Tube on plate/flat plate collector/water circulating/with water storage.

B-83 SMT Residence/Aptos/Solar hot water heating ($2060) July 1975

Retrofit/single family residence/contractor built/electric backup. Flat plate collector/pumped/water circulating/with water storage.

B-84 SPHS/Berkeley/Solar hot water heating ($1,200) June 1976

New construction/single family residence/contractor built/electric backup. Tube on plate flat plate collector.

B-85 TRK/Santa Rosa/Solar hot water heating ($1,200) Summer 1976

Retrofit/single family residence/contractor built/electric backup. Integrated system installed with new swimming pool to provide pool heating, space heating, hot water heating, and spa heating. Uses water-to-air heat pump from swimming pool.

B-87 WRD Residence/Davis/Solar hot water heating and space heating ($3,510 SH & HWH) July 1974

New construction/single family residence/contractor built/gas backup. Roof mounted sandwich-type flat plate collector/thermosiphon/water circulating/with water storage. Also passive type system (windows with movable insulation). Integrated space heating and hot water heating.

B-88 WTMN/Sacramento/Solar space heating, cooling and hot water heating ($6,000) January 1976

Retrofit/single family residence/contractor built/gas backup. Roof mounted/flat plate collector/pumped/water circulating/with water storage. Integrated space heating, cooling, and hot water heating system.

SOLAR SPACE HEATING AND COOLING SYSTEMS

B-31 BLKNS/Berkeley/Solar space heating ($)April 1976

New construction/single family residence/owner-contractor built/ electric backup/passive system utilizing south-facing windows.

B-32 BNE/Palo Alto/Solar space and hot water heating($)November 1975

Retrofit/single family residence/contractor built/gas backup. Tube-inplate flat plate collector/pumped/water-circulating/with water storage. Integrated space heating and hot water heating system.

B-34 BUSH/Livermore/Solar space heating and hot water heating ($1500-2000)

Retrofit/singel family residence/owner built/gas backup. Trickle type system flat plate collector/water circulating/pumped/with water storage. Integrated space heating and hot water heating.

B-37 CSCS Energy Center/Rohnert Park/Solar heating and cooling ($200) May 1975

New construction/classroom/student built/wood stove backup. Passive tyoe system utilizing 60 degree south-facing wall with water filled gallon jugs and moveable insulation.

B-40 DSCL/Davis/Solar space heating and cooling ($35,000 for 1500 ft^2 building)

New construction/school/contractor built/passive-type heating and cooling using south-facing glass wall with 21-inch diameter water-filled steel tubes as collector and storage.

B-44 FRTR/Bodega Bay/Solar space heating ($)May 1976

New construction/single family residence/owner-contractor build/ electric backup. Sanwich-type flat plate collector/pumped/water circulating/with water storage. Integrated solar space heating and hot water heating system.

B-48 GDE/Sonoma/Solar space heating ($6,080) Summer 1976

New construction/single family residence/contractor built/electric backup. Tube-on-plate/flat plate collector/pumped water circulating/with water storage.

B-49 GMBL/Petaluma/Solar space heating ($1600) Winter 1974-75

Retrofit/greenhouse added to residence/owner built/backup not specified. Flat plate collectors (Fafco brand)/water circulated by pumps/water storage/heat distributed by radiant baseboard heater.

B-51 GSPRS Residence/Tomales/Solar space heating ($150/$500)

Retrofit/single family residence/owner built/added south-facing greenhouse with passive type system (bottle wall) using water-filled jugs as collector and storage. Heat enters house through ducts located at top of greenhouse.

B-52 Hay (Skytherm)/Solar space heating and cooling ($) 1973

New construction/single family residence/contractor built/passive system using water-filled plastic bags on roof with movable, insulated panels/integrated collector, storage, distribution system.

B-54 HCHC/Chico/Solar space heating and cooling ($4,000 estimated)late 1976

New construction/single family residence/contractor built/wood backup. Passive-type system using south-facing windows with movable insulation and 21-inch-diameter steel tubes (water filled) for storage.

B-55 Hewlett Packard Plant/Sunnyvale/Solar space heating ($18,000) Fall 1973

Retrofit/165,000 ft^2 industrial plant/built by plant maintenance personnel/gas backup. Roof mounted flat plate collectors (7,000 ft^2) retrofitted to existing terminal reheat system. Pumped water circulating with water storage.

B-56 HFCR/Davis/Solar space heating and cooling (estimate less than $1,000) September 1976

New construction/single gamily residence/owner-contractor built/gas backup/passive system utilizing south-facing windows with 50 gallon water filled drums, slab floor for storage, and moveable, insulating shutters.

B-58 HMND/Winters/Solar space heating and cooling ($500) Summer 1974

Retrofit/single family residence/owner built/gas and wood backup. Passive type system/south wall, water-filled 55 gallon drums inside vertical window wall/with moveable insulation.

B-59 HNMN/Sunnyvale/Solar space and hot water heating ($)October 1975

Retrofit/single family residence/contractor built/gas backup. Tube-inplate flat plate collector/pumped/water circulating/with water storage. Integrated space heating and hot water heating system.

B-61 HTN/Berkeley/Solar space heating ($900)

Retrofit/duplex residence and office/owner built/gas backup. Roof mounted trickly-type (Thomason) collector/pumped/water circulating/with water storage.

B-64 ISC (Champion Homebuilders)/Various Locations/Solar heating and cooling ($2600:96 ft^2, $3140:128 ft^2)22+ units

Modular mass-produced solar heating and cooling unit. Freestanding/air collector/with rock storage/attaches to forced air heating and cooling systems of existing or new structures.

B-65 JFFR/Kentfield/Solar space heating ( )November 1975

New construction/single family residence/contractor built/gas backup. Roof mounted trickle-type collector/water-circulating/pumped with water storage.

B-67 LKS/Sacramento/Solar space heating and cooling and hot water heating ($)July 1976

New construction/single family residence/owner built/combination passive type system (south-facing Thermopane windows with concrete slab floor storage) and active-type system (air type collector with rock storage). Separate water circulating flat plate collector with water storage for domestic hot water.

B-68 LNDQT Residence/Davis/Solar heating and cooling ($400-600 est.) Summer 1976

New construction/duplex/constractor built/gas backup/passive-type system utilizing south facing windows and skylight with slab floor for storage and moveable insulation (shutters).

B-70 MCF/Solar space heating ($) May 1975

Retrofit/single family residence/owner built/gas backup. Integrated system for space heating, hot water heating and heating of swimming pool.

B-72 MLS/Valley Center/Space heating and cooling and hot water heating ($) May 1975

New/single family residence/contractor built/electric backup. Roof-mounted flat plate collector/pumped-water circulating/with water storage. Integrated solar system for space heating, space cooling, and hot water heating (heat exchanger in storage tank).

B-73 NHSR/Occidental/Solar space heating and cooling ($400) May 1976

New construction/single family residence/owner built/electric backup. Passive type system with double-glazed south-facing windows and slab floor, moveable insulating shutters. Greenhouses on east and west of house, north exposure bermed (wine cellar).

B-76 RDBS/Sausalito/Solar space heating ($4,160) April 1976

New construction/single family residence/owner and contractor built/gas backup. Space and hot water heating. Tube on plate flat plate collector/pumped water circulating/with water storage.

B-78 RYN Residence/Jenner (Sonoma County)/Solar space heating ($) August 1976

New construction/single family residence/contractor built/electric backup. Free-standing Rollbond flat plate collector/pumped/with water storage. Integrated space heating and hot water heating.

B-79 Santa Clara Community Recreation Center/Santa Clara Solar space heating and cooling ($436,000) early 1976

New construction/recreation center/contractor built/gas backup. Roof mounted flat plate collectors/pumped/water circulating/with water storage.

B-80 Scottys Castle/Death Valley/Solar heating and solar hot water heating ($) 1929

New construction (1929)/Residence/backup not specified. Tube on plate/flat plate collector/water circulating/with water storage.

B-81 Self-Help Enterprises/Visalia/Solar space heating and cooling ($4,000) late 1976

New construction/single family residences (5)/owner and contractor built. Passive-type system/(Skytherm) design/integrated collection and storage/roof-top water bags/with moveable insulation.

B-82 SHWD/Winters/Solar space heating and cooling ($4,000) April 1975

New construction/single family residence/contractor built/gas and wood backup. Passive type system/roof-mounted, water-filled tanks with moveable, insulated, reflective lids/south-facing with insulated shutters/slab floor and water-filled drums.

B-86 TRK/Santa Rosa/Solar space heating ($)Summer 1976

Retrofit/single family residence/contractor built/electric back-up. Integrated system installed with new swimming pool to provide pool heating, space heating, hot water heating and spa heating. Uses water to air heat pump from swimming pool.

B-87 WRD Residence/Davis/Solar hot water heating and space heating ($3,510) July 1974

New construction/single family residence/contractor built/gas backup. Roof-mounted sandwich type flat plate collector/thermo-siphon/water circulating/with water storage. Also passive type system (windows with moveable insulation). Integrated space heating and hot water heating.

B-88 WTMN/Sacramento/Solar space heating, cooling and hot water heating ($6,000) January 1976

Retrofit/single family residence/contractor built/gas backup. Roof-mounted/flat plate collector/pumped/water circulating/with water storage. Integrated space heating, cooling, and hot water heating system.

ADMN/Berkeley/Solar hot water heating ($500) October 1974

Retrofit/single family residence/owner built/gas backup. Tube on plate flat plate collector/thermosiphon/with water storage. Preheater/pressurized system.

Building: Existing single family residence.

System: Retrofit/HWH/tube on plate flat plate collector/water circulating/thermosiphon/with water storage. System designed and built by owner. System at city water pressure.

Collector: 32 ft^2/water circulating flat plate/double glazing: outer-sheet plexiglas, inner-sheet glass with one inch separation. Collector plate consists of 3/4 inch copper tubes wired and soldered to galvanized steel plate (4' x 8') painted with flat black paint.

Storage: 40 gallon glass-lined steel tank in attic.

Auxiliary: 20 gallon gas-fired water heater in series (after storage tank).

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$500			
Labor	$ 0			
Total	$500			

Performance: 75% estimated. 40 gallon storage tank seldom drops below 90°. Plumbed so always acts as preheater for gas hot water heater; on sunny days gas heater does not go on at all.

Additional Info: Built primarily of recycled materials by owner over a seven month period 3/74 - 10/74. Total storage: 40 gallon tank in attic plus hot water heater tank (20 gallon).

Source(s): A. F. Adamson

BLKNS/Berkeley/Solar space heating ($) April 1976

New construction/single family residence/owner-contractor built/ electric backup/passive system utilizing south-facing windows, but no storage.

Building: New/single family residence/924 ft^2 and loft/wood frame construction.

System: New/space heating/passive type system with tilted south-facing window wall. No storage. System designed by Harry Glasscock.

Collector: About 600 ft^2/passive type system with south-facing wall tilted at 62.5°. Bottom 1/3 single glazed with window glass, top 2/3 single glazed with acrylic owner-contractor built.

Storage: None.

Auxiliary: Electric radiant wall heaters.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: House tends to overheat on sunny days unless vented. Little heat storage due to low thermal mass.

Additional Info: System basically completed, but being modified.

Source(s): Owner

BNE/Palo Alto/Solar space and hot water heating/($) November 1975

Retrofit/single family residence/contractor built/gas backup. Tube-in-plate flat plate collector/pumped/water circulating/with water storage. Integrated space heating and hot water heating system.

Building: Retrofit/existing single family residence/2000 ft^2. Oriented due south, with flat roof.

System: Retrofit/SH and HWH/flat plate collector/pumped/water (with additives) circulating/with water storage. System is integrated with existing radiant floor heating system/fully automatic controls. System designed and built by Alten Associates, Santa Clara, CA.

Collector: 640* ft^2/water circulating/flat plate/double glazing of Tedlar/wood frame. Abosrber is Olin Brass Rollbond aluminum plate.

Storage: 2000 gallon steel tank/insulated with 3" polyurethane foam/located underground.

Auxiliary: Gas furnace and gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total			$1,250*	

Performance: 70% (estimated).

Additional Info: *27 3' x 8' collectors arrayed in three ranks of 12, 11, and 4 each. Contractors discount price - includes delivery and installation.

Source(s): Winston Boone; Klaus Heinemann (Alten Associates)

BRKYL Builders/Berkeley/Solar hot water heating ($1145) March 1976

New construction/single family residence/contractor built/electric backup. Tube-on-plate collector/pump/water circulating/with water storage.

Building: New/speculative house by Berkeley Builders.

System: New/HWH/flat plate collector/water circulating/pump/with water storage. System designed and built by Berkeley Solar Group.

Collector: 36 ft^2/water circulating flat plate/copper tubes mechanically bonded to aluminum plate (Raypack)/single glazing of tedlar coated fiberglas glazing/fiberglas insulation.

Storage: 120 gallon glass-lined steel tank.

Auxiliary: Electric element in storage tank.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials		$4.50/ft^2 plate .70/ft^2 glaze	$240	$635*
Labor				
Total	$1,145			

Performance: 50% estimated.

Additional Info: House is for sale. Contact Berkeley Builders.

*Controller - $40, Pump - $45, Plumbing - $100, Fees - $450.

Source(s): Berkeley Solar Group, Berkeley, CA

BUSH/Livermore/Solar space heating and hot water heating ($1500 - 2000)

Retrofit/single family residence/owner built/gas backup. Trickle type system flat plate collector/water circulating/pumped/with water storage. Integrated space heating and hot water heating.

Building: Existing/single family residence/1400 ft^2/single story/three bedrooms/built in 1969. Wood frame construction. Oriented south.

System: Retrofit/space heating/trickle type system/water circulating/pumped/with water storage. System integrated with existing forced air space heating and domestic hot water heating systems. Solar system by home built differential controller.

Collector: 400 ft^2/trickle type flat plate collector/water circulating/single glazing of single strength greenhouse glass (20" x 24" lights)/absorper plate consists of black painted corrugated aluminum sheets/wood frame/3½" fiberglass insulation.

Storage: 1000 gallons/water/in two 500 gallon capacity galvanized steel culvert sections (estimated 20 year life in the ground). Steel tank for preheating domestic hot water located in one of the culvert sections.

Auxiliary: Central gas furnace and forced air heating system. Gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$1,500			
Labor				
Total	$1,500*			

*Heat exchanger, pump, and additional fluid circuit planned - $500 dditional (est.).

Performance: 50% off total PG&E bill. Carryover: 1 day for entire house 3-5 days for living room.

Additional Info: No heat exchanger from storage to forced air heating system. Small insulated room built around storage. House air drawn into room, picking up heat from outer surface of culvert sections, then into furnace and distribution ducts (so also acts as preheater).

Source(s): George Bush

BYL Residence/Sebastopol/Solar hot water heating ($40) May 1975

Retrofit/single family residence/owner built/electric backup. Free-standing tank-type collector/thermosiphon/water circulating/with water storage.

Building: Added to existing residence.

System: Retrofit/HWH/tank-type collector/water circulating/with water storage. System built from 1936 publication "Solar Energy and Its Use for Heating Water in California"* by owner.

Collector: 32 ft^2/tank-type in insulated box/single Tedlar glazing. Collector consists of 40 gallon salvaged hot water heater tank, with insulation removed and tank painted black, in insulated wood box with Tedlar glazing and moveable insulating cover.

Storage: 40 gallon collector tank and existing hot water heater.

Auxiliary: Electric hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$ 40	$ 40		
Labor	$ 0	$ 0		
Total	$ 40	$ 40		

Performance: Preheats water for conventional hot water heater. See Additional InFo.

Additional Info: Extensive analysis of performance in "Solar Energy and Its Use for Heating Water in California" - 1936 - Bulletin No. 602, College of Agriculture, Agricultural Experiment Station, Berkeley, CA (out of print).

Source(s): Owner, Ag. Bulletin.

CRBT duplexes/Davis/Solar hot water heating ($1519 for two) March 1975

New construction/duplex/contractor built/gas backup/roof mounted tube-on-plate flat plate collector/water circulating/with water storage.

Building: New/duplexes/1200 ft^2 and 800 ft^2. Wood frame construction on slab floor. Part of a subdivision of solar tempered houses with solar hot water heating option, and optional solar space heating and cooling.

System: New/HWH/flat plate collector/water circulating/thermosiphon/with water storage. System designed by Natural Heating Systems (Davis) and constructed by M. Corbett.

Collector: 100 ft^2/water circulating flat plate/single glass glazing ½ inch copper risers manifolded to 1¼ inch headers, soldered to 22 gauge galvanized steel sheet on 4 inch centers. Collector built by Natural Heating Systems, Davis, CA.

Storage: 82 gallon galvanized steel tank in peak of roof.

Auxiliary: Conventional 40 gallon gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$1,050			
Labor	$ 469			
Total	$1,519			

Performance: Expected performance: 60% of heat for water heating.

Additional Info: Provides hot water for both duplexes, one three bedroom one bath (1,200 ft^2) and one single bedroom one bath (800 ft^2). Duplexes are solar-tempered.

Source(s): John Hofacre/Natural Heating Systems, 207 Cortez Avenue, Davis, CA 95616.

CSCS Energy Center/Rohnert Park/Solar heating and cooling ($200) May 1975

New construction/classroom/student built/wood stove backup.
Passive type system utilizing 60 degree south-facing wall with water filled gallon jugs and moveable insulation.

Building: 515 square ft. Pole building oriented SSW built by students to code specification.

System: New/space heating and cooling/passive type system/with south-facing bottle wall as collector and storage, moveable insulation and reflector. System designed by Barbara Greene and Roy Irving.

Collector: Bottle wall. 407 plastic milk bottles painted flat black and filled with water. Entire south wall is single glazed (Kalwall, Tedlar, 12 mil vinyl), oriented at 60°, south wall is collector. Insulated (2 inch foam) doors with mylar reflector opened daytime (for heating) and closed at night. Process reversed for cooling.

Storage: 407 gallons water. Some 55 gallon drums added in interior to moderate temperature fluctuations (65° to 94° in winter '75-'76).

Auxiliary: Woodstove. No auxiliary for cooling.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$200*			
Labor				
Total	$200			

Performance: Measured since December 1975: Interior temp, exterior temp and wind, insulation. Data available. Cooling in summer 1975 "excellent". Winter heating very good though wide temperature fluctuations.

Additional Info: *Cost includes: bottle ($0), insulating doors, reflector, hardware, black paint. $200 figure includes some donated materials. In summer thermal mass of wall mediates summer heat and cold fogg nights. Wall opened at night, closed during daytime in summertime, operates like Hays system, to cool building.

Source(s): Barbara Greene, Roy Irving.

CSEF Residence/Fetters hot springs/Solar hot water heating ($35) May 1975

Retrofit/single family residence/owner built/electric backup. Free-standing tank-type collector/thermosiphon/water circulating/with water storage.

Building: Added to existing residence.

System: Retrofit/HWH/tank-type collector/water circulating/with water storage. System built from 1936 publication "Solar Energy and Its Use for Heating Water in California"* by owner.

Collector: 32 ft^2/tank-type in insulated box/single Tedlar glazing. Collector consists of 40 gallon salvaged hot water heater tank, with insulation removed and tank painted black, in insulated wood box with Tedlar glazing and moveable insulating cover.

Storage: 40 gallon collector tank and existing hot water heater.

Auxiliary: Electric hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$35	$35		
Labor	$ 0	$ 0		
Total	$35	$35		

Performance: Preheats water for conventional hot water heater. See Additional Info.

Additional Info: Extensive analysis of performance in "Solar Energy and Its Use for Heating Water in California" - 1936 - Bulletin No. 602, College of Agriculture, Agricultural Experiment Station, Berkeley, CA (out of print).

Source(s): Owner, Ag. Bulletin.

DFF Residence/Tomales/Solar hot water heating ($25) summer 1975

Retrofit (portable)/single family residence/owner built/no backup. Free-standing/flat plate collector/thermosiphon/water circulating/ with water storage.

Building: Existing residence (rental).

System: New/HWH/flat plate collector/water circulating/thermosiphon/ with water storage. System designed and built by owner.

Collector: 12 ft^2/water circulating flat plate/single fibre-glass glazing. Collector consists of recycled copper milk cooler (2' x 6') with fibre-glass glazing panel, in insulated box.

Storage: 15 gallon recycled hot water tank.

Auxiliary: None.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$25	$25	0	
Labor	$ 0	$ 0	0	
Total	$25	$25	0	

Performance: To 80° in "a couple of hours". Used for showers only.

Additional Info: All components of the system salvaged. The copper milk cooler was obtained from a scrapyard ($25) and adapted as flat plate collector. System is transportable.

Source(s): Owner, Name withheld on request.

DSCL/Davis/Solar space heating and cooling ($35,000 for 1500 ft^2 building) late 1976

New construction/school/contractor built/passive-type heating and cooling system/south-facing glass wall/21-inch-diameter water-filled steel tubes (collector and storage).

Building: New/school (1500 ft^2)/estimated cost of $35,000.

System: New/passive-type/space heating and cooling/south-facing glass wall with 21-inch diameter water-filled steel tubes (collector and storage).

Collector: 250 ft^2/south-facing windows/single glazing of glass.

Storage: Steel and fiberglass tubes/21" diameter/water filled/with moveable insulation.

Auxiliary:

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance:

Additional Info:

Source(s): J. Hammond (Living Systems)

Ecology Action Office/Modesto/Solar hot water heating ($160) January 1976

Retrofit/office building/owner built/free standing roll bond brand/flat plate collector/thermostat activated pump/water circulating with water storage.

Building: Existing office building.

System: New/HWH/flat plate collector/water circulating/thermostat activated pump/with water storage. Designed and built by office staff.

Collector: 24 ft^2/water circulating flat plate/double tedlar glazing. Collector consists of a single aluminum Roll-Bond brand panel (3' x 8') insulated with monotherm insulation, and double glazed with tedlar. A thermostat-activated pump circulates water from collector to storage when the collector water temperature exceeds storage water temperature by ten or more degrees (fahrenheit).

Storage: 80 gallon storage tank (salvaged hot water heater).

Auxiliary:

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$160	$80	0	$80
Labor	0	0	0	
Total	$160	$80	0	

Performance: Serves hot water requirements of office.

Additional Info: Costs: Roll-Bond - $40. Tedlar - $40. Tank-free, differential thermostat - $10. Pump - $50. Fittings, etc. - $20. Wood, other-free (recycled).

Source(s): Office of Ecology Action Educational Institute, Modesto, CA.

Farallones Urban House/Berkeley/Solar hot water heating ($1,058) August 1975

Retrofit/residence and classroom/built by staff/electric backup.
Roof mounted tube-on-plate flat plate collector/thermosiphon/water circulating/with water storage.

Building: 3500 ft^2/retrofit two-story plus attic separate residence converted into living, teaching, and research space.

System: Retrofit/HWH/flat plate collector/water circulating/ thermosiphon/with water storage. System designed and built by Scott Matthews and Doug Daniels.

Collector: 86.4 ft^2/water circulating flat plate/single glass glazing (PPG glass doors-seconds). Absorber plate is copper tube on copper sheet. Surface painted with black urethane aircraft paint.

Storage: 120 gallon glass-lined steel tank.

Auxiliary: 30 gallon electric hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$1,058	$203	$855	
Labor				
Total	$1,058	$203		

Performance: 90-95% estimated. 100% until February as auxiliary not installed until then. System performance is being monitored.

Additional Info: Orientation S 11° E freeze protection by means of heat tape activated by bimetallic thermostat.

Source(s): Doug Daniels, Phillip Caesar

FRLNS (Farallones Rural Center)/Occidental Solar hot water heating ($100-$200)
Fall 1975

New construction/bath house for school/owner built/wood-buring backup. Roof-mounted tank collector (breadbox)/water circulating/with water storage.

Building: New/bath house for school.

System: New/HWH/tank collector/water circulating/thermosiphon with water storage. System built from S. Baer, design by students and instructors.

Collector: 32 ft^2/tank-type collector/single glass glazing/reflector. Collector consists of a 130 gallon tank in an insulated box, with glass glazing on top and south sides and insulated cover with reflector. Interior of box is lined with reflective.

Storage: Same 130-gallon tank.

Auxiliary: Wood-burning stove with water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$100-$200			
Labor				
Total	$100-$200			

Performance: Providing shower water for 12 people.

Additional Info: Built from Steve Baer "breadbox" design. Plans available from Baer.

Source(s): David Katz, Farallones Rural Center, Occidental, CA.

FRTR/Bodega Bay/Solar space heating ($) May 1976

New construction/single family residence/owner-contractor built/electric backup. Sandwich-type flat plate collector/pumped/water circulating/with water storage. Integrated solar space heating and hot water heating system.

Building: New/single family residence/1650 ft^2. Four bedrooms, two baths, living room, dining room, kitchen.

System: New/HWH and SH/flat plate collector/pumped/water circulating/ with water storage. Heat distributed by radiant brick floor (ground level) and baseboard hot water convective heaters (2nd floor). System designed by Bruce Corson.

Collector: 330 ft^2/water circulating flat plate/single glazing of Tedlar coated fiberglas. Sandwich type absorber plate consists of two sheets of galvanized sheet metal bolted together with neoprene gaskets and spacers. Collectors mounted on 42 degree south-facing roof.

Storage: ∿ 1,000 gallon concrete water tank.

Auxiliary: Franklin stove and two electric hot water heaters (one for space heating and one for domestic hot water).

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: Estimated 75-80%.

Additional Info: Closed, low pressure system (4 psi at base of collectors and 9 psi at tank). Circulating pump is 1/10 HP. Pumped freeze protection.

Source(s): Bruce Corson

FRTR/Bodega Bay/Solar hot water heating ($) May 1976

New construction/single family residence/owner-contractor built/electric backup. Sandwich-type flat plate collector/pumped water circulating/ with water storage. Integrated solar space heating and hot water heating system.

Building: New/single family residence/1650 ft^2. Four bedrooms, two baths, living room, dining room, kitchen.

System: New/HWH and SH/flat plate collector/pumped/water circulating/with water storage. System designed by Bruce Corson.

Collector: 330 ft^2/water circulating flat plate/single glazing of Tedlar coated fibreglas. Sandwich type absorber plate consists of two sheets of galvanized sheet metal bolted together with neoprene gaskets and spacers. Collectors mounted on 42 degree south-facing roof.

Storage: Hot water preheated by heat exchanger in 1,000 gallon tank used for storage for solar space heating.

Auxiliary: 40 gallon electric hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: Estimated 55-65% (pre-heating).

Additional Info: Closed, low pressure system (4 psi at base of collectors and 9 psi at tank). Circulating pump is 1/10 HP. Pumped freeze protection.

Source(s): Bruce Corson

FT/Napa/Solar hot water heating ($1,400) December 1975

Retrofit/single family residence/contractor built/electric backup. copper tube on plate/flat plate collector/thermosiphon/ water circulating/with water storage.

Building: Existing residence.

System: Retrofit/HWH/flat plate collector/water circulating/with water storage. System designed and built by Gary Gerber and John Vail of Interactive Resources, Inc.

Collector: 50 ft^2/water circulating flat plate/glazed with clear glass tubes (fluorescent light tubes). Collector plate is copper tube on copper plate.

Storage: 100 gallon hot water heater tank.

Auxiliary: Standard electric water heater (100 gallon) with bottom element removed.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$ 580	$250	existing	$300
Labor	$ 850	$300		$550
Total	$1,400	$550	-	$850

Performance:

Additional Info:

Source(s): Gary Gerber

GDE/Sonoma/Solar hot water heating ($1,240) Summer 1976

New construction/single family residence/contractor-built/electric backup. Tube on plate/flat-plate collector/pumped water circulating/with water storage.

Building: New/single family residence/about 1800 ft^2.

System: New/HWH/flat plate collector/water circulating/with water storage. System designed by Interactive Resources, Inc.

Collector: 40 ft^2/water circulating flat plate/single filon glazing. Absorber plate is copper tube on aluminum (Sunburst).

Storage: 120 gallon hot water heater (bottom element disconnected).

Auxiliary: 120 gallon hot water heater (same as storage).

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$ 560	$160	$ 400	
Labor	$ 680	$ 80	$ 600	
Total	$1,240	$240	$1,000*	

Performance:

Additional Info: *Fees for entire design work (space heating and hot water heating) were $800 additional.

Source(s): Dale Sartor, Interactive Resources, Inc.

GDE/Sonoma/Solar space heating ($6,080) Summer 1976

New construction/single family residence/contractor built/electric backup. Tube-on-plate/flat plate collector/pumped water circulating/with water storage.

Building: New/single family residence/about 1800 ft^2.

System: New/space heating/flat plate collector/water circulating/ with water storage. System designed by Interactive Resources, Inc.

Collector: 360 ft^2/water-circulating flat plate/single filon glazing. Absorber plate is copper tube on aluminum fins (Sunburst).

Storage: 1500 gallon precast concrete tank (septic tank) insulated with 3 inch foam (R=26).

Auxiliary: Wood stove. Electric resistance heating (forced air furnace).

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$3,040	$1,440	$500	$1,100
Labor	$3,040	$1,440		
Total	$6,080	$2,880		$1,600

Performance:

Additional Info: Fees for entire design work (space heating and hot water heating) were $800 additional.

Source(s): Dale Sartor, Interactive Resources, Inc.

GMBL/Petaluma/Solar space heating ($1600) Winter 1974-75

Retrofit/greenhouse added to residence/owner built/backup not specified. Flat plate collectors (Fafco brand)/water circulated by pumps/water storage/heat distributed by radiant baseboard heater.

Building: Retrofit/greenhouse added to existing residence.

System: Retrofit/space heating/flat plate collector/water circulating/ water storage/with heat distributed by radiant baseboard heater.

Collector: 300 ft^2/water circulating flat plate/single glazed with single 4 mil polyethylene glazing. Collector consists of Fafco brand panels. Glazing material installed as temporary.

Storage: 4,000 gallon (4' x 8' x 20') water storage tank, built of plywood with 3 inch styrofoam insulation.

Auxiliary: Not specified.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$1,600		$300	
Labor				
Total	$1,600			

Performance: Estimates 300,000 BTU/day.

Additional Info: Hot water from collector is pumped to storage, then pumped to (100 lineal feet) radiant baseboard heater when desired.

Source(s): Owner.

GRBR/Walnut Creek/Solar hot water heating ($1,000) November 1975

Retrofit/single family residence/contractor built/gas and electric backup/ tube on plate flat plate collector/thermosiphon/water circulating with water storage.

Building: Retrofit/single family residence.

System: Retrofit/HWH/flat plate collector/water circulating/thermosiphon/ with water storage. System designed and built by Gary Gerber and John Vail.

Collector: 50 ft^2/water circulating flat plate collector/glazing is clear glass tubes (fluorescent light type). Absorber plate is copper tube on copper plate.

Storage: 60 gallons (uses existing hot water heaters for storage).

Auxiliary: 40 gallon gas water heater and 20 gallon electric water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
				see storage
Materials	$ 550	$200	$200	$150
Labor	$ 450	$200	$100	$150
Total	$1,000	$400	$300	$300

Performance:

Additional Info: Note double use of Auxiliary and Storage

Source(s): Gary Gerber

GSPRS Residence/Tomales/Solar space heating ($150/$500)

Retrofit/single family residence/owner built/added south-facing greenhouse with passive type system (bottle wall) using water-filled jugs as collecotr and storage. Heat enters house through ducts located at top of greenhouse.

Building: Retrofit/single family residence/

System: Retrofit/space heating/passive type system (bottle wall) using south-facing greenhouse addition with water filled jugs and moveable insulation.

Collector: Approximately 120 ft^2/passive type south-facing bottle wall in lean-to greenhouse with single glazing of corrugated fibre-glass panels and moveable insulation.

Storage: Water filled jugs.

Auxiliary:

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$150			
Labor	$350			
Total	$500			

Performance: Heated greenhouse area vents at top into the house.

Additional Info: Construction funded by Point Foundation of San Francisco.

Source(s): Independent Journal (newspaper).

Hay (Skytherm)/Solar space heating and cooling ($) 1973

New construction/single family residence/contractor built/passive system using water-filled plastic bags on roof with movable, insulated panels/integrated collector, storage, distribution system.

Building: New/single family residence/1140 ft^2/one-story/oriented E-W/ exterior and partition walls of concrete blocks, interior filled with sand and exterior with vermiculite. Total cost of building (prototype) was $39,500.

System: New/SH and SC/passive type system/water-filled plastic bags on roof/movable, insulated panels/metal roof acts as ceiling, radiating (winter) or absorbing (summer) heat from interior.

Collector: 1200 ft^2/passive type system/9" of water in four transparent plastic (PVC) bags lying on metal roof between extruded aluminum tracks/insulated panels move in tracks above bags/ panels moved automatically by ¼ HP motor and chain-drive. Single "glazing" of PVC plastic sheet inflated above bags in winter, not in summer. Black PVC plastic sheet between bags and metal roof. Roof (ceiling) is ribbed steel, with 12 ft spans.

Storage: 6300 gallons (26 tons) of water in plastic bags on roof/ thermal mass of house provides additional storage.

Auxiliary: None

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: Allowing for moderate temperature fluctuation, system provided 100% of required heating and cooling during 1973-1974. Performance evaluated by Cal Poly, San Luis Obispo.

Additional Info: Winter: bags uncovered during day/sun heats water/ bags covered at night to retain heat/ceiling (roof radiates heat to interior. Summer: bags uncovered at night/cool night air and sky cools water/bags covered during day/cool ceiling absorbs interior heat.

Source(s): Shurcliff; miscellaneous other articles

Hewlett Packard Plant/Sunnyvale/Solar space heating ($18,000) Fall 1973

Retrofit/165,000 ft^2 industrial plant/built by plant maintenance personnel/ gas backup. Roof mounted flat plate collectors (7,000 ft^2) retrofitted to existing terminal reheat system. Pumped water-circulating with water storage.

Building: Retrofit to existing industrial plant/165,000 ft^2. Collectors are mounted on flat roof of the building.

System: Retrofit/space heating/roff mounted flat plate collectors/pumped water-circulating to storage/heat distributed by existing terminal reheat system. System designed by Mac McFee, Plant Facilities Manager, Hewlett Packard.

Collector: 7000 ft^2/flat plate collector/single glazing of Tedlar coated fiberglass. (Filon Weatherside 548). Collectors (8 ft by 33 inches) are wood-framed aluminum Rollbond panels, with 1 inch Celotex insulation, connected in series with CPVC plastic pipe.

Storage: 12,000 gallon steel tank (used oil storage tank) buried underground (uninsulated). Plan to add 50,000 gallon additional storage.

Auxiliary: Existing gas-fired boiler.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$18,000			
Labor				
Total	$18,000			

Performance: Gas savings are $1,000 - $2,000 per month as determined from gas bills. Data on gas consumption (1972 - 1976) available from Mac McFee.

Additional Info: System constructed by plant maintenance personnel as "low priority task", collector components purchased at lower bulk-purchase rate. Existing system adjusted to operate at 120° F.

Source(s): Marshall Merriam, Mac McFee

HFCR/Davis/Solar hot water heating ($) Sept. 1976

New construction/single family residence/contractor built/ gas backup/ roof mounted flat plate collector/thermosiphon/water circulating/with water storage.

Building: New/single family residence/1169 ft^2. Wood frame construction on slab floor. Part of a subdivision of solar tempered houses with solar hot water heating option, and optional solars pace heating and cooling.

System: New/HWH/flat plate collector/water circulating/thermosiphon/ with water storage. System designed by J. Hofacre, built by M. Corbett (with owner).

Collector: 80 ft^2/water circulating flat plate/single "Kalwall" brand glazing. "Sunburst" brand panels glazed with single layer of .040 "Kalwall" brand (premium).

Collector built by Natural Heating Systems, Davis, CA.

Storage: 82 gallon storage tank in attic.

Auxiliary: 40 gallon gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance:

Additional Info: System provides preheated (solar-heated) water, from 82 gallon storage tank to conventional heater, which may be bypassed.

Source(s): John Hofacre/Living Systems.

HCHC/Chico/Solar space heating and cooling ($4,000 estimated) late 1976

New construction/single family residence/contractor built/wood backup. Passive-type system using south-wall windows with 21-inch-diameter steel tubes (water filled) and moveable insulation.

Building: New/single family residence/1600 ft^2.

System: New/space heating and cooling/passive-type system using south-wall windows and water-filled, metal tubes with moveable insulation.

Collector: About 300 ft^2/passive-type system using 21-inch-diameter galvanized culvert tubes (water filled).

Storage: About 1,000 gallons water in water-filled steel tubes.

Auxiliary: Woodstove.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$4,000 (estimated)			

Performance: Not completed.

Additional Info: $40,000 estimated for house.

Source(s): John Hammond

HCHC/Chico/Solar hot water heating ($1,000 estimated) late 1976

New construction/single family residence/contractor built/electric backup. Flat-plate collector/water circulating/thermosiphon/with water storage.

Building: New/single family residence/1600 ft^2.

System:

Collector: 70 ft^2

Storage: 80 gallon.

Auxiliary: Electric hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$1,000 (estimated)			

Performance:

Additional Info: $40,000 estimated cost for house.

Source(s): John Hammond

HFCR/Davis/Solar space heating and cooling (estimate less than $1,000)* Sept. 1976

New construction/single family residence/owner-contractor built/ gas backup/passive system utilizing south facing windows with 50 gallon water filled drums, slab floor for storage, and moveable, insulating shutters.

Building: New/single family residence/1169 ft^2. Wood frame construction on slab floor. Part of a subdivision of solar tempered houses with solar hot water heating option; Contractor - M. Corbett.

System: New/space heating and cooling/passive-type system with water (water filled 50 gallon drums) and concrete (slab floor) storage. System designed by J. Hofacre, built by M. Corbett with owner.

Collector: 162 ft^2/passive type system with two south facing patio doors (12' x 6 ¾' each) and 20 water-filled 50 gallon drums. Collector windows will have insulated (moveable) shutters or insulated glass.

Partially owner built/partially contractor built (M. Corbett).

Storage: 20 @ water filled 50 gallon drums (estimated 40,000 BTU capacity), plus exposed slab floor and interior partition thermal mass (estimated 50,000 BTU capacity).

Auxiliary: 55,000 BTU/hr forced air gas furnace and Franklin fireplace (heating). No auxiliary cooling unit.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total (estimate less than $1,000)*				

Performance: ---

Additional Info: Located at 38° North Latitude (N 01° 13' 35" E, 488° 46' 25" W). Residence has seven rooms: three bedrooms, one bath, kitchen, living room, dining room. *Costs for system (drums, insulated shutters) not yet determined.

Source(s): John Hofacre

HMND/Winters/Solar space heating and cooling ($500) Summer 1974

Retrofit/single family residence/owner built/gas and wood backup. Passive type system/south wall, water-filled 55 gallon drums inside vertical window wall/with moveable insulation.

Building: Retrofit/single family residence/1200 ft^2. Remodeled farmhouse, frame construction with slab floor.

System: Passive type system. Water-filled drums inside south facing window-wall collect and store heat during daytime, radiating heat to house at night. Same drums mediate summer heat by using thermal mass and night sky radiation.

Collector: 200 ft^2/passive type (Baer system) utilizing water-filled 55 gallon drums inside vertical, south-facing (single glazed glass) windows. Moveable insulation (sliding panels) consists of three layers of reflective foil.

Storage: 15000 lbs water in 55 gallon drums (32). Also slab floor.

Auxiliary: Gas stove and wood burning stove.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$500 (approx)			
Labor				
Total	$500			

Performance: Woodstove, only backup, required ½ cord of wood in winter of 1974 - 1975 and ¼ cord wood in 1975 - 1976.

Additional Info: House also has solar hot water heater (50 square foot flat plate collector with 80 gallon storage tank).

Source(s): John Hammond

HNMN/Sunnyvale/Solar space and hot water heating ($) October 1975

Retrofit/single family residence/contractor built/gas backup. Tube-in-plate flat plate collector/pumped/water circulating/with water storage. Integrated space heating and hot water heating system.

Building: Retrofit/single family residence/2000 ft^2/oriented E-W. (an Eichler home).

System: Retrofit/SH and HWH/flat plate collector/pumped/water (with additives*) circulating/with water storage. System is integrated with existing radiant floor heating system/fully automatic controls (except for auxiliary). System designed and built by Alten Associates, Santa Clara, CA.

Collector: 350 ft^2/water circulating/flat plate/double glazing of Tedlar/R-11 foil backed insulation. Absorber is Olin Brass Company Rollbond aluminum plate. Collectors mounted on and integrate well with existing roof.

Storage: 1000 gallon steel tank/2/3 below ground/storage water doesn't circulate - three heat exchangers in tank, one from collectors, one for space heating, and one for domestic hot water.

Auxiliary: regular gas furnace and hot water heater/intentionally manually controlled.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: 60% of heating.

Additional Info: Closed collector fluid loop containing water/corrosion inhibitors/antifreeze solution. CPVC pipe and Al heat exchanger used - no Cu in system. 1/200 HP pump for domestic hot water system, 1/6 HP pumps for space heating and domestic hot water systems.

Source(s): Klaus Heinemann (Alten Associates)

HSR - MFR /Davis/Solar hot water heating ($950) April 1976

New Construction/Single Family Residence/Contractor built/Gas backup.
Roof mounted tube on plate/flat plate collector/thermosiphon.
Water circulating/with water storage.

Building: New/Single Family Residence/1157 ft^2. Wood frame construction on slab floor. Part of a subdivision of solar tempered houses with solar hot water heating option, and optional solar space heating and cooling.

System: New/HWH/flat plate collector/water circulating/thermosiphon/with water storage. System designed by J. Hofacre, built by M. Corbett.

Collector: 60 ft^2/water circulating flat plate/single glass glazing ½ inch copper risers manifolded to 1¼ inch headers, soldered to 22 gauge galvanized steel sheet on 4 inch centers. Collector built by Natural Heating Systems, Davis, California.

Storage: 82 gallon galvanized storage tank located in attic.

Auxiliary: 40 gallon gas water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$627 (est)			
Labor	$323 (est)			
Total	$950 (est)			

Performance: 70% load estimated.

Additional Info: 38.5° North latitude.

Source(s): John Hofacre/Natural Heating Systems, 207 Cortez Ave, Davis, CA 95616

HTN/Berkeley/Solar space heating ($900)

Retrofit/duplex residence and office/owner built/gas backup.
Roof mounted trickle-type (Thomason) collector/pumped/water circulating/ with water storage.

Building: Two-story duplex residence and office/2100 ft^2. Flat roof. Built in 1910.

System: Retrofit/space heating/trickle-type (Thomason) collector/ pumped/water circulating/with water storage.

Collector: 288 ft^2 (12' x 24')/water type/trickle system. Corrugated aluminum sheet (aluminum siding from Montgomery Ward) used for absorber plate/coated with flat black paint. Collector was originally single glazed (glass). Now testing various types and combinations of glazing.

Storage: Seven 55 gallon steel drums (385 gallon total) filled with water.

Auxiliary: Gas furnace.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$900	$2/ft ($580)		
Labor	(200 hrs)			
Total				

Performance: 58% of heating

Additional Info: Steel drums used for storage are connected by PVC plumbing and hose connections. Surfaces of drums act as heat exchanger. Furnace blower draws cooled return air through the room containing the drums and into the ducts of the regular forced air heating system.

Source(s): Owner

IRIS Images/Mill Valley/Solar hot water heating ($11,240) April 1976

Retrofit/commercial: film processing/contractor built/gas backup. Roof mounted tube-on-plate/flat plate collector/pumped water circulating/with water storage. Designed to provide large quantity of 100 degree hot water for immediate daytime use in film processing.

Building: Commercial building/5000 ft^2.

System: New/HWH/flat plate collector/pumped water circulating with water storage. System designed by Interactive Resources, Inc.

Collector: 640 ft^2/flat plate collector/single filon glazing. Absorber plate is tube on plate (Sunburst). Collector pressurized at city water pressure. System designed and built by Interactive Resources, Inc.

Storage: 360 gallon insulated storage tank.

Auxiliary: Gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$11,240			

Performance: System designed for commercial film processing to provide a peak load of 12 gallons per minute at 100° and average load of 6 gallons per minute.

Additional Info: Roof mounting required extra support structure ($3,000) to support weight, plus construction management fee.

Source(s): Dale Sartor, Interactive Resources, Inc., 30 Washington Avenue, Pt. Richmond, California.

IRVG Residence/Cotati (Sonoma County)/Solar hot water heating ($40) October 1974

Retrofit/mobile home/owner built/flat plate collector/electric backup/ thermosiphon/water circulating with water storage.

Building: Retrofit/mobile home/about 350 ft^2.

System: New/HWH/flat plate collector/water circulating (thermosiphon) with water storage. System designed and built by owner.

Collector: 15 sq ft/flat plate collector/with single glazing (tedlar). Collector consists of copper tubing, wired and soldered to metal plate in fibre-glass insulated box. Tilt is adjustable with seasons.

Storage: Standard 20 gallon water heater tank.

Auxiliary: Electric water heater (used in winter only: solar is only summer heat source).

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$45	0	0	
Labor	0	0	0	
Total	$45	$45	0	

Performance: 50% needs in winter (November 1 - May 1) 100% needs in summer (May 1 - November 1). Household consists of one person. Two years of performance data available.

Additional Info: System uses existing electric hot water heater as storage and supplement - electric heater operates only when insufficient solar hot water. In summer electric heater completely shut off (all hot water provided by solar collector).

Source(s): Owner.

ISC (Champion Homebuilders)/Various locations/Solar heating and cooling ($2600:96 ft^2, $3140:128 ft^2, $3780:160 ft^2) 200+ units

Modular mass-produced solar heating and cooling unit. Freestanding/air collector/with rock storage/attaches to forced air heating and cooling systems of existing or new structures.

Building: Reportedly over 200 have been sold for houses and mobile homes. Several houses in operation in California (San Jose, Napa).

System: Freestanding A-frame unit/air circulating/fans/with rock storage. Heat stored in rocks by circulating air is removed from storage to house interior as needed. Cooling: process is reversed, cooling rocks with night air and closing collector.

Collector: 96, 128, and 160 ft^2 models available/air-circulating flat plate/fans/double glazing of glass/reflector. Collector tilted 60 degrees on south face of A-frame structure. Aluminum absorber plate has open cylinders to divert air flow.

Storage: Rock storage (river bed rock must be obtained locally to specifications) cubic feet capacity is 225,310, and 400, respectively.

Auxiliary: Various. Most easily integrated with ducts forced air systems, either existing (retrofit) or new. Adaptible to other supplementary heating and cooling systems.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials (Whole unit):	(96 ft^2) $2600	(128 ft^2) $3140	(160 ft^2) $3780	
Labor (Installation)	500	550	600	
Total	$3100	$3690	$4380	

Performance:

Additional Info:

Source(s): Alternative Energy Co., Yountville, CA; Manufacturer's Literature; "Harnessing the Sun to Heat Your House", by J. H. Keyes.

JFFR/Kentfield/Solar space heating ( ) November 1975

New construction/single family residence/contractor built/gas backup. Roof mounted trickle-type collector/water circulating/pumped with water storage.

Building: New/single family residence/2300 ft^2. South-facing three-story house/insulation - walls (R-13) and ceiling (R-22)/double-glazed windows/oriented due south.

System: New/space heating/trickle-type collector/water circulating/thermostat controlled pump/with water storage. System designed by Interactive Resources, Inc., Richmond, CA.

Collector: 900 ft^2/trickle type/30° slope glazing of planar array of air-filled clear glass tubes (fluorescent-type). Absorber plate is corrugated aluminum sheet with black enamel surface. Fluid is softened water with no antifreeze or corrosion inhibitors. Controllable-rate (0 to 20 gpm) 3/4 HP pump feeds water to horizontal distribution pipe along top of collector.

Storage: 3,000 gallon rectangular (8½ ft x 8½ ft x 8 ft high) concrete tank in crawl space/R-27 foam insulation. 1/20 HP pump circulates hot water to two fan-coil systems.

Auxiliary: Gas-fired hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: 85% (predicted). Carry through: 3½ days (predicted).

Additional Info: Cooling: structure designed to exlude south summer sun/west windows of reflective glass/natural venting due to shape with fan assist.

Source(s): Shurcliff. Dale Sartor (Interactive Resources, Inc.)

JFFR/Kentfield/Solar hot water heating ($1,200) March 1976

New construction/single family residence/contractor built/electric backup. Roof mounted flat plate collector/water circulating/with water storage.

Building: New/single family residence/2300 ft^2.

System: New/HWH/flat plate collector/water-circulating/with water storage. System designed and built by Gary Gerber and John Vail of Interactive Resources, Inc.

Collector: 54 ft^2/water circulating flat plate/glazed with fluorescent tubes. Collector plate is copper tube on copper plate.

Storage: 100 gallon electric hot water heater tank.

Auxiliary: electric water heater (storage and auxiliary).

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$ 700	$250	$250*	$200
Labor	$ 500	$200	$ 0	$300
Total	$1,200	$450	$250	$500

Performance:

Additional Info: *See Shurcliffe (following page).

Source(s): Gary Gerber

LKS/Sacramento/Solar space heating and cooling and hot water heating
($) July 1976

New construction/single family residence/owner built/combination passive type system (south-facing Thermopane windows with concrete slab floor storage) and active type system (air type collector with rock storage). Separate water circulating flat plate collector with water storage for domestic hot water.

Building: New/single family residence/about 1752 ft^2/wood frame construction/concrete slab floor/8° rooms. Oriented 15° west of south.

System: New/SH and SC/combination passive system (south-facing, Thermopane-glazed windows with concrete slab floor storage and active system (air-circulating collector/collector with rock storage. Separate water circulating flat plate with water storage for domestic hot water.

Collector: Active: 400 ft^2/air-circulating flat plate collector/sheet metal absorbers/double glazed with (Kalwall) fiberglass.
Passive: 240 ft^2/south-facing windows/Thermopane glazing.
Hot water: water circulating flat plate.

Storage: 45 tons of 2-inch-diameter river rock/20' x 8' high x 5' concrete block storage bin/located in house. Concrete slab floor provides additional thermal mass. 50 gallon hot water heater storage.

Auxiliary: Forced air furnace/air conditioner.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: 70% (est.)

Additional Info: Estimated completion date - July 1976. Rocks in storage bin will be cooled at night during summer to provide daytime cooling.

Source(s): Owner

LNDQT Residence/Davis/Solar heating and cooling ($400 - $600 est.*) Summer 1976

New construction/duplex/contractor built/gas backup/passive-type system utilizing south facing windows and skylight with slab floor for storage and moveable insulation (shutters).

Building: New/duplex/1157 ft^2 plus 100 ft^2 loft. Wood frame construction on slab floor. Part of a subdivision of solar tempered houses with solar hot water heating option: Contractor - M. Corbett.

System: New/space heating and cooling/passive type system/with concrete (slab floor) storage.

Collector: 155 ft^2/passive type system/single glass glazing/with two sliding glass doors 6¾' x 12', 6¾' x 8 on south wall, one skylight 4' x 5' at 60 degree inclination on south facing roof. Slab floor serves as heat collector, moveable insulating shutters to be added.

Storage: 1157 ft^2 slab floor, interior brick wall, possible added thermal mass.

Auxiliary: 60,000 BTU forced air gas furnace ($400 - $600). No cooling backup considered necessary.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$400 - $600* estimated			

Performance: Currently being monitored. Thermocouples imbedded in walls, also slab floor between parquet and slab, between slab and gravel, below gravel

Additional Info: Insulation: R-19 wall, R-25 roof.

*Cost estimate is for moveable insulation on south facing glass skylight and doors.

Source(s): John Hofacre, owner.

MCF/San Jose/Solar hot water heating ($) May 1975

Retrofit/single family residence (owner built)/gas backup. Integrated system for space heating, hot water heating, and heating of swimming pool.

Building: Retrofit/single family residence/2100 ft^2.

System: Retrofit/space heating and hot water heating/pumped water-circulating to storage/heat exchanger in storage transfers heat to hot water tank.

Collector: 533 ft^2/water circulating flat plate/single, Tedlar-coated fiberglass glazing. Collector panels are Rollbond panels.

Storage: Heat exchanger in 1,000 gallon water storage tank.

Auxiliary: Gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance:

Additional Info: Heated water delivered from collectors is stored in rectangular tank located in garage. Three separate heat exchangers located in storage tank provide heat for 1) space heating 2) hot water heating 3) swimming pool.

Source(s): Owner.

MLS/Valley Center/Space heating and cooling and hot water heating ($) May 1975

New/single family residence/contractor built/electric backup. Roof-mounted flat plate collector/pumped-water circulating/with water storage. Integrated solar system for space heating, space cooling, and hot water heating (heat exchanger in storage tank).

Building: "New/single family residence/3600 ft^2. Two-story house.

System: *New/SH and SC and HWH
System designed by J. Schultz.

Collector: *500 ft^2/tube-on-plate flat plate collector/single glazing of Tedlar coated fibreglass.

Storage: Two 1200 gallon concrete tanks (water-filled).

Auxiliary: *Heat pump and electric hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: *

Additional Info: *See following page from Shurcliffe.

Source(s): Shurcliffe

LNDQT Residence/Davis/Solar hot water heating ($950) March 1976

New construction/duplex/contractor built/gas backup/roof mounted copper tube on plate/flat plate collector/thermosiphon/water circulating/with water storage.

Building: New/duplex/1157 ft^2 plus 100 ft^2 loft. Wood frame construction on slab floor. Part of a subdivision of solar tempered houses with solar hot water heating option: Contractor - M. Corbett.

System: New/HWH/flat plate collector/water circulating/thermosiphon with water storage. System designed by Natural Heating Systems, built by M. Corbett.

Collector: 60 ft^2/water circulating flat plate/single glass glazing ½ inch copper risers manifolded to 1¼ inch headers, soldered to 22 gauge galvanized steel sheet on 4 inch centers. Collector designed and built by Natural Heating Systems, Davis, CA.

Storage: 82 gallon storage tank in attic.

Auxiliary: 40 gallon gas water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$627			
Labor	$323			
Total	$950			

Performance: Anticipate 80% of hot water provided by solar. Currently being monitored in detail by UC Davis ME department and designers, particularly for reverse thermosiphon effect.

Additional Info: 82 gallon storage tank provides make-up water to conventional heater which can be bypassed. Home cost less than $35,000 total.

Source(s): John Hofacre, Natural Heating Systems, Davis, CA.

MCF/Solar space heating ($) May 1975

Retrofit/single family residence/owner built/gas backup. Integrated system for space heating, hot water heating and heating of swimming pool.

Building: Retrofit/single family residence/2100 ft^2.

System: Retrofit/space heating and hot water heating/pumped water-circulating to storage/heat exchanger in storage tank transfer heat to space heating system.

Collector: 533 ft^2/water-circulating flat plate collector/single Tedlar-coated fiberglass glazing. Collector panels are Rollbond panels.

Storage: Heat exchanger in 1,000 gallon water storage tank located in garage.

Auxiliary: Gas (forced air) furnace.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance:

Additional Info: Heated water delivered from collectors is stored in rectangular tank located in garage. Three separate heat exchangers located in storage tank provide heat for 1) space heating 2) hot water heating 3) swimming pool.

Source(s): Owner

NHSR/Occidental/Solar space heating and cooling ($400) May 1976

New construction/single family residence/owner built/electric backup. Passive type system with double-glazed south-facing windows and slab floor, moveable insulating shutters. Greenhouses on east and west of house, north exposure bermed (wine cellar).

Building: New/single family residence/900 ft^2. Greenhouses on east and west of house, north wall bermed (wine cellar).

System: New/space heating and cooling/passive-type system (south-facing double glazed windows with insulated shutters, and slab floor). Flat plate system may be added later (if necessary).*

Collector: 192 ft^2/passive-type system with south-facing windows (12' x 16') and slab floor/double-glass glazing (thermopane). Collector windows have insulated shutters. Greenhouses on east wall and west of house contribute to solar heating.

Storage: Concrete slab floor dyed red-brown.

Auxiliary: Wood burning, electric resistance.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$400			
Labor	$ 0			
Total	$400			

Performance:

Additional Info: *Active solar heating system may be added later: 400 ft^2 flat plate collectors, 1500 gallon concrete storage tank. (Estimated cost - $3,000 for materials.)

Source(s): Dale Sartor, Interactive Resources, Inc.

NHSR/Occidental (Sonoma County) Solar hot water heating ($600) May 1976

New construction/single family residence/owner built/electric backup. Tube-on-plate flat plate collector/water circulating/with water storage.

Building: New/single family residence/900 ft^2. Building designed by Interactive Resources, Inc.

System: New/HWH/flat plate collector/water circulating/with water storage. System designed by Interactive Resources, Richmond, CA.

Collector: 40 ft^2/water circulating flat plate/single glazing. Absorber plate consists of copper tubes on aluminum fins.

Storage: 120 gallon hot water tank.

Auxiliary: 120 gallon electric hot water heater with bottom element removed.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$600			
Labor	$ 0			
Total	$600			

Performance:

Additional Info:

Source(s): Dale Sartor, Interactive Resources, Inc.

RDBS Residence/Sausalito/Solar hot water heating ($930) April 1976

New construction/single family residence/owner and contractor built/gas backup. Combined space and hot water heating. Tube-on-plate flat plate collector/pumped water circulating/with water storage.

Building: New/single family residence/2300 ft^2.

System: New/SH and HWH/pumped water circulating with water storage. System designed and built by Interactive Resources, Inc., with owner.

Collector: 80 ft^2/water-circulating flat plate/
Absorber plate is copper tube on aluminum fins (Sunburst).

Storage: 120 gallon insulated tank.

Auxiliary: Gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$930	$400	$170	$360
Labor				
Total				

Performance:

Additional Info: Partially owner-built and partially contracted: labor estimates are for system if entirely contracted (no owner participation).
Labor: 52 skilled man hours

Source(s): Dale Sartor, Interactive Resources, Inc.

RDBS/Sausalito/Solar space heating ($4,160) April 1976

New construction/single family residence/owner and contractor built/ gas backup. Space and hot water heating. Tube on plate flat plate collector/pumped water circulating/with water storage.

Building: New/single family residence/2300 ft^2.

System: New/SH and HWH/flat plate collector/pumped water circulating with water storage. System designed and built by Interactive Resources, Inc. with owner.

Collector: 640 ft^2/water circulating flat plate. Absorber plate is copper tube on aluminum fins (Sunburst).

Storage: 4,000 gallon cast in place concrete tank, 3 inch foam (R-26) insulation and Hypalon lining.

Auxiliary:

Cost:

	Solar:	Collector:	Storage:	Other:
Materials	$4,160	$2,560	$500	$1,100
Labor				
Total				

Performance:

Additional Info: *Approximately 208 man hours (skilled labor).

Source(s): Dale Sartor, Interactive Resources, Inc.

RTN Residence/Davis/Solar hot water heating ($1,500) December 1, 1975

New construction/single family residence/contractor built/electric backup. Tube on plate flat plate collector/thermosiphon/water circulating with water/with water storage.

Building: New/single family residence/3076 ft^2. (12 rooms)
Solar tempered building - M. Corbett, Contractor.

System: New/HWH/flat plate collector/water circulating/thermosiphon/ with water storage. System designed by Natural Heating Systems, Davis, CA.

Collector: 100 ft^2/water circulating flat plate/single glass glazing. ½ inch copper risers bonded to 22 gallon steel plate on 4 inch centers.

Storage: 82 gallon galvanized steel tank.

Auxiliary: Two 40 gallon electric hot water heaters.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$1,066			
Labor	$ 434			
Total	$1,500			

Performance: 80% estimated.

Additional Info: Solar tempered residence.

Source(s): John Hofacre, Dave Springer.

RYN Residence/Jenner (Sonoma County)/Solar space heating ($) August 1976

New construction/single family residence/contractor built/electric backup. Free-standing Rollbond flat plate collector/pumped/with water storage. Integrated space heating and hot water heating.

Building: New/single family residence/3400 ft^2.

System: New/integrated space heating and hot water heating/pumped/with water storage/radiant heating system in floor slab. Also passive type system utilizing south-facing windows and inferior thermal mass. Designed by Berkeley Solar Group.

Collector: 400 ft^2/water circulating flat plate/single glazing of Tedlar coated fiberglas/copper Olin Brass Rollbond absorber plates used for collector in free-standing unit attached to fence on south side of house. Additional passive heating through 400 ft^2 of double-glazed south-facing windows.

Storage: 1100 gallon concrete tank. Separate 100 gallon tank for domestic hot water with thermosiphon coil in main storage tank. Interior masonry partition wall adds thermal mass (estimated capacity of 100,000 Btu) for passive system storage.

Auxiliary: Electric baseboard heater, woodstove.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance: Not completed.

Additional Info: Heat delivery via radiant slab.

Source(s): Berkeley Solar Group, Berkeley, CA.

Santa Clara Community Recreation Center/Santa Clara Solar space heating and cooling ($436,000) early 1976

New construction/recreation center/contractor built/gas backup.
Roof mounted flat plate collectors/pumped/water circulating/with water storage.

Building: New*/recreation center/27,000 ft^2. Walls are 8" concrete, no additional insulation.

System: New*/space heating and cooling/flat plate collector/water circulating. Rooms heated by fan-coil system.

Collector: 6500 ft^2/pumped/circulating fluid is water and 10% propylene glycol/flat plate collector/double glazed. Absorber plates are copper Olin Brass Rollbond panels with selective black surface coating. Collector panels were constructed by Amete Company and slope 18° from horizontal.

Storage: 10,000 gallon ylindrical steel hot water tank, insulated with plastic foam and located underground.

Auxiliary: 1,200,000 BTU/hr gas-fired boiler.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$436,000≠ (heating and cooling)			

Performance: 84% (predicted). Carryover of three days (predicted).

Additional Info: *New building, but decision to install solar system was made after building was basically designed.
≠$101,000 feasibility study.
Cooling: two 25-ton Arkla LiBr absorption chillers provide cooling, powered by hot water from solar on auxiliary systems. 50,000 gallon cylindrical steel chilled water storage tank, insulated with foam and located underground. 65% performance predicted.

Source(s): Shurcliff

Santa Clara Recreation Center/Santa Clara/Solar space heating and cooling ($436,000) early 1976

New construction/recreation center/contractor built/gas backup.
Roof mounted flat plate collectors/water circulated by pumps/to water storage.

Building: *New/recreation center/27,000 ft^2.

System: *New/space heating and cooling/flat plate collector/water circulating.

Collector: *6500 ft^2/water circulating flat plate/double glazed with selective black coating. Collector panels are copper Olin Brass Company Roll-Bond panels with fibre-glass insulation. Collector panels constructed by Ametele Company.

Storage: *50,000 gallon cylindrical steel chilled water tank, insulated foam and situated underground.

Auxiliary: Two 25 ton Arkla Li Br absorption chillers, powered by gas boiler.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$436,000 (heating and cooling)			$101,000 (feasibility study)

Performance: 65 % cooling needs (predicted).

Additional Info: *See following page from Shurcliffe.

Source(s): Shurcliffe

Santa Clara Community Recreation Center/Santa Clara Solar space heating and cooling ($436,000) early 1976

New construction/recreation center/contractor built/gas backup.
Roof mounted flat plate collectors/pumped/water circulating/with water storage.

Building: New*/recreation center/27,000 ft^2. Walls are 8" concrete, no additional insulation.

System: New*/space heating and cooling/flat plate collector/water circulating. Rooms heated by fan-coil system.

Collector: 6500 ft^2/pumped/circulating fluid is water and 10% propylene glycol/flat plate collector/double glazed. Absorber plates are copper Olin Brass Rollbond panels with selective black surface coating. Collector panels were constructed by Amete Company and slope 18° from horizontal.

Storage: 10,000 gallon ylindrical steel hot water tank, insulated with plastic foam and located underground.

Auxiliary: 1,200,000 BTU/hr gas-fired boiler.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$436,000≠ (heating and cooling)			

Performance: 84% (predicted). Carryover of three days (predicted).

Additional Info: *New building, but decision to install solar system was made after building was basically designed.
≠$101,000 feasibility study.
Cooling: two 25-ton Arkla LiBr absorption chillers provide cooling, powered by hot water from solar on auxiliary systems. 50,000 gallon cylindrical steel chilled water storage tank, insulated with foam and located underground. 65% performance predicted.

Source(s): Shurcliff

Scottys Castle/Death Valley/Solar heating and solar hot water heating ($) 1929

New construction (1929)/Residence/backup not specified.
Tube on plate/flat plate collector/water circulating/with water storage.

Building: Two and one-half story residence.

System: New (1929) HWH and SH/flat plate collector/water circulating, with water storage. Building designed by M. Alexander McNeilledge.

Collector: Included (per unconfirmed report) two arrays: one high above ground and one close to ground. Each included many parallel, black painted, 3/4 inch diameter pipes behind glass.

Storage: "Large reservoir of water (in basement?)".

Auxiliary:

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance:

Additional Info: System probably of type on pp. 55-59 in Brooks, "Solar Energy and Its Use for Heating Water in California" (1936).

Source(s): Shurcliffe, "Brief Survey of Solar-Heated Houses,

Self-Help Enterprises/Visalia/Solar space heating and cooling ($4,000) late 1976

New construction/single family residences (5)/owner and contractor built. Passive-type system/(Skytherm) design/integrated collection and storage/ roof-top water bags/with moveable insulation.

Building: New/single family residences (5)/1200 ft^2. Part of new 45 unit tract of housing

System: New/space heating and cooling/passive type system (Skytherm)/ integrated collection and storage utilizing water-filled plastic bags on roof with moveable insulated covers/metal roof acts as ceiling, radiating or absorbing heat from interior. System designed by Harold Hays.

Collector: 1200 ft^2/passive type/water-filled plastic bags on roof/with moveable insulated panels above.

Storage: Water-filled plastic bags on roof/12-inch depth.

Auxiliary:

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$4,000*			

Performance: Performance of Hays (Skytherm) system has been extensively analyzed.

Additional Info: *Not yet constructed. Will be owner and contractor built. Estimate is difference between cost of solar houses and conventional counterparts in the same tract. For operation of system, see "Hay".

Source(s): Bill French, Self-Help Enterprises

SHWD/Winters/Solar space heating and cooling ($4,000) April 1975

New construction/single family residence/contractor built/gas and wood backup. Passive type system/roof-mounted, water-filled tanks with movable, insulated, reflective lids/south-facing with insulated shutters/ slab floor and water-filled drums.

Building: New/single family residence/1250 ft^2/exposed concrete floor slab/open interior plan (walls don't go to the ceiling, except in bedroom and two bathrooms)/galvanized sheet metal roof/all windows have insulated shutters. total cost of $27,000.

System: Passive type using both roof mounted, open metal tanks containing water-filled plastic bags with movable, insulated, reflective lids, and south-facing windows with insulated shutters and slab floor plus water-filled steel drums for storage.

Collector: 400 ft^2/passive type (modified Skytherm)/galvanized steel roof-mounted open tanks containing 300 ft^3 of water (7 tons) in 9" deep plastic bags/covered by 6 insulated, reflective (aluminum foil on underside) lids, each 8' x 8'/raised by hydraulic ram. South facing windows/with sliding interior shutters (styrofoam insulated) or hinged, folding interior shutters (fiberglas insulated).

Storage: Water-filled plastic bags/300 ft^3/in roof-mounted open tanks. Concrete floor slab. Twelve 55-gallon water-filled steel drums.

Auxiliary: Gas wall heater (50,000 Btu)/small wood-burning heater in bedroom/30" Franklin fireplace. No auxiliary for cooling.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$4,000		$1,000 (shutters and drums)	

Performance: Gas wall heater and wood-burning heater never used. Franklin fireplace used occasionally for brief periods. Estimate 95% solar heated and cooled.

Additional Info: Winter: lids open during day/sun warms water in tanks/lids closed at night to retain heat/bottom of tanks is exposed to interior, acting as part of ceiling/heat radiates to interior. Summer: operation reversed/lids open during night/water cooled by night air/lids closed during day/cool bottom of tanks absorb heat from interior. Metal roof reflects sun in summer or directs additional sunlight onto reflective underside of lids in winter.

Source(s): Owner; John Hammond (Living Systems)

SMT Residence/Aptos/Solar hot water heating ($2060) July 1975

Retrofit/single family residence/contractor built/electric backup.
Flat plate collector/pumped/water circulating/with water storage.

Building: Retrofit/single family residence/3000 ft^2 (approx.)

System: Retrofit/HWH/flat plate collector/water circulating/pumped/ with water storage. System designed and constructed by Berkeley Solar Group.

Collector: 56 ft^2/water circulating flat plate/single glazing of tedlar coated fiberglas. Collector consists of copper Olin Rollbond absorber plates in shop-fabricated insulated wood frame.

Storage: 100 gallon converted gas water heater tank.

Auxiliary: Electric hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$1,260			
Labor	$ 800			
Total	$2,060			

Performance: To be instrumented by PG&E.

Additional Info:

Source(s): Berkeley Solar Group, Berkeley, CA.

SPHS/Berkeley/Solar hot water heating ($1,200) June 1976

New construction/single family residence/contractor built/electric backup. Tube on plate flat plate collector.

Building: New/single family residence/2500 ft^2/three bedrooms, two baths, living room, study, dining room, kitchen.

System: New/HWH/flat plate collector/pumped with water storage. Designed by Gary Gerber.

Collector: 60 ft^2/copper tube on aluminum plate, fylon glazing, urethane insulation. Mounted on 50° roof, south facing.

Storage: 120 gallon solaraide storage

Auxiliary: Electric: 6000 watt element in storage tank.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$ 700	275	225	200
Labor	$ 500	200	-	300
Total	$1,200	475	225	500

Performance:

Additional Info:

Source(s): Gary Gerber

TRK/Santa Rosa/Solar hot water heating ($1,200) Summer 1976

Retrofit/single family residence/contractor built/electric backup. Integrated system installed with new swimming pool to provide pool heating, space heating, hot water heating, and spa heating. Uses water to air heat pump from swimming pool.

Building: Existing residence.

System: Retrofit/HWH/flat plate collector/pumped water circulating with water storage.

Collector: 50 ft^2/water circulating flat plate/single glass glazing Raypack collector.

Storage: 120 gallon hot water tank with bottom element disconnected.

Auxiliary: 120 gallon electric HWH.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$1,200			

Performance:

Additional Info:

Source(s):

TRK/Santa Rosa/Solar space heating ($) Summer 1976

Retrofit/single family residence/contractor built/electric backup. Integrated system installed with new swimming pool to provide pool heating, space heating, hot water heating, and spa heating. Uses water to air heat pump from swimming pool.

Building: Existing residence.

System: Retrofit/space heating/flat plate collector/pumped water circulating to swimming pool. Heat pump transfers heat from swimming pool to house.

Collector: 440 ft^2/flat plate collect/unglazed. Absorber plate is tube on plate (Raypack).

Storage: Swimming pool (covered in water).

Auxiliary: Electric heat pump (forced air).

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total				

Performance:

Additional Info: Forced-air heat pump system using water to air heat pump. Warm water fed from solar heated swimming pool (covered during winter).

Source(s):

WRD Residence/Davis/Solar hot water heating and space heating ($3,510 SH & HWH)
July 1974

New construction/single family residence/contractor built/gas backup. Roof mounted sandwich type flat plate collector/thermosiphon/water circulating/with water storage. Also passive type system (windows with movable insulation). Integrated space heating and hot water heating.

Building: New/single family residence/one story/1200 ft^2/three bedrooms and one bath/wood frame construction on 6" concrete slab. 175 ft^2 of south-facing windows (80% of south wall). Oriented 12° E of S. Built by M. Corbett.

System: New/HWH and SH/sandwich type flat plate collector/water circulating/thermosiphon/with water storage. Heat distributed by radiant heating system in concrete floor. System designed by Natural Heating System, Davis, CA. Additional space heating provided by passive system (175 ft^2 of south-facing windows with movalbe styrofoam insulation 1" thick).

Collector: 200 ft^2/water circulating flat plate/double glazing of glass. Absorber plate is 18 gauge galvanized steel sandwich panel formed, riveted, and soldered together; flat black paint/on 60° tilt/manifolded to storage tank w/2" CPVC and heater hose connections. Collector manufactured by Natural Heating Systems, Davis, CA.

Storage: 200 gallon galvanized steel water tank in attic. Additional storage provided by concrete slab (radiant floor) insulated from ground by urethane foam. 20 gallon tank inside main storage tank acts as heat exchanger and storage for domestic hot water system.

Auxiliary: Franklin wood stove and gas wall heater; gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials	$2,474.20	(for HWH and space heating)		
Labor	1,036.55	(for HWH and space heating)		
Total	$3,510.75	(for HWH and space heating)		

Performance: 70% estimated; 80% measured

Additional Info: HWH system can operate as preheater or sole supplier of domestic hot water. Main storage tank is 1' above top of collector so backsiphons to prevent freezing. 1/12 HP pump sends hot water from storage to slab radiant system (6 zones) of ½" copper pipe.

Source(s): Dave Springer and John Hofacre (Natural Heating Systems); Shurcliff

WTMN/Sacramento/Solar space heating, cooling and hot water heating ($6,000) January 1976

Retrofit/single family residence/contractor built/gas backup. Roof mounted/flat plate collector/pumped/water circulating/with water storage. Integrated space heating, cooling, and hot water heating system.

Building: Retrofit/single family residence/2100 ft^2. Four bedrooms, three baths, two-story residence. Ceiling insulation R-19, walls R-7-10. Roof stove faces east. Separate support structures for collectors built on sloping roof of house and on flat roof of patio.

System: Retrofit/SH and HWH/flat plate collector/water circulating/pumped/with water storage. System integrated with forced air heating system. System designed by Alten Associates, Santa Clara, CA.

Collector: 381 ft^2/water circulating/flat plate collector/double Tedlar glazing. Absorber is Olin Brass Company Rollbond copper plate. Collectors mounted on separate support structures built on sloping roof of house and flat roof of patio, at 42° and 45° tilts, respectively.

Storage: Two 1,000 gallon steel tanks*, insulation, located in garage.

Auxiliary: Gas furnace/forced air heating system; gas hot water heater.

Cost:

	Solar:	Collector:	Storage:	Aux./Other:
Materials				
Labor				
Total	$6,000			

Performance: 80-90% (est.). Monitoring: tank temp., panel temp., ambient temp., house temp., and wind velocity (planned).

Additional Info: *System financed by credit union on 15 year loan ($67.50/month) Tanks open to atmosphere. 1/8 HP pump fills collector circuit/atmospheric pressure holds water up/pump merely overcoming friction. Air bled into top of system to drain. Copper tube and aluminum fin heat exchanger delivers heat to conventional ducting system.

Source(s): Owner. NCSEA Solar Building Register.

APPENDIX C

Data On Buildings

by

E. P. Kahn

and

V. A. Adams

C1. Building Stock Estimates

C2. Unit Energy Consumption Data for Non-Residential Buildings

C3. Derivation of Percentage Savings for 1980 Construction

APPENDIX C1 - BUILDING STOCK ESTIMATES

Stock of Commercial Buildings (1975)

Retail Stores 890×10^6 ft^2
(5 largest SMSA's = 614×10^6 ft^2 and 69% of population)
(from Commercial Construction Markets Survey July, 1975)

Office Buildings 630×10^6
(5 largest SMSA's = 435×10^6 ft^2 and 69% of population)
(from Commercial Construction Markets Survey July, 1975)

Total stock estimates for retail stores and office buildings were derived by summing the stock in the five largest SMSA's and scaling this number up to the entire state by population. To allocate schools and hospitals regionally, we also use population data. The relevant information from the 1975 California Statistical Abstract is listed below.

	Population	Percent of State
Total State	21,113,000	
SMSA's		
Los Angeles	6,970,000	33
Orange County	1,694,000	8
San Diego	1,571,700	7
SF-Oakland Total	3,123,000	15
San Francisco	667,000	
Alameda	1,086,600	
Marin	213,800	
San Mateo	571,100	
Contra Costa	584,900	
Santa Clara	1,190,000	6

Schools 566×10^6

Public Schools K-12	= 410	Bureau of School Facilities Planning, CA Dept. of Education
Community Colleges	= 38	Div. of Facilities Planning, CA Community Colleges
UC	= 32	UC - Vice President of Administration
CA State Univ. System	= 29	Facilities Planning
Private Elementary and Secondary	= 32	Estimated by portion of enrollment 8% of public
Independent Colleges	= 25	Estimated by enrollment (148,000 vs 122,600 for UC)
	566	

Hospitals 187×10^6

Estimated from number of beds as follows (CA Stat. Abstract 1975):

General Hospitals	$94{,}025 \times 10^3$ ft^2/bd	$= 94.0 \times 10^6$
Psych. Hospitals	$12{,}832 \times 600$ ft^2/bd	$= 7.7 \times 10^6$
Nursing Homes, Community and Residential Care	$168{,}726 \times 500$ ft^2/bd	$= 84.4 \times 10^6$
Day Care	$140{,}708 \times 35$ ft^2/bd	$= 1.1 \times 10^6$
		187.2

ft^2/bd estimates from
Karl Guttman, Kasin, Guttman Associates
California Department of Health

Government Buildings

Military Navy and Marines	154,298,185	Western Division Naval Facilities Engineering Command San Bruno, CA
Army Air Force	60,637,000 145,613,000	David Long Chief, Real Estate Division Corps of Engineers So. Pacific Division 630 Sansome Street San Francisco, CA 94111
Federal Government GSA Controlled	11,833,000 ft^2	Ernest Garbarino, Acting Chief Assignment and Utilization Branch Space Management Division US-GSA Region 9 525 Market Street San Francisco, CA 94105
Post Offices	6,956,785 ft^2	A. A. Peter Jr. Real Estate & Buildings Dept. Western Regional Mg. U.S. Postal Service San Bruno, CA 94099
State of California	7,113,583	Mike Langeley Building and Grounds Division Department of General Services Sacramento, CA
Department of Motor Vehicles	719,779	Mike Squyer Facilities Coordination DMV
Employment Development Department	680,000	Scott Slatterbeck Business Services Division EDD

City and County Governments

County Government (est.)	62,000,000 ft^2
City Government (est)	22,000,000 ft^2
TOTAL	469,200,000 ft^2

County Estimate

Urban Counties 2.8 ft^2/person

L. A. County Gross Estimate

35,000,000 ft^2

William Allen
Space Management
Facilities Department
L.A. County Government

Leased 11,000,000

24,000,000 including county hospitals

Separating county hospitals

4528 beds in general hospitals (x 1000 ft^2/bed)
556 beds in extended care (x 500 ft^2/bed)

Implies 4,806,000 ft^2 over counted

NET 19,200,000 ft^2, population = 6,929,600 (1-1-75)

Rural Counties: Stanislaus County

828,000 ft^2

population = 213,600
(1-1-75)

Howard Selby
Building and Grounds Department
Stanislaus County
P. O. Box 3404
Modesto, CA

Estimated 4.0 ft^2/person

$$\text{Total County} = 2.8\ (15 \times 10^6) + 4.0(5 \times 10^6)$$
$$= 62 \times 10^6\ ft^2$$

City Government estimated as 1 ft^2/person.

Hotels

Rand (1970) estimate		200×10^6		
Construction (1971-74)	74	5.0	=	9.8 $(\frac{6.6}{12.9})$
	73	9.0	=	16.9 $(\frac{7.8}{14.7})$
	72	7.6	=	14.0 $(\frac{7.5}{13.8})$
	71	5.4	=	8.9 $(\frac{6.9}{11.4})$
		227×10^6		

Construction estimate = (total Hotel & Motel-Region VIII) $\frac{\text{CA Bldg. value in year i}}{\text{Total Bldg. value in year i}}$

from F. W. Dodge Region VIII Bulletin.

APPENDIX C2

Table A - Dubin, Long Island Study

SUMMARY OF UNIT ENERGY CONSUMPTION DATA FOR NON-RESIDENTIAL BUILDINGS, IN KWH (ELECTRIC), PER SQUARE FOOT, PER YEAR

	1970	1975	1980	1985	1990	1995
Manufacturing						
1. Lighting	5.0	5.0	5.0	5.0	5.0	5.0
2. Electric cooling	3.2	3.2	3.2	3.2	3.2	3.2
3. Mechanical equip.	2.0	2.0	2.0	2.0	2.0	2.0
4. Electric process equip.	10.0	10.2	12.9	16.2	20.7	26.5
5. Electric space heat	10.0	10.0	10.0	10.0	10.0	10.0
6. Electric water heat	.30	.30	.30	.30	.30	.30
Office Buildings						
1. Lighting	7.5	7.5	7.5	7.5	7.5	7.5
2. Electric cooling	3.7	4.0	4.0	4.0	4.0	4.0
3. Mechanical equip.	2.5	2.7	2.7	2.7	2.7	2.7
4. Office equip.	1.0	1.4	1.7	2.2	2.5	3.1
5. Electric space heat	12.0	12.0	12.0	12.0	12.0	12.0
6. Electric water heat	0.5	0.5	0.5	0.5	0.5	0.5
Commercial Buildings						
1. Lighting	8.8	9.0	9.0	9.0	9.0	9.0
2. Electric cooling	4.0	4.5	4.5	4.5	4.5	4.5
3. Mechanical equip.	2.5	2.7	2.7	2.7	2.7	2.7
4. Misc. equip.	1.0	1.5	1.9	2.4	3.1	3.9
5. Electric space heat	12.0	12.0	12.0	12.0	12.0	12.0
6. Electric water heat	.37	.37	.37	.37	.37	.37
Warehouses/Transportation						
1. Lighting	2.0	2.0	2.0	2.0	2.0	2.0
2. Electric cooling	3.0	3.0	3.0	3.0	3.0	3.0
3. Mechanical equip.	0.6	0.6	0.6	0.6	0.6	0.6
4. Electric space heat	10.0	10.0	10.0	10.0	10.0	10.0
5. Electric water heat	.13	.13	.13	.13	.13	.13
Schools						
1. Lighting	3.0	4.0	4.0	4.0	4.0	4.0
2. Mechanical equip.	1.6	1.9	1.9	1.9	1.9	1.9
3. Electric space heat	14.0	14.0	14.0	14.0	14.0	14.0
4. Electric cooling	0.6	0.9	1.3	1.3	1.3	1.3
5. Electric water heat	.90	.90	.90	.90	.90	.90
Universities						
1. Lighting	6.5	7.0	7.0	7.0	7.0	7.0
2. Mechanical equip.	2.3	2.5	2.5	2.5	2.5	2.5
3. Other equipment	1.7	2.0	2.5	3.2	4.2	5.3
4. Electric space heat	14.0	14.0	14.0	14.0	14.0	14.0
5. Electric cooling	3.5	3.5	3.5	3.5	3.5	3.5
6. Electric water heat	.69	.69	.69	.69	.69	.69

SUMMARY OF UNIT ENERGY CONSUMPTION DATA FOR NON-RESIDENTIAL BUILDINGS, IN KWH (ELECTRIC), PER SQUARE FOOT, PER YEAR

continued

	1970	1975	1980	1985	1990	1995
Hospitals						
1. Lighting	8.0	8.0	8.0	8.0	8.0	8.0
2. Mechanical equip.	5.0	5.0	5.0	5.0	5.0	5.0
3. Other equip.	1.0	1.3	1.6	2.0	2.5	3.1
4. Electric space heat	20	20	20	20	20	20
5. Electric water heat	13.5	13.5	13.5	13.5	13.5	13.5
6. Electric cooling	6.0	6.0	6.0	6.0	6.0	6.0
Other Public & Institutional Buildings						
1. Lighting	4.0	5.0	5.0	5.0	5.0	5.0
2. Mechanical equip.	1.2	1.6	1.6	1.6	1.6	1.6
3. Other equip.	0.3	0.5	0.6	0.8	1.1	1.4
4. Electric space heat	12.0	12.0	12.0	12.0	12.0	12.0
5. Electric cooling	3.5	3.5	3.5	3.5	3.5	3.5
6. Electric water heat	.13	.13	.13	.13	.13	.13

Table B - Rand Study

ENERGY USE BY CLASS OF COMMERCIAL BUILDING, 1970

Class of Building	Relative Intensity[a]		Energy Use	
	Electricity	Fossil Fuel	Electricity ($kWh/ft^2/yr$)	Fossil Fuel ($1000\ Btu/ft^2/yr$)
Reference	1.0	1.0	17	42
Retail stores	1.10	1.2	19	50
Schools	0.97	2.4	16	101
Office buildings	1.25	2.7	21	113
Public buildings	0.55	1.1	9	46
Hospitals	1.30	2.8	22	118
Hotels	0.40	1.4	7	59
Garages	0.28	1.1	5	46
Average building	0.93	1.87	16	78

[a] Compared with the reference structure.

APPENDIX C3

Derivation of Percentage Savings for 1980 Construction

Source: A. D. Little Inc., An Impact Assessment of ASHRAE Standard 90-75

In Tables III-5 to III-10 of this report changes in energy consumption are listed as a result of the 90-75 Standard. We summarize only those which affect electricity consumption.

ANNUAL ENERGY CONSUMPTION (1000 Btu/ft^2)
Measured at Building Boundary

		Table	Cooling[1.]	Auxiliary	Fans	Lighting	Total	% Change
Retail	Current	III-7	22.0- 8	5.7	96.0	89.2	213.7	27.2-30.4
	90-75	III-8	27.3-34.1	4.1	56.3	61.1	148.8-155.6	
Office Bldg.	Current	III-5	13.1	3.0	11.6	54.0	81.7	27.8-30.5
	90-75	III-6	8.7-10.9	3.4	6.4	38.3	56.8- 59.0	
School	Current	III-9	4.7	2.9	2.0	34.1	43.7	22.0-23.6
	90-75	III-10	3.0- 3.7	2.0	1.1	27.3	33.4- 34.1	

Estimated percentage savings for 1980 for hospitals are an average of the impacts estimated in the Hugh Carter report, pages D-17 - D-19.

1. The A. D. Little figures for current practice are adjusted downward by 20% to allow for absorption air conditioning. This saturation is estimated by Salter, et al. (reference 3). The 90-75 Standard reflects a range of consumption to allow for uncertainty in future saturation of absorption air conditioning.

APPENDIX D

Data Tables and Data Management Procedures

by

M. W. Horovitz

and

K. B. Anderson

Appendix D1. Data Management Procedures and Conventions

Appendix D2. Summary Tables of Data Relating to Residential and Commercial Electricity Use in California

APPENDIX D1

Data Management Procedures and Conventions

Description of the Format of Data Tables

The data are entered on punched cards and processed by a computer program to produce the tables of energy use data displayed in Appendix D2. The primary classification is by device or building type. Examples of devices are dishwashers, clothes dryers, etc; building categories include manufacturing buildings, educational buildings, single family residential housing,etc. A list of building and device categories together with their 5-or 6-character codes is provided on pages D-25 - D-29. A table of contents at the beginning of Appendix D2, gives the page location of various types of data.

The format of the tables will be illustrated using the small sample of data on ranges displayed on page D-5. At the top of the page we find the device or building type heading—in this case RANGES. Within this category data are next organized by geographical region; these can be counties, SMSA's, utility service areas, etc. A list of permitted geographical regions together with their two-digit numerical code, is given on pages D-22 and D-23. On page D-5 we note that the first geographic area is California, next is Alameda county, then Alpine county, etc. At the left hand side of the six lines of data for CALIFORNIA, we note the numbers 1 through 6. These are line numbers sequentially ordering the data lines within the device category (RANGES). Next on line 1 we find a G. This denotes the fuel type—in this case G for gas. Scanning down the page on the same column we find G's and E's for gas and electricity. A list of fuel types and their corresponding one-character codes are given on page D-24. Returning to line 1, page D-5 we next find '60-60'. This denotes the time interval for which the data on this line are valid. '60-60' means 'from 1960 to 1960.' Next on line 1, we have an abbreviation for the name of a data item: -SAT.RATE- denoting saturation rate. A list of such

abbreviations is shown on page D-21. The saturation rate on line 1 has the value of 75.4%. Numerical values containing decimal points are percentages; all other values are integers. To the right of the 75.4 we find a zero, denoting a data hardness value of 0 for the saturation of 75.4. The hardness codes are explained on page D-24; a value of 0 denotes an estimated error of less than 5%. Continuing on line 1 we next find 2751; this refers to source no. 2751. Souces of data are listed sequentially at the end of the complete data tabulation; for our example we find on page D-6, source 2751 is listed merely as '1960 U.S. Census.' The next item on line 1 is a 1; this refers to a footnote number 1 for source 2751. Source footnotes are listed following the table of sources. Footnote 1 for source 2751 is missing. For illustration we can use line 11. On that line we find a saturation rate of 43.1%, source no. 9600 and source footnote 1. Entry 9600 1 on page D-7 is the corresponding source footnote.

One line of data contains either one or two data values. Lines 3-6 each contain a single value—additions for a particular year. Lines 1 and 2, each contain a saturation rate in the left half of the line and the size of the stock of ranges on the right side of the line. Returning to line 1 we see that the stock size is 2830000, the hardness value equals 1 and the source number is 2751. The star appearing, for example in the middle of line 7, means that there should be a footnote describing how this particular value was derived. Such footnotes are printed at the end of the device or building section to which they refer. Finally, scanning lines 11-28 on page D-5, we find, in each case a zero immediately to the right of the line number. This is the sector code. These codes are listed on page D-29.

Data Card Conventions

For coding purposes, we have classified data into three categories: devices, building information and load curves. Distinct punched card data entry formats have been devised for each of these cateogies. Conventions have also been specified for entry of source information, footnotes and source footnotes. These different card formats are shown on pages D-9 through D-16. The coding conventions for entering numerical data are detailed on pages D-19 and D-20. Page D-8 shows a listing of the data cards used to generate the sample tabulation on pages D-5-D-7.

Computer Program for Producing Data Tabulations

A computer program, ENLIST, was constructed to process punched cards and produce energy data tabulations. This FORTRAN program runs on the LBL CDC 7600 computer; a listing of the program, generated using the LBL RUN76 FORTRAN compiler, can be found at the end of this appendix. Some modification of this program would be required to allow it to execute on an IBM 360/370 system. The program first reads the input data card file. These cards can be in any order. The cards are checked for valid device/sector codes and then sorted into four files: a data file, a source card file, a footnote file and a source footnote file. Sorting is carried out using the LBL sorting routine SORT76. The sorted files are then formatted for printing.

Program Operation

A listing of the control cards used to generate the sample run described in this section, is shown on page D-17. A single extra card is required to precede the first data card. The first ten characters of this card should be EDIT PRINT. Following the last data card, an end card is required. The first five characters of the end card should be /END/. In case of data card format errors in the card type or device/sector field, the program prints an error message and does not process such data. Page D-18 illustrates the form of these error messages.

CALIFORNIA													
1		G	60-60	SAT. RATE	75.4	0	2751	1	STOCK	2830000	1	2751
2			60-60	SAT. RATE	17.9	0	2751	1	STOCK	159000	1	2751
3			71-71	ADDITIONS	176000	0	AHO1					
4			72-72	ADDITIONS	193000	0	AHO1					
5			73-73	ADDITIONS	211000	0	AHO1					
6			74-74	ADDITIONS	170000	0	AHO1					
ALAMEDA CO.												
7		E	60-60	SAT. RATE	2.2	0	0001	*	STOCK	67300	0	0001
8		G	60-60	SAT. RATE	7.4	0	0001	*	STOCK	220000	0	0001
9	0		70-70	SAT. RATE	43.4	0	9000	1	STOCK	159000	0	9000
10	0	G	70-70	SAT. RATE	55.1	0	9000	1	STOCK	201000	0	9000
ALPINE CO.												
11	0		60-60	SAT. RATE	43.1	0	9600	1	STOCK	5	0	9600
12	0		70-70	SAT. RATE	69.5	0	9000	2	STOCK	9	0	9000
AMADOR CO.												
13	0	G	60-60	SAT. RATE	3.8	0	9600	1	STOCK	119	0	9600
14	0		60-60	SAT. RATE	47.4	0	9600	1	STOCK	1490	0	9600
15	0		70-70	SAT. RATE	56.4	0	9000	3	STOCK	2250	0	9000
16	0	G	70-70	SAT. RATE	16.6	0	9000	3	STOCK	661	0	9000
BUTTE CO.												
17	0		60-60	SAT. RATE	33.8	0	9600	1	STOCK	9230	0	9600
18	0	G	60-60	SAT. RATE	49.2	0	9600	1	STOCK	13400	0	9600
19	0		70-70	SAT. RATE	49.3	0	9000	4	STOCK	17200	0	9000
20	0	G	70-70	SAT. RATE	41.0	0	9000	4	STOCK	14300	0	9000
CALAVERAS CO.												
21	0	G	60-60	SAT. RATE	8.5	0	9600	1	STOCK	296	0	9600
22	0		60-60	SAT. RATE	41.5	0	9600	1	STOCK	1440	0	9600
23	0		70-70	SAT. RATE	58.9	0	9000	5	STOCK	2640	0	9000
24	0	G	70-70	SAT. RATE	3.7	0	9000	5	STOCK	164	0	9000
COLUSA CO.												
25	0		60-60	SAT. RATE	41.6	0	9600	1	STOCK	1630	0	9600
26	0	G	60-60	SAT. RATE	35.8	0	9600	1	STOCK	1400	0	9600
27	0		70-70	SAT. RATE	46.8	0	9000	6	STOCK	2040	0	9000
28	0	G	70-70	SAT. RATE	42.6	0	9000	6	STOCK	1860	0	9000
CONTRA COSTA CO.												
29		G	60-60	SAT. RATE	6.4	0	0001	*	STOCK	76500	0	0001
30		E	60-60	SAT. RATE	3.1	0	0001	*	STOCK	37100	0	0001
31	0		70-70	SAT. RATE	54.6	0	9000	7	STOCK	94400	0	9000
32	0	G	70-70	SAT. RATE	44.0	0	9000	7	STOCK	76100	0	9000

S O U R C E S

AH01	THIS IS A DUMMY SOURCE REFERENCE AH01
0001	1960 CENSUS OF HOUSING TABLE 16
2751	1960 U.S. CENSUS
9000	1970 US CENSUS DETAILED HOUSING CHARACTERISTICS TABLE 63
9600	1960 CENSUS TABLE 29-OCCUPANCY CHARACTERISTICS,HEATING EQUIPMENT,AND
9600	TYPE OF FUEL, FOR COUNTIES OUTSIDE SMSA'S 1960-P6-168

S O U R C E F O O T N O T E S

2751		THIS IS A DUMMY SOURCE FOOTNOTE NO. 2751
9000	1	THIS IS A DUMMY SOURCE FOOTNOTE 90001
9000	2	THIS IS A DUMMY SOURCE FOOTNOTE 90002
9000	3	THIS IS A DUMMY SOURCE FOOTNOTE 90003
9000	4	THIS IS A DUMMY SOURCE FOOTNOTE 90004
9000	5	THIS IS A DUMMY SOURCE FOOTNOTE 90005
9000	6	THIS IS A DUMMY SOURCE FOOTNOTE 90006
9000	7	THIS IS A DUMMY SOURCE FOOTNOTE 90007
9000	8	THIS IS A DUMMY SOURCE FOOTNOTE 90008
9000	9	THIS IS A DUMMY SOURCE FOOTNOTE 90009
9600	1	DERIVED FROM OCCUPIED UNITS DATA

```
EDIT PRINT
1  RANGE 6060G0754B1375612751
1  RANGE 6060 0179B1891512751
   RANGE 7171                    176.0AH01
1  RANGE 7272                    195.0AH01
1  RANGE 7373                    211.0AH01
1  RANGE 7474                    170.0AH01
101RANGE 6060E 227 *6.7300001
101RANGE 6060G 746 *22.000001
101RANGE07070 0434*1159509000
101RANGE07070G0551*1201509000
102RANGE06060 0431B1047109600
102RANGE07070G0000*2000009000
102RANGE07070 0695*2089109000
103RANGE06060G0038B1119209600
103RANGE06060 0474B1149309600
103RANGE07070 0564*3225309000
103RANGE07070G0166*3661209000
104RANGE06060 0338B1923309600
104RANGE06060G0492B1134409600
104RANGE07070 0493*4172409000
104RANGE07070G0410*4143409000
105RANGE06060G0085B1296209600
105RANGE06060 0415B1144309600
105RANGE07070 0589*5264309000
105RANGE07070G0037*5164209000
106RANGE06060 0416B1163309600
106RANGE06060G0358B1140309600
106RANGE07070 0468*6204309000
106RANGE07070G0426*6186309000
107RANGE 6060G 649 *7.6500001
107RANGE 6060E 315 *3.7100001
107RANGE07070 0546*7944409000
107RANGE07070G0440*7761409000
S0001  1960 CENSUS OF HOUSING TABLE 16
S2751  1960 U.S. CENSUS
S9000 1970 US CENSUS DETAILED HOUSING CHARACTERISTICS TABLE 63
S96001 1960 CENSUS  TABLE 29-OCCUPANCY CHARACTERISTICS,HEATING EQUIPMENT,AND
S96002 TYPE OF FUEL, FOR COUNTIES OUTSIDE SMSA'S 1960-P6-168
F96001 1DERIVED FROM OCCUPIED UNITS DATA
SAH01   THIS IS A DUMMY SOURCE REFERENCE AH01
F90001  THIS IS A DUMMY SOURCE FOOTNOTE 90001
F90002  THIS IS A DUMMY SOURCE FOOTNOTE 90002
F90003  THIS IS A DUMMY SOURCE FOOTNOTE 90003
F90004  THIS IS A DUMMY SOURCE FOOTNOTE 90004
F90005  THIS IS A DUMMY SOURCE FOOTNOTE 90005
F90006  THIS IS A DUMMY SOURCE FOOTNOTE 90006
F90007  THIS IS A DUMMY SOURCE FOOTNOTE 90007
F90008  THIS IS A DUMMY SOURCE FOOTNOTE 90008
F90009  THIS IS A DUMMY SOURCE FOOTNOTE 90009
F2751   THIS IS A DUMMY SOURCE FOOTNOTE NO. 2751
/END/
```

DEVICE/ SECTOR INFORMATION - CARD 1

REGION	DEVICE	SECTOR	TIME PERIOD FR	TIME PERIOD TO	FUEL TYPE	SATURATION RATE % 100.0%	LIFETIME FOOTNOTE	STOCK SIZE x 10⁴	HARDNESS	SOURCE	FOOTNOTE	ADDITIONS PER YR. x 10³	HARDNESS	SOURCE	FOOTNOTE	REMOVALS PER YR. x 10³	HARDNESS	SOURCE	FOOTNOTE	AVG. COST PER UNIT x $10	HARDNESS	SOURCE	FOOTNOTE	UTILIZATION UNITS	HARDNESS	SOURCE	FOOTNOTE	ENERGY CONSUMPTION KWH/YR	HARDNESS	SOURCE	FOOTNOTE
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80																		

DEVICE INFORMATION - CARD 2

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
|---|---|---

BUILDING INFORMATION - CARD 1

TYPE	REGION	BUILDING TYPE	TIME PERIOD FR	TIME PERIOD TO	NO. OF BUILDINGS x 10^4	HARDNESS	SOURCE	FOOTNOTE	CONSTRUCTIONS PER YEAR x 10^4	HARDNESS	SOURCE	FOOTNOTE	REMOVALS PER YEAR x 10^4	HARDNESS	SOURCE	FOOTNOTE	AVG. COST PER UNIT x $(1000)	HARDNESS	SOURCE	FOOTNOTE	SQUARE FEET x 10^6	HARDNESS	SOURCE	FOOTNOTE	ENERGY CONSUMPTION kWh/ft²	HARDNESS	SOURCE	FOOTNOTE
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80									

BUILDING INFORMATION - CARD 2

| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
|---|---|---

LOAD CURVE

PERCENT OF PEAK POWER

GEOG. REGION | DEVICE | SECTOR | FR | TO | PEAK DRAW W | HARDNESS | SOURCE | FOOTNOTE

1 2 3 4 5 6 7 8 9 10 11 NOW 1 2 3 4 5 6 7 8 9 10 11 MO. AVG.

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

3
3
3

FOOTNOTES

CARD TYPE | GEOG REGION | DEVICE/SECTOR | TIME PERIOD FR / TO | FOOTNOTE NO | LINE NO

FOOTNOTE INFORMATION

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
|---|---|---

SOURCE INFORMATION

CARD TYPE / SOURCE I.D. / LINE NO.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
S		

SOURCE FOOTNOTES

SOURCE I.D.	FOOTNOTE NO.	LINE NO.
F		
F		
F		

```
FAST,12,110,74000.865301,GOLDSTEIN
RUN76,SC.
RFL,,117000.
FETCHPS,BKYLGO,S76,SORT76.
REWIND,TAPE5.
LINK,F=LGO,F=S76,P=BKYIO,X,PP=[LC=30000].
CXIT.
EXIT.
DUMP,0.
FIN.
REWIND,TAPE9.
REWIND,TAPE2.
COPY,TAPE2,TAPE9.
REWIND,TAPE6.
COPY,TAPE6,TAPE9.
REWIND,TAPE7.
COPY,TAPE7,TAPE9.
REWIND,TAPE8.
COPY,TAPE8,TAPE9.
REWIND,TAPE5.
COPY,TAPE5,OUTPUT.
COPYSBF,TAPE9,OUTPUT.
DISPOSE,OUTPUT=PR,PA=1F.
```

ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	136ALL3	6060	4.53
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	134ALL4	6060	3.41
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	167ALL4	6060	6.62
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	133ALL4	6060	2.38
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	136ALL4	6060	4.24
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	134ALL5	6060	3.11
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	167ALL5	6060	6.45
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	133ALL5	6060	2.32
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	136ALL5	6060	4.13
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	134ALL6	6060	1.40
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	167ALL6	6060	3.32
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	133ALL6	6060	1.26
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	136ALL6	6060	2.06
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	134ALL7	6060	3.63
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	167ALL7	6060	4.91
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	133ALL7	6060	1.84
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	136ALL7	6060	3.07
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	137ALL2	6060	3.81
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	137ALL3	6060	6.54
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	137ALL4	6060	7.00
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	137ALL5	6060	6.99
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	137ALL6	6060	3.47
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	137ALL7	6060	6.10
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	139ALL2	6060	.270
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	163ALL2	6060	.246
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	164ALL2	6060	.359
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	165ALL2	6060	12.1
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	139ALL3	6060	.835
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	163ALL3	6060	.718
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	164ALL3	6060	1.08
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	165ALL3	6060	36.4
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	139ALL4	6060	1.35
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	163ALL4	6060	.925
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	164ALL4	6060	1.47
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	165ALL4	6060	43.5
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	139ALL5	6060	1.97
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	163ALL5	6060	1.26
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	164ALL5	6060	1.54
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	165ALL5	6060	46.4
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	139ALL6	6060	1.18
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	163ALL6	6060	.681
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	143ALL2	6060	2.61
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	142ALL2	6060	.976
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	143ALL3	6060	4.96
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	142ALL3	6060	.969
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	143ALL4	6060	4.18
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	142ALL4	6060	.780
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	143ALL5	6060	2.94
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	142ALL5	6060	.772
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	143ALL6	6060	1.75
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	142ALL6	6060	.700
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	143ALL7	6060	3.52
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	142ALL7	6060	1.53
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	163	6060	4.63
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	164	6060	6.98
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	165	6060	228.
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	163	6060	3.95
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	164	6060	5.86
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	165	6060	146.
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	163	6060	.235
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	164	6060	.295
ERROR	IN	CARD	TYPE	OR	DEVICE/SECTCR	165	6060	12.0

Coding Conventions for Data Cards

Numbers

The numbers we are collecting - e.g., stocks, energy consumption, etc., have two possible formats (except for percentages, see below).

1. Decimal format. If the four-character field contains a decimal, the number it contains will be multiplied by the factor at the top of the column and stored.

   e.g., for device information card 1, "additions per yr.*10^3"

   34.2 means 34,200 (34.2×10^3)
   .033 means 33 (0.033×10^3)
   365. means 365,000 ($365. \times 10^3$)

2. Mantissa and exponent format. The first three characters of the four-character field will be treated as a mantissa with an implicit decimal point, and the last character will be the exponent of ten. This exponent will override the one at the top of the column, giving a larger range for our numbers, consistent three-digit accuracy, and a single format which can be used in any fields except percentages.

   e.g., for the same numbers as above

   3424 means 34,200 (3.42×10^4)
   33Ø1 means 33 (3.30×10^1)
   3655 means 365000 (3.65×10^5)

Percentages are coded in a fixed format. 1ØØØ means 100.0%; Ø6677 means 66.7%

Footnotes

There are several kinds of footnotes. Each is coded somewhat differently.

To footnote a single number— e.g., to tell how it was derived. Code an "*" in the space for footnote. On the coding sheet for footnotes, copy the information in columns 2-13 from the footnoted line, and a letter corresponding to the datum as shown below in column 14.

A - saturation rate	building stock
B - stock size	constructions/yr
C - additions/yr	removals/yr
D - removals/yr	avg. cost/unit
E - avg. cost/unit	sq. ft.
F - utilization	energy consumption/ft^2-yr
G - energy consumption-stock	fraction insulated
H - energy consumption-additions	avg. rent
I - energy consumption removals	construction price index
J - load curve	construction/yr (sq. ft.)

To footnote a series of numbers derived from the same source, code a number from 1-9 in the space for "footnote." Code the footnote on a source footnote card.

Abbreviations of Variable Names Appearing on Print-out

Abbreviation	Variable
ADDITIONS	Additions to stock
AVG.COST$	Average $ cost per unit
AVG.RENT$	Average rent $
CONSTRUCTION	Construction
CONST.SQFT.	square feet of construction
CPI	CPI
E.C. REMVLS	Energy consumption of additions to stock
E.C.REMVLS	Energy consumption of removals from stock
EN.CONSUMP or EN.CONS	Energy consumption
REMOVALS	Removals from stock
SAT.RATE	Saturation rate
SQ.FEET	Square feet
STOCK	Stock size
UTILIZATN	Utilization

Geographical Regions

Card Column 2-3

Blank	- All California	33	- Riverside
01	- Alameda	34	- Sacramento
02	- Alpine	35	- San Benito
03	- Amador	36	- San Bernardino
04	- Butte	37	- San Diego
05	- Calaveras	38	- San Francisco
06	- Colusa	39	- San Joaquin
07	- Contra Costa	40	- San Luis Obispo
08	- Del Norte	41	- San Mateo
09	- Fresno	42	- Santa Barbara
11	- Glenn	43	- Santa Clara
12	- Humboldt	44	- Santa Cruz
13	- Imperial	45	- Shasta
14	- Inyo	46	- Sierra
15	- Kern	47	- Siskiyou
16	- Kings	48	- Solano
17	- Lake	49	- Sonoma
18	- Lassen	50	- Stanislaus
19	- Los Angeles	51	- Sutter
20	- Madera	52	- Tehama
21	- Marin	53	- Trinity
22	- Mariposa	54	- Tulare
23	- Mendocino	55	- Tuolumne
24	- Merced	56	- Ventura
25	- Modoc	57	- Yolo
26	- Mono	58	- Yuba
27	- Monterey	59	- Los Angeles SCE
28	- Napa	60	- San Francisco SMSA
29	- Nevada	61	- San Francisco SCA
30	- Orange	62	- Los Angeles SCA
31	- Placer	63	- Bakersfield U.A.
32	- Plumas	64	- Fresno U.A.

65 - Los Angeles-Long Beach SMSA

66 - Sacramento U.A.

67 - San Bernardino-Riverside U.A.

68 - San Diego U.A.

69 - San Jose U.A.

70 - San Francisco HUD District

71 - Fresno HUD District

72 - Sacramento HUD District

73 - Los Angeles-Santa Ana HUD District

74 -

75 - Los Angeles-Santa Ana HUD District

76 - Santa Barbara U.A.

77 - Stockton U.A.

78 - Pomona-Ontario U.A.

79 - San Bernardino-Riverside-Ontario SMSA

80 -

81 - P.G.& E. Service area

82 - SMUD Service area

83 - SCE Service area

84 - LADWP Service area

85 - SDG & E Service area

86 - Other utility districts

90 - Urban California

91 - Rural California

93 - San Francisco-Oakland U.A.

98 - Agency defined area

99 - United States

Fuel Type Codes

Card Column 14

E or blank	- Electricity	C	- Coal or coke
G	- Natural gas	W	- Wood
P	- Propane	O	- Others
F	- Fuel oil		

Hardness Codes

0 - Excellent, error probably less than 5%

1 - Very Good, high confidence, error probably less than 10%, data well accepted and verified

2 - Good. Reportable and accepted, error probably less than 25%

3 - Fair. Validity may be uncertain due to method of combining or applying data. Error probably less than 50%

4 - Poor. Low confidence, validity questionable, error may be as high as an order of magnitude

5 - Very Poor. Validity unknown. Error may be greater than an order of magnitude

List of Building Sectors
Card Columns 4-9

CODE	DESCRIPTION
ALLH	All Housing
RECBLD	Amusement, social, + Rec. Bldg.
GARAGE	Comm'l garage + Service stn.
DETACH	Detached housing units
ATTACH	Duplexes
SCHOOL	Educational buildings
FHAAP	FHA Mortg. applcs.
FHAAP1	FHA Mortg. applcs. single family units
FHAAP2	FHA mortg. applcs, multi unit bldgs.
FHAAP5	FHA mortg. applcs. single + multi
HOSPIT	Hospital and health buildings
MFGBLD	Manufacturing buildings
MISCBL	Miscellaneous buildings
MOBHOM	Mobile homes
MOBHOD	Mobile home double width
MOBHOS	Mobile home single width
ATTACH	Multifamily units
MULTIU	Multi-Unit residential buildings
HOTELS	Nonhousekeeping residtl. building
NONRES	Non-residential buildings
OFFICE	Office and bank buildings
PUBLIC	Public buildings
CHURCH	Religious buildings
RCUST	Residential customers
RETAIL	Retail + other mercantile buildings
SINFAM	Single family residential building
OCCUP5	Single + multi-init housing

CODE	DESCRIPTION
TOTAL1	Total occupd. single family housing
TOTAL2	Total occupd. multi-unit housing
OCCUP	Total occupied housing
VAAP	VA Mortgage applications
VAAP5	VA mortgage applications-single+multi
WAREHS	Warehouses not manufacturer owned

List of Devices

Card Columns 4-8

CODE	Device
AIRCN	Air conditioners, all
TOTAE	All electric dwelling
TOTHT	All units - electric heating use
TOTTL	All units, total electric use
BASEH	Baseboard heater
BEV	Built-in electric units
CABLH	Ceiling heater
CNTAC	Central air conditions
CWF	Central warm air furnace
DRYER	Clothes dryer
WASHER	Clothes washer
DWASH	Dishwasher
EDWEL	Electric dwellings
EHEAT	Electric resistance heating
EH+AC	Electric heat + Electric air conditioning
EVPCL	Evaporative cooler
FRZ	Freezer
FRZFF	Freezer, frost-free
FRZMD	Freezer, manual defrost
FRH	Fireplace, stove or portable furance
FLULT	Fluorescent lighting
PIPEF	Floor, wall or pipeless furnace
FURNH	Furnace heater
FFAN	Furnace fan

CCDE	Device
GHEAT	Gas heating
HEATO	Heaters only
HEATC	Heater + air conditioner
HEATT	Heater + heater/A.C. combination
PUMPH or HPUMP	Heat pump
HWH	Hot water heating
INCLT	Incandescent lighting
KWHCS	KWH/customer
KWHSL	KWH sales
METER	Master metered
MUNAE	Multi-unit all electric dwelling
MUNHT	Multi-unit dwelling, electric heating
MUNTL	Multi-unit dwelling, electricity use
MISCH	Other heaters
REF	Refrigerator
REFFF	Refrigerator, frost-free
REFMD	Refrigerator, manual defrost
RMAC	Room air conditioners
RHNF	Room heater, no flue
RHWF	Room heater, with flue
RANGE	Range
HSFDAE	Single family all electric home
SFDHT	Single family dwelling, electric use
TV	Television, all types
BWTV	Television, black and white

CCDE	Device
CLRTV	Television, color
TOTLH	Total heaters
WTHTR	Water heaters

Sectors for Devices - Column 9

BLANK	- All Sectors
1	- Single-family homes
2	- Multi-unit homes
3	- Mobile homes

Listing of Computer Program Enlist

This program produces energy use tables from data on punched cards.

ENLIST

```
      PROGRAM ENLIST(INPUT,OUTPUT,TAPE4=INPUT,TAPE5        ,TAPE6,TAPE7
     1TAPE8,TAPE2)
      COMMON /SORTCOM/  SRTTYP, RCDSIZ, KEYSIZ, LCMLO, LCMHI,
     -                  SCMSIZ, SCM(20000)
      INTEGER SRTTYP, RCDSIZ, KEYSIZ, LCMLO, LCMHI, SCMSIZ
      EXTERNAL SRTRTN, SORTEDS, SORTEDF, SORTEDN
      DATA SRTTYP, RCDSIZ, KEYSIZ, LCMLO, LCMHI, SCMSIZ
     -    /     2,       8,      4,     1, 40000,  20000 /
      INTEGER KEY(4)
      COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
     - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     -  , REGNAME, DEVNAME
     -  ,PAGENO
      INTEGER CARD(8), CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
     1       FOOTNT(12), DEVNAME(3), REGNAME(2)
     2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     3  ,PAGENO
      REAL RVALUE(12)
C
      READ(4,1000) NEDIT,NPRINT
 1000 FORMAT(2A5)
12    IF(NEDIT.EQ.5HEDIT ) CALL CRDEDIT
15    IF(NPRINT.EQ.5HPRINT) CALL PRINT
20    STOP
22    END
```

PROGRAM LENGTH INCLUDING I/O BUFFERS

03666

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000042	C00015	1000	000003

BLOCK NAMES AND LENGTHS
SORTCOM- 047046/01 CRDINFO- 000142/02

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000000/02	G00003	CARD	NONE
000010/02	V00012	CRDTYPE	NONE
000011/02	V00013	DEVBLDG	NONE
000013/02	V00015	DEVICE	NONE
000136/02	G00011	DEVNAME	NONE
000045/02	G00005	EXPNT	NONE
000111/02	G00010	FOOTNT	NONE

ENLIST

000130/02	V00031	FUELTYP	NONE	
000061/02	G00006	HARDNS	NONE	
000125/02	V00026	J	NONE	
000053	G00002	KEY	NONE	
000002/01	V00004	KEYSIZ	NONE	
000004/01	V00006	LCMHI	NONE	
000003/01	V00005	LCMLO	NONE	
000133/02	V00034	LINENO	NONE	
000132/02	V00033	LNCNT	NONE	
000031/02	G00004	MANTISA	NONE	
000057	V00037	NEDIT	000006	000013
000060	V00040	NPRINT	000010	000016
000131/02	V00032	NUM4	NONE	
000141/02	V00035	PAGENO	NONE	
000001/01	V00003	RCDSIZ	NONE	
000134/02	G00012	REGNAME	NONE	
000012/02	V00014	REGNO	NONE	
000015/02	G00013	RVALUE	NONE	
000006/01	G00001	SCM	NONE	
000005/01	V00007	SCMSIZ	NONE	
000014/02	V00016	SECTOR	NONE	
000075/02	G00007	SOURCE	NONE	
000000/01	V00002	SRTTYP	NONE	
000126/02	V00027	TIMEFR	NONE	
000127/02	V00030	TIMETO	NONE	

START OF CONSTANTS-000025 TEMPS--000051 INDIRECTS-000053

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 044000

CRDEDIT

```
      SUBROUTINE CRDEDIT
      COMMON /SRTTST/ CDSREAD,CDSRTND
      INTEGER CDSREAD(4), CDSRTND(4)
C
C      THIS ROUTINE READS CARDS, CHECKS CARD TYPES 1,2,AND 3 FOR
C      VALID DEVICE/SECTOR CODES, PRODUCES SORTED FILES OF?
C          1. THE DATA BASE -CARD COL 1 = 1,2, OR 3 (FILE 2)
C          2. SOURCE INFORMATION (FILE 6) CARD COL 1 = S
C          3. SOURCE FOOTNOTES (FILE 7) CARD COL 1 = F
C          4. FOOTNOTES (FILE 7) CARD COL 1 = *
C      AND AN ERROR LISTING OF INVALID CARDS
      COMMON /SORTCOM/  SRTTYP, RCDSIZ, KEYSIZ, LCMLC, LCMHI,
     -                  SCMSIZ, SCM(20000)
      INTEGER SRTTYP, RCDSIZ, KEYSIZ, LCMLO, LCMHI, SCMSIZ
      EXTERNAL SRTRTN, SORTEDS, SORTEDF, SORTEDN
      DATA SRTTYP, RCDSIZ, KEYSIZ, LCMLO, LCMHI, SCMSIZ
     -    /     2,      8,      4,     1, 40000,  20000 /
      INTEGER KEY(7)
      COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
     - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     -  , REGNAME, DEVNAME
     -  ,PAGENO
      INTEGER CARD(8), CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
     1       FOOTNT(12), DEVNAME(3), REGNAME(2)
     2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     3  ,PAGENO
      REAL RVALUE(12)
C
C     RVALUE = REAL VALUE WITH CORECT SCALE FACTORS IN
C
C     KEY =1 FOR DEVICE/SECTOR
C     KEY =2 FOR REGION
C     KEY =3 FOR TIME FROM ...
C     KEY =4 FOR TYPE
C
C        SORTED FILES ARE -
C     FILE NO. 2 = TYPES 1,2,3 BY DEV,REG,TIME,TYPE
C     FILE NO. 6 = S
C     FILE NO. 7 = F
C     FILE NO. 8 = *
C
C      SORT0 INITIALIZES THE SORT ROUTINE.
C      VALUES FOR SORTING CARD TYPES 1,2,AND 3 ARE PRE-LOADED.
      DO 1 I = 1,4
      CDSREAD(I) = 0
    1 CDSRTND(I) = 0
      CALL SORT0
   50 READ(4,100) CARD
  100 FORMAT(8A10)
      IF (CARD.EQ.5H/END/) GO TO 290
      DO 101 I = 1,12
  101 RVALUE = -0
      DO 102 I = 9,83
  102 CARD(I) = 10H
```

CRDEDIT

```
 37          CALL BRKCARD
 40          IF (CRDTYPE.EQ.5HERROR) GO TO 200
 42          IF (CRDTYPE.EQ.1HS) GO TO 220
 44          IF (CRDTYPE.EQ.1HF) GO TO 230
 45          IF (CRDTYPE.EQ.1H*) GO TO 240
       C      SORT KEYS - 1 DEVICE/SECTOR KEY - 0 FOR SECTOR,1 FOR DEVICE
       C                  2-4 - DEVICE OR SECTOR NAME
       C                  5 - REGION NUMBER
       C                  6 - DATE
       C                  7 - CARD TYPE
 47          KEY(1) = 0
 47          IF (DEVBLDG.EQ.1) KEY(1) = 1
 53          KEY(2) = DEVNAME(1)
 54          KEY(3) = DEVNAME(2)
 56          DECODE(11,150,CARD) KEY(7), KEY(5), KEY(6)
         150 FORMAT(A1,A2,6X,A2)
 75          IF (KEY(5).EQ.2H  ) KEY(5) = 2H00
100          ENCODE(5,175,KEY(4)) KEY(5),KEY(6), KEY(7)
         175 FORMAT(A2,A2,A1)
       C      SORTIN PASSES 2ND PARAMETER TO SORT ROUTINE TO BE SORTED ON 3R
       C       PARAMETER (1ST PARAMETER IS IGNORED).
117          CALL SORTIN(SRTTRN,CARD,KEY)
122          CDSREAD(1) = CDSREAD(1) + 1
124          GO TO 50
124      200 WRITE(5,210) CARD
         210 FORMAT(5X,*ERROR IN CARD TYPE OR DEVICE/SECTOR *,8A10)
132          GO TO 50
       C      STORE S CARDS FOR LATER SORTING
133      220 WRITE(6,100) CARD
141          GO TO 50
       C      STORE F CARDS FOR LATER SORTING
142      230 WRITE(7,100) CARD
150          GO TO 50
       C      STORE * CARDS FOR LATER SORTING
151      240 WRITE(8,100) CARD
157          GO TO 50
       C      END OF CARD INPUT
       C        WRITE END MARKER ON ALL FILES
160      290 CONTINUE
160          WRITE(6,295)
164          ENDFILE 6
166          REWIND 6
170          WRITE(7,295)
174          ENDFILE 7
176          REWIND 7
200          WRITE(8,295)
204          ENDFILE 8
206          REWIND 8
       C      SORT SORTS THE FILE, PASSING THE SORTED RECORDS BACK, ONE AT
       C        A TIME, TO SRTRTN.  SORT RETURNS TO PROGRAM WITH ENTIRE FILE
       C        SORTED.
210          CALL SORT(SRTRTN)
       C      WRITE END MARKER ON SORTED FILE
212          WRITE(2,295)
         295 FORMAT(5H/END/)
216          ENDFILE 2
```

```
220          REWIND 2
       C      CHANGE SORT PARAMTER
222          KEYSIZ = 1
       C      INITIALIZE SORT WITH NEW PARAMETERS
223          CALL SORT0
       C      READ SOURCE CARDS, BUILD KEY
224      303 READ(6,100) CARD
232          IF (CARD.EQ.5H/END/) GO TO 310
234          DECODE(6,305,CARD) KEY
         305 FORMAT(X,A5)
       C      PASS CARD TO SORT, WITH KEY
244          CALL SORTIN(SORTEDS, CARD, KEY)
247          CDSREAD(2) = CDSREAD(2) + 1
251          GO TO 303
       C      END OF SOURCE INFO. REWIND FILE SO SORT OVERWRITES FILE
       C        WITH SORTED INFO
251      310 CONTINUE
251          REWIND 6
       C      SORT FILE.  SORTEDS STORES SORTED S RECORDS IN FILE 6
253          CALL SORT(SORTEDS)
       C      WRITE END MARKS ON FILE 6
255          WRITE(6,295)
261          ENDFILE 6
263          REWIND 6
       C      RE-INITIALIZE SORT ROUTINE, SAME PARAMETERS.
265          CALL SORT0
       C      READ SOURCE FOOTNOTE FILE.  BUILD KEY FOR SORTING.
266      320 READ(7,100) CARD
274          IF (CARD.EQ.5H/END/) GO TO 350
276          DECODE(8,325,CARD) KEY
         325 FORMAT(X,A7)
       C      PASS CARD TO SORT ROUTINE, WITH KEY FOR SORTING.
306          CALL SORTIN(SORTEDF,CARD,KEY)
311          CDSREAD(3) = CDSREAD(3) + 1
313          GO TO 320
       C      END OF SOURCE FOOTNOTES.  REWIND FILE TO OVERWRITE IT WITH
313      350 CONTINUE
       C        SORTED FILE.
313          REWIND 7
       C      SORT FILE.  SORTEDF STORES SORTED F RECORDS IN FILE 7.
315          CALL SORT(SORTEDF)
       C      WRITE END MARKER ON FILE 7.
317          WRITE(7,295)
323          ENDFILE 7
325          REWIND 7
       C      CHANGE SORT PARAMETER.
327          KEYSIZ = 4
       C      RE-INITIALIZE SORT ROUTINE WITH NEW PARAMETERS.
330          CALL SORT0
       C      READ FOOTNOTE FILE.
331      360 READ(8,100) CARD
337          IF (CARD.EQ.5H/END/) GO TO 380
       C      BUILD KEY FOR SORTING.
341          DECODE(16,370,CARD) KEY(2), KEY(1), KEY(3), KEY(4)
         370 FORMAT(X,I2,A6,A2,2X,A3)
       C      KEY(3) MIGHT BE LOADED WITH BLANKS
```

CRDEDIT

```
363          IF(KEY(3).NE.2H  ) GO TO 378
365          DECODE(3,375,CARD(2)) KEY(3)
         375 FORMAT(X,A2)
376      378 CONTINUE
      C       PASS CARD AND KEY FOR SORTING TO SORT ROUTINE.
376          CALL SORTIN(SORTEDN,CARD,KEY)
401          CDSREAD(4) = CDSREAD(4) + 1
403          GO TO 360
      C       END OF FOOTNOTES.  REWIND FILE SO SORTED FILE WILL OVERWRITE
403      380 REWIND 8
      C       SORT THE FOOTNOTES.  SORTEDN STORES SORTED RECORDS IN FILE 8.
405          CALL SORT(SORTEDN)
      C       WRITE END MARKERS ON FILE 8.
407          WRITE(8,295)
413          ENDFILE 8
415          REWIND 8
         492 FORMAT(5X,I4,* CARDS READ, *,I4,* CARDS RETURNED, FILE 2*)
         496 FORMAT(5X,I4,* CARDS READ, *,I4,* CARDS RETURNED, FILE 6*)
         497 FORMAT(5X,I4,* CARDS READ, *,I4,* CARDS RETURNED, FILE 7*)
         498 FORMAT(5X,I4,* CARDS READ, *,I4,* CARDS RETURNED, FILE 8*)
417          RETURN
420          END
```

SUBPROGRAM LENGTH

00567

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES			
000012	L00015	50	000124	000133	000142	000151
000425	C00002	100	000012	000134	000143	000152
			000332			
000444	C00021	150	000057			
000453	C00030	175	000101			
000125	L00073	200	000042			
000457	C00034	210	000125			
000134	L00077	220	000044			
000143	L00103	230	000045			
000152	L00107	240	000047			
000161	L00113	290	000021			
000471	C00046	295	000161	000171	000201	000213
			000410			
000225	L00154	303	000251			
000476	C00053	305	000235			
000252	L00170	310	000234			
000267	L00205	320	000313			
000502	C00057	325	000277			
000314	L00221	350	000276			
000332	L00237	360	000403			

CRDEDIT

000506	C00063	370	000342
000513	C00070	375	000366
000377	L00254	378	000365
000404	L00260	380	000341
000515	C00072	492	NONE
000524	C00101	496	NONE
000533	C00110	497	NONE
000542	C00117	498	NONE

BLOCK NAMES AND LENGTHS

SRTTST - 000010/01 SORTCOM- 047046/02 CRDINFO- 000142/03

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES			
000000/03	G00005	CARD	000015	000020	000034	000062
			000137	000146	000155	000230
			000245	000272	000275	000302
			000340	000345	000377	
000000/01	G00001	CDSREAD	000006	000123		
000004/01	G00002	CDSRTNO	000005			
000010/03	V00014	CRDTYPE	000041			
000011/03	V00015	DEVBLDG	000050			
000013/03	V00017	DEVICE	NONE			
000136/03	G00013	DEVNAME	000054			
000045/03	G00007	EXPNT	NONE			
000111/03	G00012	FOOTNT	NONE			
000130/03	V00033	FUELTYP	NONE			
000061/03	G00010	HARDNS	NONE			
000565	V00041	I	000003	000023	000032	
000125/03	V00030	J	NONE			
000556	G00004	KEY	000050	000053	000121	000242
			000310	000352	000400	
000002/02	V00006	KEYSIZ	000223	000330		
000004/02	V00010	LCMHI	NONE			
000003/02	V00007	LCMLO	NONE			
000133/03	V00036	LINENO	NONE			
000132/03	V00035	LNCNT	NONE			
000031/03	G00006	MANTISA	NONE			
000131/03	V00034	NUM4	NONE			
000141/03	V00037	PAGENO	NONE			
000001/02	V00005	RCDSIZ	NONE			
000134/03	G00014	REGNAME	NONE			
000012/03	V00016	REGNO	NONE			
000015/03	G00015	RVALUE	000030			
000006/02	G00003	SCM	NONE			
000005/02	V00011	SCMSIZ	NONE			
000014/03	V00020	SECTOR	NONE			
000075/03	G00011	SOURCE	NONE			
000566	V00042	SRTTRN	000120			
000000/02	V00004	SRTTYP	NONE			
000126/03	V00031	TIMEFR	NONE			
000127/03	V00032	TIMETO	NONE			

START OF CONSTANTS-000423 TEMPS--000551 INDIRECTS-000553

CRDEDIT

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 045200

PRINT

```
              SUBROUTINE PRINT
      C
      C        THIS ROUTINE PRINTS THE FOUR FILES.
              COMMON /SORTCOM/  SRTTYP, RCDSIZ, KEYSIZ, LCMLO, LCMHI,
             -                  SCMSIZ, SCM(20000)
              INTEGER SRTTYP, RCDSIZ, KEYSIZ, LCMLO, LCMHI, SCMSIZ
              EXTERNAL SRTRTN, SORTEDS, SORTEDF, SORTEDN
              DATA SRTTYP, RCDSIZ, KEYSIZ, LCMLO, LCMHI, SCMSIZ
             -    /     2,       8,       4,     1, 40000,  20000 /
              INTEGER KEY(4)
              COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLOG, REGNO, DEVICE, SECTOR,
             -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
             - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
             -  , REGNAME, DEVNAME
             -  ,PAGENO
              INTEGER CARD(8), CRDTYPE, DEVBLOG, REGNO, DEVICE, SECTOR,
             - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
             1       FOOTNT(12), DEVNAME(3), REGNAME(2)
             2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
             3  ,PAGENO
              REAL RVALUE(12)
      C
      C        PRNTOUT PRINTS CARD TYPES 1 AND 2 FROM THE DATA FILE.
              CALL PRNTOUT
    2         WRITE(5,510)
      C        PRINT THE SOURCE FILE.
        510 FORMAT(1H1,24X,*S O U R C E S*//)
    6         REWIND 6
   10     520 READ(6,530) K,CARD
        530 FORMAT(X,A4,X,7A10,A4)
   20         IF (K.EQ.4HEND/) GO TO 560
   22         WRITE(5,550) K,CARD
        550 FORMAT(2X,A4,3X,7A10,A4)
   32         GO TO 520
   33     560 REWIND 7
   35         WRITE(5,570)
      C        PRINT THE SOURCE FOOTNOTE FILE.
        570 FORMAT(1H1,24X,*S O U R C E   F O O T N O T E S*//)
   41     580 READ(7,590) K,L,CARD
        590 FORMAT(X,A4,A1,2X,7A10,A2)
   53         IF (K.EQ.4HEND/) GO TO 620
   55         WRITE(5,600) K,L,CARD
        600 FORMAT(2X,A4,2X,A1,2X,7A10,A2)
   67         GO TO 580
   70     620 REWIND 8
   72         WRITE(5,630)
      C        PRINT THE FOOTNOTE FILE.
        630 FORMAT(1H1,20X,*F O O T N O T E S*//)
   76     650 READ(8,660) CARD
        660 FORMAT(8A10)
  104         IF (CARD.EQ.5H/END/) GO TO 999
  106         WRITE(5,660) CARD
  114         GO TO 650
  115     999 CONTINUE
  115         RETURN
  116         END
```

PRINT

SUBPROGRAM LENGTH

00203

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES	
000123	C00002	510	000003	
000011	L00013	520	000033	
000130	C00007	530	000011	
000135	C00014	550	000023	
000034	L00024	560	000022	
000141	C00020	570	000036	
000042	L00031	580	000070	
000147	C00026	590	000042	
000155	C00034	600	000056	
000071	L00042	620	000055	
000162	C00041	630	000073	
000077	L00047	650	000115	
000167	C00046	660	000077	000107
000116	L00060	999	000106	

BLOCK NAMES AND LENGTHS
SORTCOM- 047046/01 CRDINFO- 000142/02

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES			
000000/02	G00003	CARD	000016	000030	000051	000065
			000112			
000010/02	V00012	CRDTYPE	NONE			
000011/02	V00013	DEVBLDG	NONE			
000013/02	V00015	DEVICE	NONE			
000136/02	G00011	DEVNAME	NONE			
000045/02	G00005	EXPNT	NONE			
000111/02	G00010	FOOTNT	NONE			
000130/02	V00031	FUELTYP	NONE			
000061/02	G00006	HARDNS	NONE			
000125/02	V00026	J	NONE			
000201	V00037	K	000014	000021	000026	000045
000175	G00002	KEY	NONE			
000002/01	V00004	KEYSIZ	NONE			
000202	V00040	L	000047	000063		
000004/01	V00006	LCMHI	NONE			
000003/01	V00005	LCMLO	NONE			
000133/02	V00034	LINENO	NONE			
000132/02	V00033	LNCNT	NONE			
000031/02	G00004	MANTISA	NONE			
000131/02	V00032	NUM4	NONE			

PRINT

```
000141/02 V00035    PAGENO    NONE
000001/01 V00003    RCDSIZ    NONE
000134/02 G00012    REGNAME   NONE
000012/02 V00014    REGNO     NONE
000015/02 G00013    RVALUE    NONE
000006/01 G00001    SCM       NONE
000005/01 V00007    SCMSIZ    NONE
000014/02 V00016    SECTOR    NONE
000075/02 G00007    SOURCE    NONE
000000/01 V00002    SRTTYP    NONE
000126/02 V00027    TIMEFR    NONE
000127/02 V00030    TIMETO    NONE
```

START OF CONSTANTS-000121 TEMPS--000173 INDIRECTS-000175

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 044100

BRKCARD

```
      SUBROUTINE BRKCARD
C
C     ROUTINE TO BREAK NON-BLANK CARD INFC. ,PUTS IT INTO VARIOUS ARI
C     FOR CARD TYPES 1 AND 2
C      CRDINFC
C        THIS AREA IS NOT CLEARED BY THIS ROUTINE - CLEARING MUST
C        BE DONE EXTERNALLY.  THIS ALLOWS ACCUMULATION OF INFC
C        FROM MULTIPLE CARDS.
C          CARD - THE CARD TO BE BROKEN APART
C          CRDTYPE - DERIVED FROM CARD COL 1.
C              1 - CARD TYPE 1 FOUND, CARD BROKEN APART.
C              2 - CARD TYPE 2 FOUND, CARD BRCKEN APART.
C              3 - CARD TYPE 3 FOUND, CARD NOT ANALYZED.
C              S - CARD TYPE S FOUND, CARD NOT ANALYZED.
C              F - CARD TYPE F FOUND, CARD NOT ANALYZED.
C              * - CARD TYPE * FOUND, CARD NOT ANALYZED.
C              ERROR - INVALID TYPE OR DEVICE/SECTOR CODE FCUND.
C          DEVBLDG - 1 IF DEVICE CARD
C                    2 IF BUILDING CARD
C          REGNO - REGION NUMBER - 0-99
C          DEVICE - DEVICE CODE
C          SECTOR - SECTOR CODE
C        THE FOLLOWING SIX ARRAYS CONTAIN THE INFORMATION FCUND IN TH
C        VARIOUS DATA COLUMNS.  ARRAY ELEMENT 1 CONTAINS THE INFO FRC
C        THE FIRST INFORMATION COLUMN ON CARD TYPE 1, ARRAY ELEMENT
C        2 CONTAINS THE INFO FROM THE 2ND SET OF INFC ON CARD TYPE 1,
C        ETC.
C          RVALUE - THE REAL VALUE OF THE DATA, WITH FROPER EXPONENTS
C          MANTISA - THE MANTISA FOUND OR DERIVED FROM THE VARIOUS CC
C              NS.
C          EXPNT - THE EXPONENT FOUND OR DERIVED FROM THE VARIOUS COL
C          HARDNS - THE HARDNESS CODE FOUND IN THE COLUMNS
C          SOURCE  - THE SOURCE CODE FOUND IN THE COLUMNS.
C          FOCTNT - THE FOOTNOTE CODE FOUND IN THE CCLUMNS.
C          J - THE COLUMN NUMBER
C          TIMEFR - THE STARTING YEAR OF THE FERIOD TO WHICH THE DATA
C                   APPLIES.
C          TIMETO - THE ENDING YEAR OF THE PERIOD.
C          FUELTYP - THE FUEL TYPE CODE FOR DEVICE CARDS
C          NUM4 - TEMPORARY STORAGE FOR THE 4-COLUMN NUMBER FOUND
C              ON THE CARD.
C          LNCNT - POSITION ON PAGE FCR PRINTING HEADINGS.
C          LINENC - LINE NUMBER FOR CORRELATING DATA AND FOOTNOTE INF
C          REGNAME - EXPANDED REGION NAME
C          DEVNAME - EXPANDED DEVICE OR SECTOR NAME.
C
      COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
     - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     -  , REGNAME, DEVNAME
     -  ,PAGENO
      INTEGER CARD(8), CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
     1       FOOTNT(12), DEVNAME(3), REGNAME(2)
     2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     3  ,PAGENO
```

```
              REAL RVALUE(12)
              INTEGER ITMFR, ITMTO, SATRATE, SATSRC, SATFTNT,ITEMP
              COMMON /EXPEXP/  IEXP
              DIMENSION NCOLS(2,2)
      C        NO. OF COLUMNS OF INFO ON VARIOUS KINDS OF CARDS.
              DATA NCOLS/6,2,6,4/
              DIMENSION IEXPS(6,2,2)
      C        EXPECTED EXPONENTS.
              DATA IEXPS/4,3,3,1,-1,0,0,0,0,0,0,0,4,3,3,2,5,0,-2,1,-2,5,0,0/
      C
      C          CHECK COLUMN 1
              DECODE(1,101,CARD) CRDTYPE
          101 FORMAT(A1)
   11         IF (CRDTYPE.EQ.1HS) GO TO 108
   13         IF (CRDTYPE.EQ.1HF) GO TO 108
   15         IF (CRDTYPE.EQ.1H*) GO TO 108
   16         DECODE(20,110,CARD) CRDTYPE,REGNO,SECTOR,ITMFR, ITMTO, ITEMP,
             -  SATRATE, SATSRC, SATFTNT
          110 FORMAT(A1,I2,A6,I2,I2,A1,I4,A1,A1)
   46         IF (CRDTYPE.EQ.1H1) GO TO 111
   50         IF (CRDTYPE.EQ.1H2) GO TO 160
   52         IF (CRDTYPE.EQ.1H3) GO TO 170
   53     105 CRDTYPE = 5HERROR
   55     108 RETURN
      C
      C           CARD TYPE 1
      C
   56     111 CRDTYPE = 1
      C
      C           CARD TYPES 1,2, AND 3
      C
   57     115 IF (ITMFR.EQ.0) ITMFR = ITMTO
   61         IF (ITMTO.EQ.0) ITMTO = ITMFR
   63         TIMEFR = ITMFR
   64         TIMETO = ITMTO
   66         DECODE(20,118,CARD) I1TEMP,JUNK,JUNK1,I2TEMP
          118 FORMAT(A9,I2,I2,A7)
  103         ENCODE(20,118,CARD) I1TEMP,TIMEFR,TIMETO,I2TEMP
  121     120 DEVNAME = 10H
      C        ATTEMPT TO EXPAND SECTOR CODE.
      C          IF SECTOR CODE IS VALID, EXPANDED NAME WILL BE LOADED INTO
      C          DEVNAME.
  123         CALL TRNSCT
  124         IF (DEVNAME.NE.10H           ) GO TO 150
  126         DECODE(6,130,SECTOR) DEVICE, SECTOR
          130 FORMAT(A5,A1)
      C        ATTEMPT TO EXPAND DEVICE CODE.  IF VALID, EXPANDED NAME WILL B
      C          LOADED INTO DEVNAME.
  140         CALL TRNDEV
  141         IF (DEVNAME.EQ.10H           ) GO TO 105
      C
      C           DEVICE CARD
      C
  143     140 DEVBLOG = 1
  144         IF (CRDTYPE.EQ.3) GO TO 108
  146         GO TO 200
```

```
      C
      C           BUILDING CARD
      C
147     150 IF (CRDTYPE.EQ.3) GO TO 105
151         DEVBLDG = 2
152         CALL TRNSCT
153         GO TO 200
      C
      C           CARD TYPE 2
      C
154     160 CRDTYPE = 2
155         GO TO 115
      C
      C           CARD TYPE 3
      C
156     170 CRDTYPE = 3
157         GO TO 115
      C
      C           DEVICE AND SECTOR CARDS
      C
160     200 IF (CRDTYPE.NE.1) GO TO 210
162         IF (DEVBLDG.NE.1) GO TO 210
164         IF (SATRATE.EQ.0) GO TO 210
      C      LOAD SATURATION RATE INFO FOR DEVICE CARDS, TYPE 1
165         MANTISA(1) = SATRATE
165         EXPNT(1) = 0
166         RVALUE(1) = FLOAT(SATRATE)/10.
170         HARDNS(1) = 0
171         DECODE(10,205,CARD(3)) SATSRC
        205 FORMAT(5X,A4,X)
201         SOURCE(1) = SATSRC
202         FOOTNT(1) = SATFTNT
204         FUELTYP = ITEMP
      C      LOAD THE NUMBER OF DATA COLUMNS INTO K
206     210 K = NCOLS(CRDTYPE, DEVBLDG)
      C      THE FOLLOWING LOOP EXAMINES EACH BLOCK OF INFO ON THE CARD,
      C        DECODING THE BLOCKS FOR WHICH THE NUMBER IS NON-BLANK.
211         DO 300 I=1,K
213         DECODE (4,212,CARD(I+2)) NUM4
        212 FORMAT(A4)
      C      IF THE NUMBER FIELD IS BLANK, CHECK THE NEXT COLUMN.
223         IF (NUM4.EQ.4H    ) GO TO 300
      C      LOAD THE DEFAULT EXPONENT
232         IEXP = IEXPS(I,CRDTYPE, DEVBLDG)
      C      LOAD THE COLUMN NUMBER.
233         J = I + 6*CRDTYPE - 6
235         IF (DEVBLDG.EQ.1) J = J + 1
      C      CHECK FOR NON-STANDARD FORMATS.
240         IF (IEXP.LT.0) GO TO 230
242         DECODE(10,220,CARD(I+2)) NUM4, HARDNS(J), SOURCE(J), FOOTNT(
        220 FORMAT(A4,I1,A4,A1)
      C     ************************ CLEAN-UP PATCH ********************
      C        THE FOLLOWING PATCH FIXES FREQUENTLY OCCURING ERRORS.
263         IF(SOURCE(J).EQ.4H0001.AND.FOOTNT(J).EQ.1H*)FOOTNT(J)=1H1
275         IF(SOURCE(J).NE.4H    ) GO TO 902
301         SOURCE(J)=4H0002
```

BRKCARD

```
302          HARDNS(J)=0
303      902 CONTINUE
303          IF(DEVBLDG.EQ.2) GO TO 911
305          IF(SOURCE(J).EQ.4H9000.AND.FOOTNT(J).NE.1H )FOOTNT(J)=1H3
317          IF(SOURCE(J).EQ.4H2751.AND.FOOTNT(J).EQ.1H1)FOOTNT(J)=1H2
331      901 CONTINUE
331          ENCODE(10,220,CARD(I+2))NUM4,HARDNS(J),SOURCE(J),FOOTNT(J)
       C     ********************* END OF CLEAN-UP PATCH *****************
       C      GETNMB WILL LOAD THE MANTISSA AND EXPONENT.
353          CALL GETNMB
354          RVALUE(J) = FLOAT (MANTISA(J) * 10**EXPNT(J))/100.
364          GO TO 300
       C
       C           SPECIAL FIELD TYPES (PERCENTS AND UTILIZATION)
       C
365      230 IF (IEXP.LT.-1) GO TO 250
       C      UTILIZATION - EXPNT IS UTILIZATION CODE.
370          DECODE(10,240,CARD(I+2)) MANTISA(J), EXPNT(J),HARDNS(J),SOURCE(J
            -, FOOTNT(J)
         240 FORMAT(I3,A1,I1,A4,A1)
415          RVALUE(J) = MANTISA(J)
420          GO TO 300
       C      PERCENT FORMAT
420      250 DECODE(10,260,CARD(I+2)) MANTISA(J), HARDNS(J), SOURCE(J),
            -     FOOTNT(J)
         260 FORMAT(I4,A1,A4,I1)
444          EXPNT(J) = 0
445          RVALUE(J) = FLOAT(MANTISA(J))/10.
       C      ********  END OF DO LOOP
450      300 CONTINUE
       C      ******   END OF DISSECTION OF CARD - EXPAND REGION CODE.
453      310 CONTINUE
453          CALL TRNREG
454          RETURN
455          END
```

SUBPROGRAM LENGTH

00647

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES			
000461	C00001	101	000002			
000054	L00026	105	000143	000151		
000056	L00027	108	000013	000015	000016	000146
000471	C00011	110	000017			
000057	L00030	111	000050			
000060	L00031	115	000156	000160		
000505	C00025	118	000067	000104		

BRKCARD

000122	L00047	120	NONE		
000512	C00032	130	000127		
000144	L00063	140	NONE		
000150	L00067	150	000126		
000155	L00075	160	000052		
000157	L00077	170	000053		
000161	L00101	200	000147	000154	
000517	C00037	205	000172		
000207	L00121	210	000162	000164	000165
000522	C00042	212	000214		
000526	C00046	220	000243	000332	
000366	L00176	230	000242		
000554	C00074	240	000371		
000421	L00205	250	000370		
000557	C00077	260	000421		
000451	L00212	300	000225	000365	000420
000454	L00214	310	NONE		
000332	L00166	901	000305	000327	
000304	L00154	902	000300		

BLOCK NAMES AND LENGTHS

CRDINFO- 000142/01 EXPEXP - 000001/02

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES			
000000/01	G00001	CARD	000005	000022	000071	000107
000010/01	V00002	CRDTYPE	000007	000012	000024	000047
			000144	000150	000155	000157
			000227			
000011/01	V00003	DEVBLCG	000145	000152	000163	000210
000013/01	V00005	DEVICE	000134			
000136/01	G00007	DEVNAME	000123	000125	000142	
000045/01	G00003	EXPNT	000167	000446		
000111/01	G00006	FOOTNT	000205			
000130/01	V00021	FUELTYP	000206			
000061/01	G00004	HARDNS	000171	000303		
000646	V00044	I	000213	000216	000226	000245
			000424	000451		
000000/02	V00045	IEXP	000233	000241	000366	
000611	G00013	IEXPS	NONE			
000604	V00034	ITEMP	000036	000204		
000577	V00027	ITMFR	000032	000060	000063	000064
000600	V00030	ITMTO	000034	000061	000062	
000641	V00037	I1TEMP	000073	000111		
000644	V00042	I2TEMP	000101	000117		
000125/01	V00016	J	000236	000252	000255	000260
			000306	000320	000342	000345
			000363	000376	000401	000404
			000416	000427	000432	000435
000642	V00040	JUNK	000075			
000643	V00041	JUNK1	000077			
000645	V00043	K	000211	000451		
000133/01	V00024	LINENO	NONE			
000132/01	V00023	LNCNT	NONE			
000031/01	G00002	MANTISA	000166	000445		

BRKCARD

000605	G00012	NCOLS	NONE			
000131/01	V00022	NUM4	000221	000224	000250	000340
000141/01	V00025	PAGENO	NONE			
000134/01	G00010	REGNAME	NONE			
000012/01	V00004	REGNO	000026			
000015/01	G00011	RVALUE	000171	000450		
000603	V00033	SATFTNT	000044	000203		
000601	V00031	SATRATE	000040	000164		
000602	V00032	SATSRC	000042	000177	000202	
000014/01	V00006	SECTOR	000030	000132	000136	
000075/01	G00005	SOURCE	000203	000302		
000126/01	V00017	TIMEFR	000065	000113		
000127/01	V00020	TIMETO	000066	000115		

START OF CONSTANTS-000460 TEMPS--000563 INDIRECTS-000571

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 045300

GETINFO

```
                SUBROUTINE GETINFO
          C
          C     *************
          C     THIS ROUTINE IS NOT IN USE BY THIS PROGRAM
          C     *************
          C
                COMMON /GTCDCOM/ XDEVSEC, XREGNO, XTMFRTO
                INTEGER XDEVSEC, XREGNO, STMFRTC
                COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
               -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
               - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
               -  , REGNAME, DEVNAME
               -  ,PAGENO
                INTEGER CARD(8), CRDTYPE, DEVBLDG, REGNC, DEVICE, SECTOR,
               - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
               1       FOOTNT(12), DEVNAME(3), REGNAME(2)
               2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
               3  ,PAGENO
                REAL RVALUE(12)
          C
          C     SET BLANK COMMON AREA
          C
                DO 5 I = 1,12
                RVALUE(I) = -0
     11         MANTISA(I) = 10H
     12         EXPNT(I) = 10H
     12         HARDNS(I) = 10H
     13         SOURCE(I) = 10H
     13       5 CONTINUE
     14         DO 6 I = 1,3
     22       6 DEVNAME(I) = 10H
     24         REGNAME(1) = 10H
     24         REGNAME(2) = 10H
     25         CRDTYPE = 0
     26         DEVBLDG = 0
     27         REGNO = 0
     27         DEVICE = 10H
     30         SECTOR = 10H
          C
     32         REWIND 2
     34       8 READ(2,10) CARD
             10 FORMAT(8A10)
     42         IF (CARD(1).EQ.5H/END/) GO TO 40
     44         DECODE(13,20,CARD) I1,I2,I3
             20 FORMAT(X,2I,A6,I4)
     60         IF (I1.LT.0) I1 = 0
     62         IF (I2.EQ.XDEVSEC.AND.I1.EQ.XREGNO.AND.I3.EQ.XTMFRTO)CALL BRKCA
     77         IF (I2.GT.XDEVSEC) GO TO 40
    103         GO TO 8
    103        40 RETURN
    104         END
```

SUBPROGRAM LENGTH

GETINFO

00141

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES	
000035	L00036	8	000103	
000114	C00005	10	000035	
000120	C00011	20	000045	
000104	L00063	40	000044	000102

BLOCK NAMES AND LENGTHS
GTCDCOM- 000003/01 CRDINFO- 000142/02

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES		
000000/02	G00001	CARD	000040	000043	000050
000010/02	V00005	CRDTYPE	000027		
000011/02	V00006	DEVBLDG	000027		
000013/02	V00010	DEVICE	000031		
000136/02	G00007	DEVNAME	000020		
000045/02	G00003	EXPNT	000007		
000111/02	G00006	FOOTNT	NONE		
000130/02	V00024	FUELTYP	NONE		
000061/02	G00004	HARDNS	000006		
000135	V00032	I	000003	000016	
000136	V00033	I1	000052	000061	
000137	V00034	I2	000054	000063	000100
000140	V00035	I3	000056	000071	
000125/02	V00021	J	NONE		
000133/02	V00027	LINENO	NONE		
000132/02	V00026	LNCNT	NONE		
000031/02	G00002	MANTISA	000007		
000131/02	V00025	NUM4	NONE		
000141/02	V00030	PAGENO	NONE		
000134/02	G00010	REGNAME	000025		
000012/02	V00007	REGNO	000030		
000015/02	G00011	RVALUE	000010		
000014/02	V00011	SECTOR	000032		
000075/02	G00005	SOURCE	000006		
000134	V00003	STMFRTO	NONE		
000126/02	V00022	TIMEFR	NONE		
000127/02	V00023	TIMETO	NONE		
000000/01	V00001	XDEVSEC	000063	000100	
000001/01	V00002	XREGNO	000066		
000002/01	V00036	XTMFRTO	000072		

START OF CONSTANTS-000107 TEMPS--000123 INDIRECTS-000130

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

GETINFO

ROUTINE COMPILES IN 044000

GETNMB

```
              SUBROUTINE GETNMB
        C
        C       THIS ROUTINE INTERPRETS 4-CHARACTER NUMERIC FIELDS AS EITHE
        C       F4.0 NUMBERS MULTIPLIED BY A SCALING FACTOR OR AS MANTISSA
        C       AND EXPONENT.
        C
              COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLOG, REGNO, DEVICE, SECTO
             -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
             - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
             -  , REGNAME, DEVNAME
             -  ,PAGENO
              INTEGER CARD(8), CRDTYPE, DEVBLOG, REGNO, DEVICE, SECTOR,
             - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
             1       FOOTNT(12), DEVNAME(3), REGNAME(2)
             2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
             3  ,PAGENO
              REAL RVALUE(12)
              COMMON /EXPEXP/  IEXP
              INTEGER ARAY(4)
              DECODE(4,5,NUM4) ARAY
            5 FORMAT(4A1)
11            I = 1
12          7 IF (ARAY(I).EQ.1H.) GO TO 15
15            IF (I.EQ.4) GO TO 40
16            I = I + 1
17            GO TO 7
20         15 DECODE(4,20,NUM4) R
           20 FORMAT(F4.0)
31            MANTISA(J) = R * 10**(4-I) + 0.5
42            EXPNT(J) = IEXP + I - 2
45            RETURN
45         40 DECODE(4,50,NUM4) MANTISA(J), EXPNT(J)
           50 FORMAT(I3,I1)
61            RETURN
62            END
```

SUBPROGRAM LENGTH

00113

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000066	C00001	5	000002
000013	L00010	7	000020
000021	L00016	15	000015
000072	C00005	20	000021
000046	L00025	40	000016
000075	C00010	50	000046

GETNMB

BLOCK NAMES AND LENGTHS
CRDINFO- 000142/01 EXPEXP - 000001/02

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES			
000105	G00012	ARAY	000007			
000000/01	G00001	CARD	NONE			
000010/01	V00002	CRDTYPE	NONE			
000011/01	V00003	DEVBLDG	NONE			
000013/01	V00005	DEVICE	NONE			
000136/01	G00007	DEVNAME	NONE			
000045/01	G00003	EXPNT	000045			
000111/01	G00006	FOOTNT	NONE			
000130/01	V00021	FUELTYP	NONE			
000061/01	G00004	HARDNS	NONE			
000111	V00030	I	000012	000013	000032	000043
000000/02	V00032	IEXP	000042			
000125/01	V00016	J	000031	000053	000056	
000133/01	V00024	LINENO	NONE			
000132/01	V00023	LNCNT	NONE			
000031/01	G00002	MANTISA	000043			
000131/01	V00022	NUM4	000005	000024	000051	
000141/01	V00025	PAGENO	NONE			
000112	V00031	R	000026	000037		
000134/01	G00010	REGNAME	NONE			
000012/01	V00004	REGNO	NONE			
000015/01	G00011	RVALUE	NONE			
000014/01	V00006	SECTOR	NONE			
000075/01	G00005	SOURCE	NONE			
000126/01	V00017	TIMEFR	NONE			
000127/01	V00020	TIMETO	NONE			

START OF CONSTANTS-000065 TEMPS--000077 INDIRECTS-000104

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 044000

PGHDNG

```
                SUBROUTINE PGHDNG
        C        PAGE HEADING ROUTINE USED BY PRNTOUT
                COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLCG, REGNO, DEVICE, SECTO
               -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
               - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
               -  ,REGNAME,DEVNAME,PAGENO
                INTEGER CARD(8), CRDTYPE, DEVBLCG, REGNO, DEVICE, SECTOR,
               - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
               1       FOOTNT(12), DEVNAME(3), REGNAME(2)
               2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
               3  , PAGENO
                REAL RVALUE(12)
                PAGENO = PAGENO + 1
      3         WRITE(5,200) DEVNAME,PAGENO
          200 FORMAT(1H1,23X,3A10,15X,*PAGE *I3 //)
     12         LNCNT = 4
     13         RETURN
     14         END
```

SUBPROGRAM LENGTH

00030

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000021	C00002	200	000003

BLOCK NAMES AND LENGTHS
CRDINFO- 000142/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES	
000000/01	G00001	CARD	NONE	
000010/01	V00002	CRDTYPE	NONE	
000011/01	V00003	DEVBLCG	NONE	
000013/01	V00005	DEVICE	NONE	
000136/01	G00007	DEVNAME	000006	
000045/01	G00003	EXPNT	NONE	
000111/01	G00006	FOOTNT	NONE	
000130/01	V00021	FUELTYP	NONE	
000061/01	G00004	HARDNS	NONE	
000125/01	V00016	J	NONE	
000133/01	V00024	LINENO	NONE	
000132/01	V00023	LNCNT	000013	
000031/01	G00002	MANTISA	NONE	
000131/01	V00022	NUM4	NONE	
000141/01	V00025	PAGENO	000002	000010
000134/01	G00010	REGNAME	NONE	

```
PGHDNG
          000012/01 V00004     REGNO      NONE
          000015/01 G00011     RVALUE     NONE
          000014/01 V00006     SECTOR     NONE
          000075/01 G00005     SOURCE     NONE
          000126/01 V00017     TIMEFR     NONE
          000127/01 V00020     TIMETO     NONE

START OF CONSTANTS-000017        TEMPS--000026    INDIRECTS-000030

7600 COMPILATION -- RUN76 LEVEL 17A     14 JUL 76

ROUTINE COMPILES IN 044000
```

```
      SUBROUTINE PRNTOUT
C      THIS ROUTINE PRINTS THE NON-BLANK INFO IN THE DATA FILE FOR
C      CARD TYPES 1 AND 2
      COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTO
     -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
     - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     -  ,REGNAME,DEVNAME,PAGENO
      INTEGER CARD(8), CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
     1       FOOTNT(12), DEVNAME(3), REGNAME(2)
     2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     3  , PAGENO
      REAL RVALUE(12)
      INTEGER LASTID(2), THISID(2), LASTDEV(2), LASTREG
      INTEGER COLNAME(24),PRNTLN(8),COLNO
C      NAMES OF VARIOUS BLOCKS (COLUMNS)
      DATA COLNAME/
     110HSAT. RATE  ,10HSTOCK       ,10HADDITIONS   ,
     210HREMOVALS   ,10HAVG. COST$  ,10HUTILIZATN.  ,
     310HEN.CONSUMP ,10HE.C.ADDNS.  ,10HE.C.REMVLS,
     410H           ,10H            ,10H            ,
     510HSTOCK      ,10HCONSTRUCTN  ,10HREMOVALS    ,10HAVG.COST $ ,
     610HSQ. FEET   ,10HEN. CONS.   ,10HPCT.INSUL.  ,10HAVG.RENT $  ,
     710HCPI        ,10HCONST.SQFT  ,10H            ,10H            /
C
C          FOOTNOTE STORAGE AREAS AND INDEXES
C
      INTEGER SRCFTNT(200),FTNTLST(400),FTNTINX,SRCINDX
      INTEGER LETTER(12)
      DATA LETTER/1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL/
C         INDEX INFORMATION STORAGE AREA
      INTEGER IXLIST(400)
C
C     CARDA IS A STORAGE ARRAY FOR FOOTNOTE AND SOURCE FOOTNOTE CAR
C     IMAGE
C
      INTEGER CARDA(8),THISIDA(2),LASTIDA(2)
C
C
C     ALLOW 2 PAGES FOR INDEX
C
      PAGENO = 2
 2    IXLSTIX = 1
 3    READ(2,100) CARD
  100 FORMAT(8A10)
11    IF (CARD.EQ.5H/END/) GO TO 900
13    DECODE(13,120,CARD) THISID
  120 FORMAT(X,A10,A2)
C
C          CLEAR CARD INFO STORAGE AREAS
C
23    DO 110 I = 9,83
31  110 CARD(I) = 10H
32    DO 112 I = 1,12
37  112 RVALUE(I) = -0
41    CALL BRKCARD
```

```
      C
      C           NEW DEVICE/SECTOR
      C
  42    130 CALL PGHDNG
  43        IXLIST(IXLSTIX) = DEVNAME(1)
  44        IXLIST(IXLSTIX + 1) = DEVNAME(2)
  47        IXLIST(IXLSTIX + 2) = DEVNAME(3)
  51        IXLIST(IXLSTIX + 3) = PAGENO
  54        IXLSTIX = IXLSTIX + 4
      C
      C           CLEAR FOOTNOTE INFO STORAGE AREAS
      C
  56        DO 70 N = 1,200
  64     70 SRCFTNT(N) = 10H
  65        DO 71 N = 1,400
  73     71 FTNTLST(N) = 10H
  74        FTNTINX = 1
  75        SRCINDX = 1
      C
      C           INITIALIZE DEVICE/SECTOR NAME AND LINE NO
      C
  76        LASTDEV(1) = DEVNAME(1)
  77        LASTDEV(2) = DEVNAME(2)
 101        LINENO = 1
      C
      C           NEW REGION
      C
 102    140 WRITE(5,145) REGNAME
        145 FORMAT(X,2A10)
 110        LNCNT=LNCNT+1
 112        IF (LNCNT.GT.60) CALL PGHDNG
 115        LASTREG = REGNO
      C
      C           NEW TIME PERIOD
      C
 117    150 DO 155 I = 1,2
 124    155 LASTID(I) = THISID(I)
 126    168 CONTINUE
 126        CALL BRKCARD
 127    170 READ(2,100) CARD
 135        DECODE(13,120,CARD) THISID
      C
      C     PRINT 1 SET OF DATA
      C
      C           CLEAR PRINT LINE STORAGE AREA
      C
 145        DO 380 I = 1,8
 153    380 PRNTLN(I) = 10H
 154        COLNO = 1
      C           LOAD TIME PERIOD INTO PRINT LINE
 155        ENCODE(10,390,PRNTLN(2)) TIMEFR, TIMETO
        390 FORMAT(4X,I2,*-*,I2,X)
      C
      C           THE FOLLOWING LOOP (TO 600) LOADS THE NON-BLANK CARD INF
      C           INTO THE PRINT LINE IN TWO COLUMNS
      C
```

```
167         DO 600 I = 1,12
171         IF(RVALUE(I).EQ.-0) GO TO 595
      C           (IF RVALUE(I) = -0 THERE WAS NO INFO IN THAT COLUMN)
      C           LOAD THE DESCRIPTION OF THE INFO INTO THE PRINT LINE
174         PRNTLN(3*COLNO) = COLNAME(12*DEVBLDG - 12 + I)
      C           LOAD THE INFO FOR THE COLUMN INTO THE PRINTLINE
200         IF(I.EQ.1.AND.DEVBLDG.EQ.1) GO TO 402
206         IF(I.EQ.7.AND.DEVBLDG.EQ.2) GO TO 402
214         IF(I.EQ.9.AND.DEVBLDG.EQ.2) GO TO 402
222         IF(I.EQ.6.AND.DEVBLDG.EQ.1) GO TO 406
230         GO TO 408
230     402 ENCODE(20,404,PRNTLN(3*COLNO+1))RVALUE(I),HARDNS(I),SOURCE(I)
           - FOOTNT(I)
        404 FORMAT(5X,F5.1,X,I1,X,A4,X,A1,X)
253         GO TO 412
254     406 IRVALU=RVALUE(I)+0.5
257         ENCODE(20,407,PRNTLN(3*COLNO+1))IRVALU,EXPNT(I),HARDNS(I),
           - SOURCE(I),FOOTNT(I)
        407 FORMAT(5X,I3,X,A1,X,I1,X,A4,X,A1,X)
304         GO TO 412
305     408 CONTINUE
305         IRVALU = RVALUE(I) + 0.5
310         ENCODE(20,410,PRNTLN(3*CO_NO+1)) IRVALU    , HARDNS(I),SOURCE
           -      FOOTNT(I)
        410 FORMAT(I10,X,I1,X,A4,X,A1,X)
332     412 CONTINUE
332         IF (FOOTNT(I).EQ.1H ) GO TO 415
      C
      C           THE FOLLOWING CODE STORES FOOTNOTE INFO FOR
      C           LATER RETRIEVAL AND PRINTING OF FOOTNOTES
      C
      C           CHECK WHETHER FOOTNOTE IS SOURCE FTNT OR DETAIL FTNT
335         IF (FOOTNT(I).NE.1H*) GO TO 740
      C
      C           ITS A DETAIL FOOTNOTE - STORE INFO IN CC2-13, LETTER
      C           CORRESPONDING TO COLUMN NO, AND LINE NO ON WHICH WE
      C           PRINTED IT
      C
337         ENCODE(20,710,FTNTLST(FTNTINX))LASTID,LETTER(I),LINENO,COLNO
        710 FORMAT(A10,A2,A1,I3,I1,3X)
356         FTNTINX = FTNTINX + 2
360         GO TO 790
      C
      C           SOURCE FOOTNOTE - STORE SOURCE CODE AND FOOTNOTE NO
      C           IF IT IS A NEW REFERENCE
      C
360     740 ENCODE(5,750,M) SOURCE(I),FOOTNT(I)
        750 FORMAT(A4,A1)
374         N = 0
375     760 N = N + 1
377         IF (SRCFTNT(N).EQ.M) GO TO 790
401         IF (N.LT.SRCINDX) GO TO 760
403         SRCFTNT(N) = M
405         SRCINDX = SRCINDX + 1
406     790 CONTINUE
      C           CHECK WHETHER THE PRINT LINE IS FULL
```

```
406     415 IF (COLNO.EQ.1) GO TO 590
      C           IT IS FULL - PRINT IT
410           COLNO = 0
      C           LOAD THE LINE NUMBER FOR REFERENCING FOOTNOTES
410           IF (DEVBLDG.EQ.1) GO TO 416
412           ENCODE(10,417,PRNTLN) LINENO
        417 FORMAT(2X,I3,5X)
421           GO TO 421
422     416 ENCODE(10,420,PRNTLN) LINENO,SECTOR,FUELTYP
        420 FORMAT(2X,I3,2X,A1,1X,A1)
436     421 CONTINUE
436           LINENO = LINENO + 1
440           WRITE(5,430) PRNTLN
        430 FORMAT(8A10)
445           LNCNT = LNCNT + 1
447           IF (LNCNT.GT.60) CALL PGHDNG
      C           CLEAR THE PRINT LINE STORAGE AREA
452           DO 440 K = 1,8
460     440 PRNTLN(K) = 10H
461     590 COLNO = COLNO + 1
463     595 CONTINUE
      C        ******** END OF LOOP
463     600 CONTINUE
      C           CHECK TO SEE IF SOME INFO REMAINS TO BE PRINTED
465           IF (COLNO.EQ.1) GO TO 620
      C           IT DOES, SO PRINT IT
467           ENCODE(10,420,PRNTLN) LINENO
477           LINENO = LINENO + 1
501           WRITE(5,430) PRNTLN
506           LNCNT = LNCNT + 1
510           IF (LNCNT.GT.60) CALL PGHDNG
513     620 CONTINUE
      C
513           IF (CARD.EQ.5H/END/) GO TO 900
      C           CLEAR CARD INFO STORAGE AREA
515           DO 200 I = 9,83
523     200 CARD(I) = 10H
524           DO 202 I = 1,12
531     202 RVALUE(I) = -0
533           CALL ERKCARD
      C           DO WE HAVE NEW DEVICE/SECTOR, NEW REGION, OR NEW PERIOD
534           IF(LASTDEV(1).EQ.DEVNAME(1).AND.LASTDEV(2).EQ.DEVNAME(2))GO
544           GO TO 800
544     210 IF (LASTREG.EQ.REGNO) GO TO 150
546           GO TO 140
      C
      C           PRINT FOOTNOTES AND SOURCE FOOTNOTES
      C
547     800 CONTINUE
547           IF (FTNTINX.EQ.1) GO TO 870
551           ICHK=0
551           N = 1
553           WRITE(5,810)
        810 FORMAT(//,5X,*- - - - -   F O O T N O T E S   - - - - -*)
556     815 DECODE(20,820,FTNTLST(N))THISIDA,LINENO,COLNO
        820 FORMAT(A10,A3,I3)
```

```
573     825 REWIND 8
575     830 LASTIDA(1)=10H
577         READ(8,840) LASTIDA,(CARDA(II),II=1,7)
        840 FORMAT(X,A10,A3,2X,6A10,A4)
606         IF(EOF(8))851,841,851
611     841 CONTINUE
611         IF(LASTIDA.EQ.10HEND/        ) GO TO 860
613         IF(THISIDA(1).EQ.LASTIDA(1).AND.THISIDA(2).EQ.LASTIDA(2)) GO
           1 845
622         GO TO 830
622     845 WRITE(5,850) LINENO,COLNO,(CARDA(I),I=1,7)
        850 FORMAT(X,I3,2X,I1,2X,6A10,A4)
634         ICHK=1
635         GO TO 830
636     851 WRITE(5,852) THISIDA,LINENO,COLNO
        852 FORMAT(X,*F852 - MISSED END CHECK *,A10,A3,2I3)
650         GO TO 825
651     860 N = N + 2
653         IF(ICHK.EQ.1) GO TO 867
655         WRITE(5,866) THISIDA
        866 FORMAT(X,*MISSING FOOTNOTE - *,A10,A3)
662     867 ICHK=0
663         IF (N.GE.FTNTINX) GO TO 870
666         GO TO 815
666     870 IF (SRCINDX.EQ.1) GO TO 899
670         WRITE(5,872)
        872 FORMAT(//,5X,*- - - - -   S O U R C E   F O O T N O T E S
           -- -*)
674         N = 1
675         ICHK=0
676     874 REWIND 7
700     875 K=10H
702         READ(7,876) K,CARDA
        876 FORMAT(X,A5,2X,7A10,A2)
711         IF(K.EQ. 5HEND/       ) GO TO 880
713         IF (K.NE.SRCFTNT(N)) GO TO 875
715         WRITE(5,878) K,CARDA
        878 FORMAT(X,A5,2X,7A10,A2)
725         ICHK=1
726         GO TO 875
727     880 CONTINUE
727         IF(ICHK.EQ.1) GO TO 886
731         WRITE(5,885) SRCFTNT(N)
        885 FORMAT(X,*MISSING FOOTNOTE - *, A5)
740     886 ICHK=0
741         N = N + 1
743         IF (N.EQ.SRCINDX) GO TO 899
744         GO TO 874
745     899 CONTINUE
745         GO TO 130
746     900 WRITE(5,905)
        905 FORMAT(1H1,20X,*C O N T E N T S*////,46X,*PAGE*/)
752         I = 1
753     907 IF (I.GE.IXLSTIX) GO TO 999
756         IPLUS3 = I + 3
757         WRITE(5,910) (IXLIST(J),J=I,IPLUS3)
```

```
PRNT001
          910 FORMAT(15X,3A10,2X,I3)
767           I = I + 4
771           GO TO 907
771       999 RETURN
772           END
```

SUBPROGRAM LENGTH

03276

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES		
000777	C00002	100	000004	000130	
001003	C00006	120	000014	000136	
000043	L00034	130	000746		
000103	L00063	140	000547		
001012	C00015	145	000103		
000120	L00074	150	000546		
000127	L00102	168	NONE		
000130	L00103	170	NONE		
000545	L00314	210	000544		
001016	C00021	390	000156		
000231	L00152	402	000206	000214	000222
001022	C00025	404	000231		
000255	L00156	406	000230		
001027	C00032	407	000260		
000306	L00163	408	000230		
001035	C00040	410	000311		
000333	L00167	412	000254	000305	
000407	L00213	415	000335	000360	000401
000423	L00224	416	000412		
001053	C00056	417	000413		
001056	C00061	420	000423	000470	
000437	L00227	421	000422		
001062	C00065	430	000440	000501	
000462	L00246	590	000410		
000464	L00247	595	000174		
000464	L00247	600	000174		
000514	L00267	620	000467	000511	000512
001045	C00050	710	000340		
000361	L00200	740	000337		
001051	C00054	750	000361		
000376	L00204	760	000403		
000407	L00213	790	000335	000360	000401
000550	L00317	800	000544		
001071	C00074	810	000553		
000557	L00326	815	000666		
001100	C00103	820	000557		
000574	L00331	825	000651		

PRNTOUT

000576	L00333	830	000622	000636	
001106	C00111	840	000577		
000612	L00341	841	NONE		
000623	L00350	845	000622		
001115	C00120	850	000623		
000637	L00355	851	000611		
001121	C00124	852	000637		
000652	L00361	860	000613		
001127	C00132	366	000655		
000663	L00367	867	000655		
000667	L00373	870	000551	000665	000666
001134	C00137	872	000671		
000677	L00402	874	000745		
000701	L00404	875	000715	000727	
001147	C00152	876	000702		
001154	C00157	878	000716		
000730	L00421	880	000713		
001157	C00162	885	000732		
000741	L00426	886	000731		
000746	L00433	899	000670	000744	
000747	L00434	900	000013	000515	
001164	C00167	905	000747		
000754	L00440	907	000771		
001172	C00175	910	000760		
000772	L00450	999	000755	000756	

BLOCK NAMES AND LENGTHS
CRDINFO- 000142/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES			
000000/01	G00001	CARD	000007	000012	000017	000027
			000514	000521		
003251	G00023	CARDA	000604	000632	000707	000723
001222	G00015	COLNAME	NONE			
001262	V00035	COLNO	000155	000174	000234	000263
			000407	000462	000466	000571
000010/01	V00002	CRDTYPE	NONE			
000011/01	V00003	DEVBLCG	000176	000411		
000013/01	V00005	DEVICE	NONE			
000136/01	G00007	DEVNAME	000044	000076	000535	
000045/01	G00003	EXPNT	NONE			
000111/01	G00006	FOOTNT	NONE			
002413	V00040	FTNTINX	000075	000342	000357	000550
001573	G00020	FTNTLST	000071			
000130/01	V00021	FUELTYP	000434			
000061/01	G00004	HARDNS	NONE			
003266	V00050	I	000025	000034	000121	000147
			000237	000242	000245	000250
			000273	000276	000301	000306
			000327	000333	000347	000366
			000517	000526	000753	000754
003273	V00055	ICHK	000552	000635	000653	000664
			000730	000742		
003274	V00056	II	NONE			

003275	V00057	IPLUS3	000757	000764		
003270	V00052	IRVALU	000257	000266	000310	000317
002431	G00022	IXLIST	000046			
003265	V00047	IXLSTIX	000003	000045	000047	000052
000125/01	V00016	J	NONE			
003272	V00054	K	000454	000702	000705	000712
001217	G00014	LASTDEV	000100	000535		
001213	G00012	LASTID	000124	000345		
003263	G00025	LASTIDA	000577	000602	000612	
001221	V00032	LASTREG	000117	000545		
002415	G00021	LETTER	NONE			
000133/01	V00024	LINENO	000102	000352	000417	000430
			000500	000567	000626	000644
000132/01	V00023	LNCNT	000111	000446	000507	
003271	V00053	M	000364	000400		
000031/01	G00002	MANTISA	NONE			
003267	V00051	N	000060	000067	000375	000376
			000652	000663	000675	000714
000131/01	V00022	NUM4	NONE			
000141/01	V00025	PAGENO	000002	000053		
001252	G00016	PRNTLN	000151	000235	000264	000315
			000443	000456	000473	000504
000134/01	G00010	REGNAME	000106			
000012/01	V00004	REGNO	000116	000545		
000015/01	G00011	RVALUE	000036	000530		
000014/01	V00006	SECTOR	000432			
000075/01	G00005	SOURCE	NONE			
001263	G00017	SRCFTNT	000062			
002414	V00041	SRCINDX	000077	000402	000667	000743
001215	G00013	THISID	000021	000123	000143	
003261	G00024	THISIDA	000565	000614	000642	000600
000126/01	V00017	TIMEFR	000163			
000127/01	V00020	TIMETO	000165			

START OF CONSTANTS-000775 TEMPS--001175 INDIRECTS-001207

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 047100

SORTEDF

```
                SUBROUTINE SORTEDF(CARD,KEY)
        C        THIS ROUTINE WRITES SORTED SOURCE FOOTNOTES TO FILE 7
                COMMON /SRTTST/ CDSREAD,CDSRTND
                INTEGER CDSREAD(4), CDSRTND(4)
                INTEGER CARD(8)
                WRITE(7,100) CARD
     12         CDSRTND(3) = CDSRTND(3) + 1
            100 FORMAT(8A10)
     15         RETURN
     16         END
```

SUBPROGRAM LENGTH

00030

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000024	C00003	100	000004

BLOCK NAMES AND LENGTHS
SRTTST - 000010/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000000/01	G00001	CDSREAD	NONE
000004/01	G00002	CDSRTND	NONE

START OF CONSTANTS-000021 TEMPS--000026 INDIRECTS-000030

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 044000

SORTEDN

```
                SUBROUTINE SORTEDN(CARD,KEY)
        C        THIS ROUTINE WRITES SORTED FOOTNOTES TO FILE 8
                COMMON /SRTTST/ CDSREAD,CDSRTND
                INTEGER CDSREAD(4), CDSRTND(4)
                INTEGER CARD(8)
                WRITE(8,100) CARD
     12         CDSRTND(4) = CDSRTND(4) + 1
            100 FORMAT(8A10)
     15         RETURN
     16         END
```

SUBPROGRAM LENGTH

00030

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000024	C00003	100	000004

BLOCK NAMES AND LENGTHS
SRTTST - 000010/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000000/01	G00001	CDSREAD	NONE
000004/01	G00002	CDSRTND	NONE

START OF CONSTANTS-000021 TEMPS--000026 INDIRECTS-000030

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 044000

SORTEDS

```
              SUBROUTINE SORTEDS(CARD,KEY)
        C      THIS ROUTINE WRITES SORTED SOURCE RECORDS TO FILE 6
              COMMON /SRTTST/ CDSREAD,CDSRTND
              INTEGER CDSREAD(4), CDSRTND(4)
              INTEGER CARD(8)
              WRITE(6,100) CARD
     12       CDSRTND(2) = CDSRTND(2) + 1
          100 FORMAT(8A10)
     15       RETURN
     16       END
```

SUBPROGRAM LENGTH

00030

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000024	C00003	100	000004

BLOCK NAMES AND LENGTHS
SRTTST - 000010/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000000/01	G00001	CDSREAD	NONE
000004/01	G00002	CDSRTND	NONE

START OF CONSTANTS-000021 TEMPS--000026 INDIRECTS-000030

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN C44000

SRTRTN

```
                SUBROUTINE SRTRTN(CARD,KEY)
        C        THIS ROUTINE WRITES SORTED DATA RECORDS TO FILE 2.
                COMMON /SRTTST/ CDSREAD,CDSRTND
                INTEGER CDSREAD(4), CDSRTND(4)
                INTEGER CARD(8)
                WRITE(2,102) CARD
     12         CDSRTND(1) = CDSRTND(1) + 1
            102 FORMAT(8A10)
     15         RETURN
     16         END
```

SUBPROGRAM LENGTH

00030

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000024	C00003	102	000004

BLOCK NAMES AND LENGTHS
SRTTST - 000010/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000000/01	G00001	CDSREAD	NONE
000004/01	G00002	CDSRTND	000013

START OF CONSTANTS-000021 TEMPS--000026 INDIRECTS-000030

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 044000

TRNDEV

```
      SUBROUTINE TRNDEV
C
C           THIS ROUTINE LOADS THE FULL NAME OF A DEVICE INTO DEVNA
C
      COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLDG, REGNO, DEVICE, SECT
     -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
     - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     -  , REGNAME, DEVNAME
     -  ,PAGENO
      INTEGER CARD(8), CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
     1       FOOTNT(12), DEVNAME(3), REGNAME(2)
     2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     3  ,PAGENO
      REAL RVALUE(12)
      INTEGER DEVCOD(60)
      DATA DEVCOD/5HREF    ,5HREFFF,5HREFMD,5HFRZ   ,5HFRZFF,5HFRZMD
     15HRANGE,5HWTHTR,5HCLRTV,5HBWTV ,5HDRYER,5HWASHR,5HDWASH,5HEHI
     25HCNTAC,5HRMAC ,5HEVPCL,5HINCLT,5HFLULT,5HFFAN ,
     35HHEATO ,5HHEATC ,5HHEATT ,5HBASEH ,5HCABLH ,
     45HFURNH ,5HPUMPH ,5HMISCH ,5HTOTLH ,5HEDWEL ,
     55HRCUST ,5HMETER ,5HKWHCS ,5HKWHSL ,5HSFDTL ,
     65HMUNTL ,5HTOTTL ,5HSFDHT ,5HMUNHT ,5HTOTHT ,
     75HSFDAE ,5HMUNAE ,5HTOTAE ,5HAIRCN,5HBEV  ,
     85HCWF   ,5HEH+AC,        5HHPUMP,5HKWHCS,
     95HKWHSL,5HPIPEF,5HPRH  ,5HRHNF ,5HRHWF ,
     A5HTV    ,5HHWH  ,5HGHEAT/
      INTEGER DEVNAM(180)
      DATA DEVNAM/10HREFRIGERAT ,10HORS        ,10H          ,10HFR
     1EE,10H REFRIGERA,10HTORS       ,10HMANUAL DEF,10HROST REFRI,
     210HGERATORS    ,10HFREEZERS    ,10H          ,10H          ,
     310HFROST-FREE ,10H FREEZERS   ,10H          ,10HMANUAL DEF ,
     410HROST FREEZ ,10HERS         ,10HR A N G E  ,10HS          ,
     510H           ,10HWATER HEAT  ,10HERS        ,10H          ,
     610HCOLOR TELE ,10HVISIONS     ,10H          ,10HBLACK + WH ,
     710HITE TELEVI ,10HSIONS       ,10HCLOTHES DR ,10HYERS       ,
     810H           /
      DATA (DEVNAM(I),I=34,72)/ 10HCLOTHES WA,10HSHER      ,
     810H           ,10HDISHWASHER  ,10HS          ,10H          ,
     910HELECTRIC R ,10HESISTANCE   ,10HHEATING    ,10HCENTRAL AI ,
     A10HR CONDITIO ,10HNERS        ,10HRCOM AIR C ,10HONDITIONER ,
     B10HS          ,10HEVAPORATIV  ,10HE COOLERS  ,10H          ,
     C10HINCANDESCN ,10HT LIGHTING  ,10H          ,10HFLUORESCEN ,
     D10HT LIGHTING ,10H            ,10HFURNACE FA ,10HNS        ,
     E10H           ,
     F 10HHEATERS ON ,10HLY         ,10H          ,
     G 10HHEATER + A , 10HIR CONDITI , 10HONER        ,
     H 10HHEATERS +  ,10HHEATER-A/C ,10H COMBCS      ,
     110HBASEBOARD  ,10HHEATER      ,10H          /
      DATA (DEVNAM(I), I = 73,129)/
     210HCEILING HE ,10HATER        ,10H          ,
     310HFURNACE HE ,10HATER        ,10H          ,
     410HHEAT PUMP  ,10H            ,10H          ,
     510HOTHER HEAT ,10HERS         ,10H          ,
     610HTOTAL ELEC ,10HTRIC HEATE  ,10HRS        ,
     710HELECTRIC D ,10HWELLINGS    ,10H          ,
```

```
          810HRESIDENTIA ,10HL CUSTOMER ,10HS          ,
          910HMASTER MET ,10HERED       ,10H           ,
          A10HKWH/CUSTOM ,10HER         ,10H           ,
          B10HKWH SALES  ,10H           ,10H           ,
          C10HSNGL-FMLY  ,10HDWELLING E ,10HLECTR.USE  ,
          D10HMLTI-UNIT  ,10HDWELLING E ,10HLECTR.USE  ,
          E10HALL UNITS  ,10HTOTAL ELEC ,10HTRIC USE   ,
          F10HSNGL-FMLY  ,10HDWELLING E ,10HLECTR.HTNG ,
          G10HMLTI-UNIT  ,10HDWELLING E ,10HLECTR.HTNG ,
          H10HALL UNITS  ,10HELECTRIC H ,10HEATING USE ,
          I10HSNGL-FMLY  ,10HALL ELECTR ,10HIC HOME    ,
          J10HMLTI-UNIT  ,10HALL-ELECTR ,10HIC DWELLNG ,
          K10HALL-ELECTR ,10HIC DWELLIN ,10HG          /
           DATA (DEVNAM(I),I=130,175)/
          110HALL AIR CO ,10HNDITIONERS ,10H           ,
          210HBUILT IN E,10HLECTRIC JN,10HITS       ,
          310HCENTRAL WA,10HRM AIR FJR,10HNACE      ,
          410HELEC.HEAT+,10HELEC.AIR C,10HONDITION,G,
          610HHEAT PUMP ,10H          ,10H          ,
          710HKWH SALES ,10HPER CUSTOM,10HER        ,
          810HKWH SALES ,10HFOR TOTAL ,10HRESIDENTL.,
          910HFLCOR,WALL,10HOR PIPELES,10HS FURNACE ,
          A10HFIREPLC,ST,10HOVE OR PRT,10HBLE FRNACE,
          B10HROOM HEATE,10HR,NO FLUE ,10H          ,
          C10HROOM HEATE,10HR WITH FLU,10HE         ,
          D10HTELEVISION,10H ALL TYPES,10H          ,
          E10HHOT WATER ,10HHEATING   ,10H          ,
          F10HGAS HEATIN,10HG         ,10H          /
C
C          ************************  CLEAN UP PATCH ****************
C               CHANGE ALTERNATIVELY CODED NAMES TO CORRECT FREQUENTL.
C               OCCURRING ERRORS
          IF(DEVICE.EQ.5HFZZ  ) DEVICE = 5HFRZ
 4        IF (DEVICE.EQ.5HAC   ) DEVICE = 5HAIRCN
 7        IF (DEVICE.EQ.5HWHEAT) DEVICE = 5HWTHTR
12        DECODE(10,99,CARD) ITEMP1,JUNK,ITEMP2
       99 FORMAT(A3,A5,A2)
26        ENCODE(10,99,CARD) ITEMP1,DEVICE,ITEMP2
C         ******************** END OF CLEAN-UP PATCH ****************
42        I = 1
43      2 CONTINUE
43        IF(DEVICE.NE.DEVCOD(I))GO TO 10
46        J2=I*3-2
50        DO 9 J1=1,3
56        DEVNAME(J1) = DEVNAM(J2)
57      9 J2 = J2 + 1
61        RETURN
62     10 CONTINUE
62        I = I +1
64        IF (I.GT.60) GO TO 15
67        GO TO 2
67     15 CONTINUE
67        RETURN
70        END
```

TRNDEV

SUBPROGRAM LENGTH

00506

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES	

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES	
000044	L00024	2	000067	
000063	L00037	10	000046	
000070	L00044	15	000066	
000110	C00015	99	000013	000027

BLOCK NAMES AND LENGTHS
CRDINFO- 000142/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES		
000000/01	G00001	CARD	000016	000032	
000010/01	V00002	CRDTYPE	NONE		
000011/01	V00003	DEVBLDG	NONE		
000120	G00012	DEVCOD	NONE		
000013/01	V00005	DEVICE	000002	000036	000045
000214	G00013	DEVNAM	000055		
000136/01	G00007	DEVNAME	000055		
000045/01	G00003	EXPNT	NONE		
000111/01	G00006	FOOTNT	NONE		
000130/01	V00021	FUELTYP	NONE		
000061/01	G00004	HARDNS	NONE		
000503	V00034	I	000043	000044	000063
000500	V00031	ITEMP1	000020	000034	
000502	V00033	ITEMP2	000024	000040	
000125/01	V00016	J	NONE		
000501	V00032	JUNK	000022		
000505	V00036	J1	000051		
000504	V00035	J2	000050	000052	000061
000133/01	V00024	LINENO	NONE		
000132/01	V00023	LNCNT	NONE		
000031/01	G00002	MANTISA	NONE		
000131/01	V00022	NUM4	NONE		
000141/01	V00025	PAGENO	NONE		
000134/01	G00010	REGNAME	NONE		
000012/01	V00004	REGNO	NONE		
000015/01	G00011	RVALUE	NONE		
000014/01	V00006	SECTOR	NONE		
000075/01	G00005	SOURCE	NONE		
000126/01	V00017	TIMEFR	NONE		
000127/01	V00020	TIMETO	NONE		

START OF CONSTANTS-000073 TEMPS--000113 INDIRECTS-000115

```
TRNDEV

7600 COMPILATION -- RUN76 LEVEL 17A      14 JUL 76

ROUTINE COMPILES IN 045700
```

```
      SUBROUTINE TRNREG
C
C       THIS ROUTINE TRANSLATES THE REGION CODE INTO THE NAME OF TH
C       REGION.  THE NAME IS LOADED INTO NMREG.
      COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTO
     -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
     - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     -  , REGNAME, DEVNAME
     -  ,PAGENO
      INTEGER CARD(8), CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
     1       FOOTNT(12), DEVNAME(3), REGNAME(2)
     2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     3  ,PAGENO
      REAL RVALUE(12)
      INTEGER REGNMS(200)
      DATA (REGNMS(I), I= 1,74)/10HCALIFORNIA ,10H            ,
     110HALAMEDA CO ,10H.          ,10HALPINE CO. ,10H          ,
     210HAMADOR CO. ,10H           ,10HBUTTE CO.  ,10H          ,
     310HCALAVERAS  ,10HCO.        ,10HCOLUSA CO. ,10H          ,
     410HCONTRA COS ,10HTA CO.     ,10HDEL NORTE  ,10HCO.       ,
     510HEL DORADO  ,10HCO.        ,10HFRESNO CO. ,10H          ,
     610HGLENN CO   ,10H           ,10HHUMBOLDT C ,10HO.        ,
     710HIMPERIAL C ,10HO.         ,10HINYO CO.   ,10H          ,
     810HKERN CO.   ,10H           ,10HKINGS CO.  ,10H          ,
     910HLAKE CO.   ,10H           ,10HLASSEN CO. ,10H          ,
     A10HLOS ANGELE ,10HS CO.      ,10HMADERA CO. ,10H          ,
     B10HMARIN CO.  ,10H           ,10HMARIPOSA C ,10H          ,
     C10HMENDOCINO  ,10HCO.        ,10HMERCED CO. ,10H          ,
     D10HMODOC CO.  ,10H           ,10HMONO CO.   ,10H          ,
     E10HMONTEREY C ,10HO.         ,10HNAPA CO.   ,10H          ,
     F10HNEVADA CO. ,10H           ,10HORANGE CO. ,10H          ,
     G10HPLACER CO. ,10H           ,10HPLUMAS CO. ,10H          ,
     H10HRIVERSIDE  ,10HCO.        ,10HSACRAMENTO ,10H CO.      ,
     I10HSAN BENITO ,10H CO.       ,10HSAN BERNAR ,10HDINO CO.  /
      DATA (REGNMS(I), I = 75,150)/
     J10HSAN DIEGO  ,10HCO.        ,10HSAN FRANCI ,10HSCO CO.   ,
     K10HSAN JOAQUI ,10HN CO.      ,10HSAN LUIS O ,10HBISPO CO. ,
     L10HSAN MATEO  ,10HCO.        ,10HSANTA BARB ,10HARA CO.   ,
     M10HSANTA CLAR ,10HA CO.      ,10HSANTA CRUZ ,10H CO.      ,
     N10HSHASTA CO. ,10H           ,10HSIERRA CO. ,10H          ,
     O10HSISKIYOU C ,10HO.         ,10HSOLANO CO. ,10H          ,
     P10HSONOMA CO. ,10H           ,10HSTANISLAUS ,10H CO.      ,
     Q10HSUTTER CO. ,10H           ,10HTEHAMA CO. ,10H          ,
     R10HTRINITY CO ,10H.          ,10HTULARE CO. ,10H          ,
     S10HTUOLUMNE C ,10HO.         ,10HVENTURA CO ,10H.         ,
     T10HYOLO CO.   ,10H           ,10HYUBA CO.   ,10H          ,
     U10HLOS ANGELE ,10H SCE       ,10HSAN FRANCI ,10HSCO SMSA  ,
     V10HSAN FRANCI ,10HSCO SCA    ,10HLOS ANGELE ,10HS SCA     ,
     W10HBAKERSFIEL ,10HD UA       ,10HFRESNO UA  ,10H          ,
     X10HLA - LONG  ,10HBEACH SMSA ,10HSACRAMENTO ,10H UA       ,
     Y10HSN BRNADIN ,10HO-RIV JA   ,10HSAN DIEGO  ,10HUA        ,
     Z10HSAN JOSE U ,10HA          ,10HSAN FRAN.  ,10HHUD DIST. ,
     110HFRESNO HUD ,10H DIST.     ,10HSACRAMENTO ,10H HUD DIST.,
     210HL.A.-SANTA ,10HANA HUD DT,10H*74        ,10H          /
      DATA (REGNMS(I), I = 151,200)/
```

```
          310HLA-SANTA A ,10HNA HUD DST ,10HSANTA BARB ,10HARA UA     ,
          410HSTOCKTON U ,10HA          ,10HPCMONA-ONT ,10HARIO UA    ,
          510HSN BERN-RI ,10HV-ONT SMSA ,10H*80        ,10H          ,
          610HPG+E SERVI ,10HCE AREA    ,10HSMUD SERVI ,10HCE AREA    ,
          710HSCE SERVIC ,10HE AREA     ,10HLADWP SERV ,10HICE AREA
          810HSDG+E SERV ,10HICE AREA   ,10HOTHER UTIL ,10HITY DIST. ,
          910H*87        ,10H           ,10H*88        ,10H          ,
          A10H*89        ,10H           ,10HURBAN CALI ,10HFCRNIA    ,
          B10HRURAL CALI ,10HFORNIA     ,10H*92        ,10H          ,
          C10HSF-OAK URB ,10HANIZD AREA ,10H*94        ,10H          ,
          D10H*95        ,10H           ,10H*96        ,10H          ,
          E10H*97        ,10H           ,10HAGENCY-DEF ,10HINED AREA ,
          F10HUNITED STA ,10HTES        /
           IF (REGNO.LT.1) REGNO = 0
C          ******************** CLEAN-UP PATCH ***********************
 4         IF(DEVBLDG.EQ.2.AND.REGNO.EQ.76) REGNO=73
15         DECODE(10,99,CARD) ITEMP1,JUNK,ITEMP2
        99 FORMAT(A1,I2,A7)
31         ENCODE(10,99,CARD) ITEMP1,REGNO,ITEMP2
C          ****************** END OF CLEAN-UP PATCH ******************
45         ITEMP = REGNO*2+1
47         REGNAME(1) = REGNMS(ITEMP)
51         REGNAME(2) = REGNMS(ITEMP+1)
54         RETURN
55         END
```

SUBPROGRAM LENGTH

00404

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES	
000061	C00001	99	000016	000032

BLOCK NAMES AND LENGTHS
CRDINFO- 000142/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES	
000000/01	G00001	CARD	000021	000035
000010/01	V00002	CRDTYPE	NONE	
000011/01	V00003	DEVBLDG	000005	
000013/01	V00005	DEVICE	NONE	
000136/01	G00007	DEVNAME	NONE	
000045/01	G00003	EXPNT	NONE	
000111/01	G00006	FOOTNT	NONE	
000130/01	V00021	FUELTYP	NONE	
000061/01	G00004	HARDNS	NONE	

TRNREG

000403	V00033	ITEMP	000047	000052	
000400	V00030	ITEMP1	000023	000037	
000402	V00032	ITEMP2	000027	000043	
000125/01	V00016	J	NONE		
000401	V00031	JUNK	000025		
000133/01	V00024	LINENO	NONE		
000132/01	V00023	LNCNT	NONE		
000031/01	G00002	MANTISA	NONE		
000131/01	V00022	NUM4	NONE		
000141/01	V00025	PAGENO	NONE		
000134/01	G00010	REGNAME	000052		
000070	G00012	REGNMS	000051		
000012/01	V00004	REGNO	000002	000041	000046
000015/01	G00011	RVALUE	NONE		
000014/01	V00006	SECTOR	NONE		
000075/01	G00005	SOURCE	NONE		
000126/01	V00017	TIMEFR	NONE		
000127/01	V00020	TIMETO	NONE		

START OF CONSTANTS-000060 TEMPS--000064 INDIRECTS-000070

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 045500

```
      SUBROUTINE TRNSCT
C
C       THIS ROUTINE EXPANDS THE SECTOR ABBREVIATIONS
C
      COMMON /CRDINFO/ CARD, CRDTYPE, DEVBLDG, REGNO, DEVICE,    C
     -       RVALUE, MANTISA, EXPNT, HARDNS, SOURCE, FOOTNT, J,
     - TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     -  , REGNAME, DEVNAME
     -  ,PAGENO
      INTEGER CARD(8), CRDTYPE, DEVBLDG, REGNO, DEVICE, SECTOR,
     - MANTISA(12), EXPNT(12), HARDNS(12), SOURCE(12),
     1       FOOTNT(12), DEVNAME(3), REGNAME(2)
     2 , J, TIMEFR, TIMETO, FUELTYP, NUM4, LNCNT, LINENO
     3  ,PAGENO
      REAL RVALUE(12)
      INTEGER SCTRNM(40)
      DATA SCTRNM/6HSINFAM ,6HMULTIU ,6HMOBHOM, 6HRETAIL ,6HWAREH
     16HOFFICE ,6HGARAGE ,6HMFGBLD ,6HSCHOOL ,6HHOSPIT ,6HPUBLIC
     26HCHURCH ,6HRECBLD ,6HMISCBL ,6HHOTELS ,6HNONRES ,6HFHAAP ,
     36HMOBHOC,6HMOBHOS,6HNHKRES,6HOCCUP ,6HVAAP  ,6HTOTAL1 ,
     46HRCUST  ,6HALLH   ,6HOCCUP5 ,6HFHAAP5 ,
     56HVAAP5  ,6HDETACH ,6HATTAC1 ,6HATTACH ,
     66HFHAAP1 ,6HFHAAP2 ,6HTOTAL2 ,6HALL2  ,6HALL3  ,6HALL4  ,6H
     76HALL6  ,6HALL7  /
      INTEGER SCTNMS(120)
      DATA (SCTNMS(I),I=1,48)/
     110HSINGLE-FAM ,10HILY RESIDE ,10HNTIAL BLDG ,
     210HMULTI-UNIT ,10H RESIDENTI ,10HAL BLDGS.  ,
     310HMOBILE HOM ,10HES         ,10H           ,
     410HRETAIL + O ,10HTHER MERCA ,10HNTILE BLDG ,
     510HWAREHOUSES ,10H NOT MFR-O ,10HWNED       ,
     610HOFFICE AND ,10H BANK BUIL ,10HDINGS      ,
     710HCOMM'L GAR ,10HAGE + SERV ,10HICE STN.   ,
     810HMANUFACTUR ,10HING BUILDI ,10HNGS        ,
     910HEDUCATIONA ,10HL BUILDING ,10HS          ,
     A10HHOSPITAL A ,10HND HEALTH  ,10HBUILDINGS  ,
     B10HPUBLIC BUI ,10HLDINGS     ,10H           ,
     C10HRELIGIOUS  ,10HBUILDINGS  ,10H           ,
     D10HAMUSEMENT, ,10HSOCIAL, +  ,10HREC. BLDGS ,
     E10HMISCELLANE ,10HOUS BUILDI ,10HNGS        ,
     F10HNON-HOUSEK ,10HEEPING RES ,10HIDENTIAL   ,
     G10HNON-RESIDE ,10HNTIAL BUIL ,10HDINGS        /
      DATA(SCTNMS(I),I=49,69)/
     110HFHA MORTGA,10HGE APPLICA,10HTIONS      ,
     210HMOBILE HOM,10HE DOUBLE W,10HIDTH       ,
     310HMOBILE HOM,10HE SINGLE W,10HIDTH       ,
     410HNONHOUSEKE,10HEPING RESI,10HDTL. BLDG.,
     510HTOTAL OCCU,10HPIED HOUSI,10HNG         ,
     610HVA MORTGAG,10HE APPLICAT,10HIONS        ,
     710HTOTAL OCCU,10HPD.SINGLE ,10HFAMILY HSG /
      DATA (SCTNMS(I),I=70,120)/
     110HRESIDENTIA ,10HL CUSTOMER ,10HS          ,
     210HALL HOUSIN ,10HG          ,10H           ,
     310HSINGLE + M ,10HULTI-UNIT  ,10H           ,
     410HFHA MORTG. ,10HAPPLCS.SIN ,10HGLE+MULTI  ,
     510HVA MORTG.  ,10HAPPLCS.SIN ,10HGLE+MULTI  ,
```

TRNSCT

```
              610HDETACHED H ,10HOUSING UNI ,10HTS          ,
              710HDUPLEXES   ,10H           ,10H            ,
              810HMULTIFAMIL ,10HY UNITS    ,10H            ,
              910HFHA MORTG.,10HAPPLCS.SIN,10HGLE FAM.U.,
              A10HFHA MORTG.,10HAPPLCS.MUL,10HTI-U.BLDGS,
              B10HTOTAL OCCU,10HPD.MULTI-U,10HNIT HSG.  ,
              C10HHSG.YR.BUI,10HLT 1959-MA,10HRCH 1960  ,
              D10HHSG.YR.BUI,10HLT 1955-19,10H58        ,
              E10HHSG.YR.BUI,10HLT 1950-19,10H54        ,
              F10HHSG.YR.BUI,10HLT 1940-19,10H49        ,
              G10HHSG.YR.BUI,10HLT 1930-19,10H39        ,
              H10HHSG.YR.BUI,10HLT 1929 OR,10H EARLIER  /
               I=1
 2         10 IF(SECTOR.EQ.SCTRNM(I)) GO TO 30
      C       40 BUILDING SECTOR ABBREVIATIONS HAVE BEEN DEFINED
 5            IF (I.EQ.40) GO TO 50
 6            I = I+1
 7            GO TO 10
10         30 I = 3*I-2
12            DO 40 K = 1,3
20         40 DEVNAME(K) = SCTNMS(I+K-1)
22         50 RETURN
23            END
```

SUBPROGRAM LENGTH

00276

STATEMENT FUNCTION REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES

STATEMENT NUMBER REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000003	L00005	10	000010
000011	L00013	30	000005
000023	L00022	50	000006

BLOCK NAMES AND LENGTHS
CRDINFO- 000142/01

VARIABLE REFERENCES

LOCATION	GEN TAG	SYM TAG	REFERENCES
000000/01	G00001	CARD	NONE
000010/01	V00002	CRDTYPE	NONE
000011/01	V00003	DEVBLDG	NONE
000013/01	V00005	DEVICE	NONE
000136/01	G00007	DEVNAME	000020
000045/01	G00003	EXPNT	NONE
000111/01	G00006	FOOTNT	NONE
000130/01	V00021	FUELTYP	NONE
000061/01	G00004	HARDNS	NONE

TRNSCT

000274	V00031	I	000002	000003	000011	000015
000125/01	V00016	J	NONE			
000275	V00032	K	000014			
000133/01	V00024	LINENO	NONE			
000132/01	V00023	LNCNT	NONE			
000031/01	G00002	MANTISA	NONE			
000131/01	V00022	NUM4	NONE			
000141/01	V00025	PAGENO	NONE			
000134/01	G00010	REGNAME	NONE			
000012/01	V00004	REGNO	NONE			
000015/01	G00011	RVALUE	NONE			
000104	G00013	SCTNMS	NONE			
000034	G00012	SCTRNM	NONE			
000014/01	V00006	SECTOR	000004			
000075/01	G00005	SOURCE	NONE			
000126/01	V00017	TIMEFR	NONE			
000127/01	V00020	TIMETO	NONE			

START OF CONSTANTS-000026 TEMPS--000027 INDIRECTS-000031

7600 COMPILATION -- RUN76 LEVEL 17A 14 JUL 76

ROUTINE COMPILES IN 045200

APPENDIX D2

Summary Tables of Data Relating to Residential and Commercial Electricity Use in California

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ALAMEDA CO.						
1	60-60	STOCK	310000	0	0002	
2	70-70	STOCK	380000	0	9000	1
ALPINE CO.						
3	60-60	STOCK	168	0	9600	
AMADOR CO.						
4	60-60	STOCK	3990	0	9600	
BUTTE CO.						
5	60-60	STOCK	31500	0	9600	
CALAVERAS CO.						
6	60-60	STOCK	4680	0	9600	
COLUSA CO.						
7	60-60	STOCK	4390	0	9600	
CONTRA COSTA CO.						
8	60-60	STOCK	124000	0	0002	
DEL NORTE CO.						
9	60-60	STOCK	5830	0	9600	
EL DORADO CO.						
10	60-60	STOCK	15600	0	9600	
FRESNO CO.						
11	60-60	STOCK	119000	0	0002	
GLENN CO						
12	60-60	STOCK	5960	0	9600	
HUMBOLDT CO.						
13	60-60	STOCK	34700	0	9600	
IMPERIAL CO.						
14	60-60	STOCK	21900	0	9600	
INYO CO.						
15	60-60	STOCK	5100	0	9600	
KERN CO.						
16	60-60	STOCK	97600	0	0002	
KINGS CO.						
17	60-60	STOCK	16100	0	9600	
LAKE CO.						
18	60-60	STOCK	8570	0	9600	
LASSEN CO.						
19	60-60	STOCK	5920	0	9600	
LOS ANGELES CO.						
20	60-60	STOCK	2140000	0	0002	
MADERA CO.						
21	60-60	STOCK	13600	0	9600	
MARIN CO.						
22	60-60	STOCK	49600	0	0002	
MARIPOSA C						
23	60-60	STOCK	2440	0	9600	
MENDOCINO CO.						
24	60-60	STOCK	17600	0	9600	
MERCED CO.						
25	60-60	STOCK	28500	0	9600	
MODOC CO.						
26	60-60	STOCK	3320	0	9600	
MONO CO.						
27	60-60	STOCK	1630	0	9600	
MONTEREY CO.						
28	60-60	STOCK	57500	0	9600	
NAPA CO.						
29	60-60	STOCK	21200	0	9600	

NEVADA CO. 30	60-60	STOCK	9180	0	9600
ORANGE CO. 31	60-60	STOCK	227000	0	0002
PLACER CO. 32	60-60	STOCK	21400	0	9600
PLUMAS CO. 33	60-60	STOCK	5520	0	9600
RIVERSIDE CO. 34	60-60	STOCK	115000	0	0002
SACRAMENTO CO. 35	60-60	STOCK	165000	0	0002
SAN BENITO CO. 36	60-60	STOCK	5220	0	9600
SAN BERNARDINO CO. 37	60-60	STOCK	194000	0	0002
SAN DIEGO CO. 38	60-60	STOCK	339000	0	0002
SAN FRANCISCO CO. 39	60-60	STOCK	311000	0	0002
SAN JOAQUIN CO. 40	60-60	STOCK	80600	0	0002
SAN LUIS OBISPO CO. 41	60-60	STOCK	29400	0	9600
SAN MATEO CO. 42	60-60	STOCK	142000	0	0002
SANTA BARBARA CO. 43	60-60	STOCK	57200	0	0002
SANTA CLARA CO. 44	60-60	STOCK	199000	0	0002
SANTA CRUZ CO. 45	60-60	STOCK	40900	0	9600
SHASTA CO. 46	60-60	STOCK	21000	0	9600
SIERRA CO. 47	60-60	STOCK	1500	0	9600
SISKIYOU CO. 48	60-60	STOCK	13300	0	9600
SOLANO CO. 49	60-60	STOCK	41900	0	0002
SONOMA CO. 50	60-60	STOCK	59800	0	9600
STANISLAUS CO. 51	60-60	STOCK	51800	0	9600
SUTTER CO. 52	60-60	STOCK	11100	0	9600
TEHAMA CO. 53	60-60	STOCK	9140	0	9600
TRINITY CO. 54	60-60	STOCK	4040	0	9600
TULARE CO. 55	60-60	STOCK	55600	0	9600
TUOLUMNE CO. 56	60-60	STOCK	8160	0	9600
VENTURA CO. 57	60-60	STOCK	60700	0	9600
YOLO CO.					

58	60-60	STOCK	21000	0	9600
YUBA CO.					
59	60-60	STOCK	11100	0	9600
SAN FRANCISCO SMSA					
60	60-60	STOCK	978000	0	0002
BAKERSFIELD UA					
61	60-60	STOCK	46300	0	0002
FRESNO UA					
62	60-60	STOCK	69800	0	0002
LA - LONG BEACH SMSA					
63	60-60	STOCK	2370000	0	0002
SACRAMENTO UA					
64	60-60	STOCK	152000	0	0002
SN BRNADINO-RIV UA					
65	60-60	STOCK	125000	0	0002
SAN DIEGO UA					
66	60-60	STOCK	276000	0	0002
SAN JOSE UA					
67	60-60	STOCK	187000	0	0002
SAN FRAN. HUD DIST.					
68	60-60	STOCK	269000	0	0002
FRESNO HUD DIST.					
69	60-60	STOCK	472000	0	0002

- - - - - S O U R C E F O O T N O T E S - - - - -

90001 OCCUPIED HOUSING ONLY

CALIFORNIA

1	63-63	CONST.SQFT	4300000	1	DG63 1
2	63-63	CONST.SQFT	4300000	1	DG63 1
3	64-64	CONST.SQFT	5320000	1	DG64 1
4	64-64	CONST.SQFT	5320000	1	DG64 1
5	65-65	CONST.SQFT	6610000	1	DG65 1
6	66-66	CONST.SQFT	4300000	1	DG66 1
7	67-67	CONST.SQFT	5050000	1	DG67 1
8	68-68	CONST.SQFT	4920000	1	DG68 1
9	69-69	CONST.SQFT	6990000	1	DG69 1
10	70-70	CONST.SQFT	5730000	1	DG70 1
11	71-71	CONST.SQFT	5690000	1	DG71 1
12	72-72	CONST.SQFT	5690000	1	DG72 1
13	73-73	CONST.SQFT	6150000	1	DG73 1

- - - - - S O U R C E F O O T N O T E S - - - - -

DG631 THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES. FIGURES
DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126508/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/264758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137659/219135 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/258301 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129730/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 138445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 196546/263911 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

CALIFORNIA

1	63-63	CONST.SQFT	6000000	1	DG63	1
2	63-63	CONST.SQFT	6000000	1	DG63	1
3	64-64	CONST.SQFT	5940000	1	DG64	1
4	64-64	CONST.SQFT	5940000	1	DG64	1
5	65-65	CONST.SQFT	6750000	1	DG65	1
6	65-65	CONST.SQFT	6750000	1	DG65	1
7	66-66	CONST.SQFT	6330000	1	DG66	1
8	67-67	CONST.SQFT	5390000	1	DG67	1
9	68-68	CONST.SQFT	6750000	1	DG68	1
10	69-69	CONST.SQFT	8660000	1	DG69	1
11	70-70	CONST.SQFT	10300000	1	DG70	1
12	71-71	CONST.SQFT	6640000	1	DG71	1
13	72-72	CONST.SQFT	4170000	1	DG72	1
14	73-73	CONST.SQFT	4590000	1	DG73	1

- - - - - S O U R C E F O O T N O T E S - - - - -

DG631 THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES. FIGURES
DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126508/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209686 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137658/219199 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/258331 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129730/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 138445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 156546/286511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

ALAMEDA CO.					
1	60-60	STOCK	193000	0	0002
CONTRA COSTA CO.					
2	60-60	STOCK	102000	0	0002
FRESNO CO.					
3	60-60	STOCK	103000	0	0002
KERN CO.					
4	60-60	STOCK	80200	0	0002
LOS ANGELES CO.					
5	60-60	STOCK	1360000	0	0002
MARIN CO.					
6	60-60	STOCK	38400	0	0002
ORANGE CO.					
7	60-60	STOCK	1800000	0	0002
RIVERSIDE CO.					
8	60-60	STOCK	93700	0	0002
SACRAMENTO CO.					
9	60-60	STOCK	123000	0	0002
SAN BERNARDINO CO.					
10	60-60	STOCK	163000	0	0002
SAN DIEGO CO.					
11	60-60	STOCK	232000	0	0002
SAN FRANCISCO CO.					
12	60-60	STOCK	58200	0	0002
SAN JOAQUIN CO.					
13	60-60	STOCK	64400	0	0002
SAN MATEO CO.					
14	60-60	STOCK	110000	0	0002
SANTA BARBARA CO.					
15	60-60	STOCK	40900	0	0002
SANTA CLARA CO.					
16	60-60	STOCK	157000	0	0002
SOLANO CO.					
17	60-60	STOCK	298000	0	0002
SAN FRANCISCO SMSA					
18	60-60	STOCK	933000	0	0002
LA - LONG BEACH SMSA					
19	60-60	STOCK	1540000	0	0002
SACRAMENTO UA					
20	60-60	STOCK	110000	0	0002
SN BRNADINO-RIV UA					
21	60-60	STOCK	257000	0	0002
SAN DIEGO UA					
22	60-60	STOCK	181000	0	0002
SAN JOSE UA					
23	60-60	STOCK	149000	0	0002
SAN FRAN. HUD DIST.					
24	60-60	STOCK	18100	0	0002
FRESNO HUD DIST.					
25	60-60	STOCK	35100	0	0002
POMONA-ONTARIO UA					
26	60-60	STOCK	49900	0	0002

ALPINE CO.
AMADOR CO.
1 60-60 STOCK 180 0 0002
BUTTE CO.
2 60-60 STOCK 290 0 0002
CALAVERAS CO.
3 60-60 STOCK 390 0 0002
COLUSA CO.
4 60-60 STOCK 130 0 0002
DEL NORTE CO.
5 60-60 STOCK 250 0 0002
EL DORADO CO.
6 60-60 STOCK 230 0 0002
GLENN CO
7 60-60 STOCK 310 0 0002
HUMBOLDT CO.
8 60-60 STOCK 450 0 0002
IMPERIAL CO.
9 60-60 STOCK 450 0 0002
INYO CO.
10 60-60 STOCK 370 0 0002
KINGS CO.
11 60-60 STOCK 250 0 0002
LAKE CO.
12 60-60 STOCK 140 0 0002
LASSEN CO.
13 60-60 STOCK 540 0 0002
MADERA CO.
14 60-60 STOCK 60 0 0002
MARIPOSA C
15 60-60 STOCK 170 0 0002
MENDOCINO CO.
16 60-60 STOCK 140 0 0002
MERCED CO.
17 60-60 STOCK 220 0 0002
MODOC CO.
18 60-60 STOCK 50 0 0002
MONO CO.
19 60-60 STOCK 200 0 0002
MONTEREY CO.
20 60-60 STOCK 220 0 0002
NAPA CO.
21 60-60 STOCK 230 0 0002
NEVADA CO.
22 60-60 STOCK 340 0 0002
PLACER CO.
23 60-60 STOCK 250 0 0002
PLUMAS CO.
24 60-60 STOCK 140 0 0002
SAN BENITO CO.
25 60-60 STOCK 100 0 0002
SAN LUIS OBISPO CO.
26 60-60 STOCK 240 0 0002
SANTA CRUZ CO.
27 60-60 STOCK 230 0 0002
SHASTA CO.
28 60-60 STOCK 310 0 0002

SIERRA CO.					
29	60-60	STOCK	30	0	0002
SISKIYOU CO.					
30	60-60	STOCK	300	0	0002
SONOMA CO.					
31	60-60	STOCK	230	0	0002
STANISLAUS CO.					
32	60-60	STOCK	150	0	0002
SUTTER CO.					
33	60-60	STOCK	190	0	0002
TEHAMA CO.					
34	60-60	STOCK	210	0	0002
TRINITY CO.					
35	60-60	STOCK	90	0	0002
TULARE CO.					
36	60-60	STOCK	180	0	0002
TUOLUMNE CO.					
37	60-60	STOCK	390	0	0002
VENTURA CO.					
38	60-60	STOCK	340	0	0002
YOLO CO.					
39	60-60	STOCK	400	0	0002
YUBA CO.					
40	60-60	STOCK	300	0	0002

CALIFORNIA

1	63-63	CONST.SQFT	25900000	1	DG63	1
2	63-63	CONST.SQFT	25900000	1	DG63	1
3	64-64	CONST.SQFT	25200000	1	DG64	1
4	64-64	CONST.SQFT	25200000	1	DG64	1
5	65-65	CONST.SQFT	27800000	1	DG65	1
6	65-65	CONST.SQFT	27800000	1	DG65	1
7	66-66	CONST.SQFT	24700000	1	DG66	1
8	67-67	CONST.SQFT	23500000	1	DG67	1
9	68-68	CONST.SQFT	23100000	1	DG68	1
10	69-69	CONST.SQFT	21000000	1	DG69	1
11	70-70	CONST.SQFT	16500000	1	DG70	1
12	71-71	CONST.SQFT	16000000	1	DG71	1
13	72-72	CONST.SQFT	13500000	1	DG72	1
14	73-73	CONST.SQFT	14400000	1	DG73	1

- - - - - S O U R C E F O O T N O T E S - - - - -

DG631 THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES. FIGURES
DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126508/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/226516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 157658/219199 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 176222/253381 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129730/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 138445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 158546/283911 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

L.A.-SANTAANA HUD DT

1	58-58	STOCK	1320	0	8500
2	59-59	STOCK	1210	0	8500

SANTA BARBARA UA

3	58-58	STOCK	1320	0	8500
4	59-59	STOCK	1210	0	8500
5	60-60	STOCK	1550	0	8500
6	61-61	STOCK	2090	0	8500
7	62-62	STOCK	5930	0	8500
8	63-63	STOCK	3660	0	8500
9	64-64	STOCK	3800	0	8500
10	65-65	STOCK	4800	0	8500
11	66-66	STOCK	1940	0	8500
12	67-67	STOCK	1060	0	8500
13	68-68	STOCK	2420	0	8500
14	69-69	STOCK	2770	0	8500
15	70-70	STOCK	8150	0	8500
16	71-71	STOCK	9490	0	8500
17	72-72	STOCK	11500	0	8500
18	73-73	STOCK	2460	0	8500
19	74-74	STOCK	902	0	8500

SAN FRAN. HUD DIST.

1	60-60	STOCK	10700	0	8000
2	61-61	STOCK	11700	0	8000
3	62-62	STOCK	12900	0	8000
4	63-63	STOCK	12200	0	8000
5	64-64	STOCK	13200	0	8000
6	65-65	STOCK	12800	0	8000
7	66-66	STOCK	10000	0	8000
8	67-67	STOCK	12100	0	8000
9	68-68	STOCK	15700	0	8000
10	69-69	STOCK	11900	0	8000
11	70-70	STOCK	16100	0	8000
12	71-71	STOCK	23200	0	8000
13	72-72	STOCK	13200	0	8000
14	73-73	STOCK	7940	0	8000
15	74-74	STOCK	6400	0	8000

FRESNO HUD DIST.

16	60-60	STOCK	481	0	8000
17	61-61	STOCK	736	0	8000
18	62-62	STOCK	566	0	8000
19	63-63	STOCK	677	0	8000
20	64-64	STOCK	770	0	8000
21	65-65	STOCK	1090	0	8000
22	66-66	STOCK	991	0	8000
23	67-67	STOCK	1070	0	8000
24	68-68	STOCK	994	0	8000
25	69-69	STOCK	913	0	8000
26	70-70	STOCK	1780	0	8000
27	71-71	STOCK	2900	0	8000
28	72-72	STOCK	3800	0	8000
29	73-73	STOCK	2120	0	8000
30	74-74	STOCK	2650	0	8000

SACRAMENTO HUD DIST.

31	60-60	STOCK	4280	0	8000
32	61-61	STOCK	4210	0	8000
33	62-62	STOCK	3910	0	8000
34	63-63	STOCK	3550	0	8000
35	64-64	STOCK	3370	0	8000
36	65-65	STOCK	3310	0	8000
37	66-66	STOCK	2630	0	8000
38	67-67	STOCK	2840	0	8000
39	68-68	STOCK	2740	0	8000
40	69-69	STOCK	3400	0	8000
41	70-70	STOCK	5730	0	8000
42	71-71	STOCK	6140	0	8000
43	72-72	STOCK	5050	0	8000
44	73-73	STOCK	3550	0	8000
45	74-74	STOCK	4710	0	8000

SANTA BARBARA UA

46	58-58	STOCK	11000	0	8500
47	59-59	STOCK	15300	0	8500
48	60-60	STOCK	15800	0	8500
49	61-61	STOCK	10300	0	8500
50	62-62	STOCK	11100	0	8500
51	63-63	STOCK	11000	0	8500
52	64-64	STOCK	8000	0	8500
53	65-65	STOCK	9200	0	8500

54	66-66 STOCK	8400	0	8500
55	67-67 STOCK	8550	0	8500
56	68-68 STOCK	11600	0	8500
57	69-69 STOCK	13700	0	8500
58	70-70 STOCK	12300	0	8500
59	71-71 STOCK	21100	0	8500
60	72-72 STOCK	16200	0	8500
61	73-73 STOCK	10100	0	8500
62	74-74 STOCK	2820	0	8500

CALIFORNIA

1	63-63	CONST.SQFT	6600000	1	DG63	1
2	63-63	CONST.SQFT	6600000	1	DG63	1
3	64-64	CONST.SQFT	7530000	1	DG64	1
4	64-64	CONST.SQFT	7530000	1	DG64	1
5	65-65	CONST.SQFT	7320000	1	DG65	1
6	65-65	CONST.SQFT	7320000	1	DG65	1
7	66-66	CONST.SQFT	7520000	1	DG66	1
8	67-67	CONST.SQFT	6760000	1	DG67	1
9	68-68	CONST.SQFT	7870000	1	DG68	1
10	69-69	CONST.SQFT	12300000	1	DG69	1
11	70-70	CONST.SQFT	7430000	1	DG70	1
12	71-71	CONST.SQFT	7460000	1	DG71	1
13	72-72	CONST.SQFT	7860000	1	DG72	1
14	73-73	CONST.SQFT	5940000	1	DG73	1

- - - - - S O U R C E F O O T N O T E S - - - - -

DG631 THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES. FIGURES
DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126508/193572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209680 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137698/219195 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/298381 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129783/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 138445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 156546/263911 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

CALIFORNIA

1	63-63	CONST.SQFT	20300000	1	DG63	1
2	63-63	CONST.SQFT	20300000	1	DG63	1
3	64-64	CONST.SQFT	23400000	1	DG64	1
4	64-64	CONST.SQFT	23400000	1	DG64	1
5	65-65	CONST.SQFT	22300000	1	DG65	1
6	65-65	CONST.SQFT	22600000	1	DG65	1
7	66-66	CONST.SQFT	30300000	1	DG66	1
8	67-67	CONST.SQFT	24800000	1	DG67	1
9	68-68	CONST.SQFT	31000000	1	DG68	1
10	69-69	CONST.SQFT	34900000	1	DG69	1
11	70-70	CONST.SQFT	20500000	1	DG70	1
12	71-71	CONST.SQFT	19800000	1	DG71	1
13	72-72	CONST.SQFT	24600000	1	DG72	1
14	73-73	CONST.SQFT	31300000	1	DG73	1

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DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126903/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/260247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137658/219195 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/255861 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129738/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 138446/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 156846/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

CALIFORNIA

1	63-63	CONST.SQFT	7260000	1	DG63	1
2	63-63	CONST.SQFT	7260000	1	DG63	1
3	64-64	CONST.SQFT	8310000	1	DG64	1
4	64-64	CONST.SQFT	8310000	1	DG64	1
5	65-65	CONST.SQFT	8580000	1	DG65	1
6	66-66	CONST.SQFT	9920000	1	DG66	1
7	67-67	CONST.SQFT	10700000	1	DG67	1
8	68-68	CONST.SQFT	8620000	1	DG68	1
9	69-69	CONST.SQFT	8590000	1	DG69	1
10	70-70	CONST.SQFT	7140000	1	DG70	1
11	71-71	CONST.SQFT	6030000	1	DG71	1
12	72-72	CONST.SQFT	6890000	1	DG72	1
13	73-73	CONST.SQFT	7490000	1	DG73	1

- - - - - S O U R C E F O O T N O T E S - - - - -

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DG631 126508/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137658/219195 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/258381 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129730/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 133405/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 156640/233511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

ALAMEDA CO.					
1	60-60	STOCK	1740	0	0002
ALPINE CO.					
2	60-60	STOCK	770	0	0002
AMADOR CO.					
3	60-60	STOCK	190	0	0002
BUTTE CO.					
4	60-60	STOCK	260	0	0002
CALAVERAS CO.					
5	60-60	STOCK	320	0	0002
COLUSA CO.					
6	60-60	STOCK	250	0	0002
CONTRA COSTA CO.					
7	60-60	STOCK	1810	0	0002
DEL NORTE CO.					
8	60-60	STOCK	910	0	0002
EL DORADO CO.					
9	60-60	STOCK	620	0	0002
FRESNO CO.					
10	60-60	STOCK	1540	0	0002
GLENN CO					
11	60-60	STOCK	160	0	0002
HUMBOLDT CO.					
12	60-60	STOCK	490	0	0002
IMPERIAL CO.					
13	60-60	STOCK	350	0	0002
INYO CO.					
14	60-60	STOCK	850	0	0002
KERN CO.					
15	60-60	STOCK	2870	0	0002
KINGS CO.					
16	60-60	STOCK	120	0	0002
LAKE CO.					
17	60-60	STOCK	280	0	0002
LASSEN CO.					
18	60-60	STOCK	160	0	0002
MADERA CO.					
19	60-60	STOCK	170	0	0002
MARIPOSA C					
20	60-60	STOCK	230	0	0002
MENDOCINO CO.					
21	60-60	STOCK	5240	0	0002
MERCED CO.					
22	60-60	STOCK	180	0	0002
MODOC CO.					
23	60-60	STOCK	190	0	0002
MONO CO.					
24	60-60	STOCK	750	0	0002
MONTEREY CO.					
25	60-60	STOCK	200	0	0002
NAPA CO.					
26	60-60	STOCK	170	0	0002
NEVADA CO.					
27	60-60	STOCK	200	0	0002
PLACER CO.					
28	60-60	STOCK	290	0	0002
PLUMAS CO.					

29	60-60	STOCK	170	0	0002
RIVERSIDE CO.					
30	60-60	STOCK	4920	0	0002
SACRAMENTO CO.					
31	60-60	STOCK	3350	0	0002
SAN BENITO CO.					
32	60-60	STOCK	140	0	0002
SAN BERNARDINO CO.					
33	60-60	STOCK	5680	0	0002
SAN DIEGO CO.					
34	60-60	STOCK	12400	0	0002
SAN JOAQUIN CO.					
35	60-60	STOCK	1480	0	0002
SAN LUIS OBISPO CO.					
36	60-60	STOCK	120	0	0002
SANTA BARBARA CO.					
37	60-60	STOCK	3270	0	0002
SANTA CLARA CO.					
38	60-60	STOCK	3110	0	0002
SANTA CRUZ CO.					
39	60-60	STOCK	210	0	0002
SHASTA CO.					
40	60-60	STOCK	90	0	0002
SIERRA CO.					
41	60-60	STOCK	140	0	0002
SISKIYOU CO.					
42	60-60	STOCK	350	0	0002
SONOMA CO.					
43	60-60	STOCK	190	0	0002
STANISLAUS CO.					
44	60-60	STOCK	200	0	0002
SUTTER CO.					
45	60-60	STOCK	290	0	0002
TEHAMA CO.					
46	60-60	STOCK	40	0	0002
TRINITY CO.					
47	60-60	STOCK	1570	0	0002
TULARE CO.					
48	60-60	STOCK	210	0	0002
TUOLUMNE CO.					
49	60-60	STOCK	230	0	0002
VENTURA CO.					
50	60-60	STOCK	350	0	0002
YOLO CO.					
51	60-60	STOCK	480	0	0002
YUBA CO.					
52	60-60	STOCK	470	0	0002
SAN FRANCISCO SMSA					
53	60-60	STOCK	6570	0	0002
BAKERSFIELD UA					
54	60-60	STOCK	880	0	0002
FRESNO UA					
55	60-60	STOCK	590	0	0002
LA - LONG BEACH SMSA					
56	60-60	STOCK	33500	0	0002
SACRAMENTO UA					
57	60-60	STOCK	2940	0	0002

SAN DIEGO UA					
58	60-60	STOCK	8590	0	0002
SAN JOSE UA					
59	60-60	STOCK	2870	0	0002
SAN FRAN. HUD DIST.					
60	60-60	STOCK	670	0	0002
FRESNO HUD DIST.					
61	60-60	STOCK	590	0	0002
POMONA-ONTARIO UA					
62	60-60	STOCK	1080	0	0002

MOBILE HOME DOUBLE WIDTH

ALAMEDA CO.						
1	69-69	CONSTRUCTN	32	0	1000	1
2	70-70	CONSTRUCTN	49	0	1000	1
3	71-71	CONSTRUCTN	228	0	1000	1
4	72-72	CONSTRUCTN	263	0	1000	1
5	73-73	CONSTRUCTN	199	0	1000	1
6	74-74	CONSTRUCTN	150	0	1000	1
7	75-75	CONSTRUCTN	125	0	1000	1
AMADOR CO.						
8	69-69	CONSTRUCTN	6	0	1000	1
9	70-70	CONSTRUCTN	12	0	1000	1
10	71-71	CONSTRUCTN	11	0	1000	1
11	72-72	CONSTRUCTN	4	0	1000	1
12	73-73	CONSTRUCTN	11	0	1000	1
13	74-74	CONSTRUCTN	10	0	1000	1
14	75-75	CONSTRUCTN	10	0	1000	1
BUTTE CO.						
15	69-69	CONSTRUCTN	144	0	1000	1
16	70-70	CONSTRUCTN	241	0	1000	1
17	71-71	CONSTRUCTN	385	0	1000	1
18	72-72	CONSTRUCTN	484	0	1000	1
19	73-73	CONSTRUCTN	551	0	1000	1
20	74-74	CONSTRUCTN	547	0	1000	1
21	75-75	CONSTRUCTN	428	0	1000	1
CALAVERAS CO.						
22	69-69	CONSTRUCTN	1	0	1000	1
23	73-73	CONSTRUCTN	5	0	1000	1
24	74-74	CONSTRUCTN	4	0	1000	1
25	75-75	CONSTRUCTN	3	0	1000	1
CONTRA COSTA CO.						
26	69-69	CONSTRUCTN	110	0	1000	1
27	70-70	CONSTRUCTN	254	0	1000	1
28	71-71	CONSTRUCTN	334	0	1000	1
29	72-72	CONSTRUCTN	230	0	1000	1
30	73-73	CONSTRUCTN	250	0	1000	1
31	74-74	CONSTRUCTN	191	0	1000	1
32	75-75	CONSTRUCTN	130	0	1000	1
DEL NORTE CO.						
33	69-69	CONSTRUCTN	10	0	1000	1
34	70-70	CONSTRUCTN	15	0	1000	1
35	71-71	CONSTRUCTN	15	0	1000	1
36	72-72	CONSTRUCTN	29	0	1000	1
37	73-73	CONSTRUCTN	30	0	1000	1
38	74-74	CONSTRUCTN	13	0	1000	1
39	75-75	CONSTRUCTN	10	0	1000	1
EL DORADO CO.						
40	69-69	CONSTRUCTN	1	0	1000	1
41	70-70	CONSTRUCTN	11	0	1000	1
42	71-71	CONSTRUCTN	39	0	1000	1
43	72-72	CONSTRUCTN	45	0	1000	1
44	73-73	CONSTRUCTN	55	0	1000	1
45	74-74	CONSTRUCTN	53	0	1000	1
46	75-75	CONSTRUCTN	32	0	1000	1
FRESNO CO.						
47	69-69	CONSTRUCTN	177	0	1000	1
48	70-70	CONSTRUCTN	296	0	1000	1
49	71-71	CONSTRUCTN	558	0	1000	1

50	72-72	CONSTRUCTN	747	0	1000	1
51	73-73	CONSTRUCTN	691	0	1000	1
52	74-74	CONSTRUCTN	600	0	1000	1
53	75-75	CONSTRUCTN	435	0	1000	1
GLENN CO						
54	70-70	CONSTRUCTN	1	0	1000	1
55	73-73	CONSTRUCTN	1	0	1000	1
56	74-74	CONSTRUCTN	5	0	1000	1
HUMBOLDT CO.						
57	69-69	CONSTRUCTN	84	0	1000	1
58	70-70	CONSTRUCTN	103	0	1000	1
59	71-71	CONSTRUCTN	135	0	1000	1
60	72-72	CONSTRUCTN	194	0	1000	1
61	73-73	CONSTRUCTN	310	0	1000	1
62	74-74	CONSTRUCTN	20	0	1000	1
63	75-75	CONSTRUCTN	127	0	1000	1
IMPERIAL CO.						
64	69-69	CONSTRUCTN	52	0	1000	1
65	70-70	CONSTRUCTN	59	0	1000	1
66	71-71	CONSTRUCTN	75	0	1000	1
67	72-72	CONSTRUCTN	120	0	1000	1
68	73-73	CONSTRUCTN	150	0	1000	1
69	74-74	CONSTRUCTN	130	0	1000	1
70	75-75	CONSTRUCTN	131	0	1000	1
INYO CO.						
71	69-69	CONSTRUCTN	28	0	1000	1
72	70-70	CONSTRUCTN	39	0	1000	1
73	71-71	CONSTRUCTN	59	0	1000	1
74	72-72	CONSTRUCTN	82	0	1000	1
75	73-73	CONSTRUCTN	68	0	1000	1
76	74-74	CONSTRUCTN	73	0	1000	1
77	75-75	CONSTRUCTN	63	0	1000	1
KERN CO.						
78	69-69	CONSTRUCTN	205	0	1000	1
79	70-70	CONSTRUCTN	293	0	1000	1
80	71-71	CONSTRUCTN	452	0	1000	1
81	72-72	CONSTRUCTN	540	0	1000	1
82	73-73	CONSTRUCTN	539	0	1000	1
83	74-74	CONSTRUCTN	514	0	1000	1
84	75-75	CONSTRUCTN	375	0	1000	1
KINGS CO.						
85	69-69	CONSTRUCTN	1	0	1000	1
86	70-70	CONSTRUCTN	1	0	1000	1
87	71-71	CONSTRUCTN	8	0	1000	1
88	72-72	CONSTRUCTN	52	0	1000	1
89	73-73	CONSTRUCTN	61	0	1000	1
90	74-74	CONSTRUCTN	59	0	1000	1
91	75-75	CONSTRUCTN	55	0	1000	1
LAKE CO.						
92	69-69	CONSTRUCTN	40	0	1000	1
93	70-70	CONSTRUCTN	73	0	1000	1
94	71-71	CONSTRUCTN	116	0	1000	1
95	72-72	CONSTRUCTN	157	0	1000	1
96	73-73	CONSTRUCTN	210	0	1000	1
97	74-74	CONSTRUCTN	157	0	1000	1
98	75-75	CONSTRUCTN	117	0	1000	1
LASSEN CO.						

99	69-69	CONSTRUCTN	2	0	1000	1
100	70-70	CONSTRUCTN	14	0	1000	1
101	71-71	CONSTRUCTN	24	0	1000	1
102	72-72	CONSTRUCTN	24	0	1000	1
103	73-73	CONSTRUCTN	428	0	1000	1
104	74-74	CONSTRUCTN	48	0	1000	1
105	75-75	CONSTRUCTN	47	0	1000	1
LOS ANGELES CO.						
106	69-69	CONSTRUCTN	1920	0	1000	1
107	70-70	CONSTRUCTN	1640	0	1000	1
108	71-71	CONSTRUCTN	2370	0	1000	1
109	72-72	CONSTRUCTN	2310	0	1000	1
110	73-73	CONSTRUCTN	2330	0	1000	1
111	74-74	CONSTRUCTN	1410	0	1000	1
112	75-75	CONSTRUCTN	1090	0	1000	1
MADERA CO.						
113	69-69	CONSTRUCTN	13	0	1000	1
114	70-70	CONSTRUCTN	17	0	1000	1
115	71-71	CONSTRUCTN	32	0	1000	1
116	72-72	CONSTRUCTN	38	0	1000	1
117	73-73	CONSTRUCTN	48	0	1000	1
118	74-74	CONSTRUCTN	54	0	1000	1
119	75-75	CONSTRUCTN	44	0	1000	1
MARIN CO.						
120	69-69	CONSTRUCTN	6	0	1000	1
121	70-70	CONSTRUCTN	53	0	1000	1
122	71-71	CONSTRUCTN	49	0	1000	1
123	72-72	CONSTRUCTN	29	0	1000	1
124	73-73	CONSTRUCTN	44	0	1000	1
125	74-74	CONSTRUCTN	151	0	1000	1
126	75-75	CONSTRUCTN	175	0	1000	1
MARIPOSA C						
127	71-71	CONSTRUCTN	2	0	1000	1
128	73-73	CONSTRUCTN	10	0	1000	1
129	74-74	CONSTRUCTN	18	0	1000	1
130	75-75	CONSTRUCTN	9	0	1000	1
MENDOCINO CO.						
131	69-69	CONSTRUCTN	44	0	1000	1
132	70-70	CONSTRUCTN	73	0	1000	1
133	71-71	CONSTRUCTN	133	0	1000	1
134	72-72	CONSTRUCTN	164	0	1000	1
135	73-73	CONSTRUCTN	132	0	1000	1
136	74-74	CONSTRUCTN	151	0	1000	1
137	75-75	CONSTRUCTN	95	0	1000	1
MERCED CO.						
138	69-69	CONSTRUCTN	24	0	1000	1
139	70-70	CONSTRUCTN	31	0	1000	1
140	71-71	CONSTRUCTN	127	0	1000	1
141	72-72	CONSTRUCTN	174	0	1000	1
142	73-73	CONSTRUCTN	120	0	1000	1
143	74-74	CONSTRUCTN	67	0	1000	1
144	75-75	CONSTRUCTN	35	0	1000	1
MODOC CO.						
145	70-70	CONSTRUCTN	3	0	1000	1
146	71-71	CONSTRUCTN	7	0	1000	1
147	72-72	CONSTRUCTN	10	0	1000	1
148	73-73	CONSTRUCTN	17	0	1000	1

149	74-74	CONSTRUCTN	15	0	1000	1
150	75-75	CONSTRUCTN	7	0	1000	1
MONO CO.						
151	69-69	CONSTRUCTN	1	0	1000	1
152	70-70	CONSTRUCTN	2	0	1000	1
153	71-71	CONSTRUCTN	2	0	1000	1
154	72-72	CONSTRUCTN	5	0	1000	1
155	73-73	CONSTRUCTN	7	0	1000	1
156	74-74	CONSTRUCTN	6	0	1000	1
MONTEREY CO.						
157	69-69	CONSTRUCTN	104	0	1000	1
158	70-70	CONSTRUCTN	107	0	1000	1
159	71-71	CONSTRUCTN	134	0	1000	1
160	72-72	CONSTRUCTN	213	0	1000	1
161	73-73	CONSTRUCTN	233	0	1000	1
162	74-74	CONSTRUCTN	166	0	1000	1
163	75-75	CONSTRUCTN	171	0	1000	1
NAPA CO.						
164	69-69	CONSTRUCTN	41	0	1000	1
165	70-70	CONSTRUCTN	95	0	1000	1
166	71-71	CONSTRUCTN	81	0	1000	1
167	72-72	CONSTRUCTN	106	0	1000	1
168	73-73	CONSTRUCTN	91	0	1000	1
169	74-74	CONSTRUCTN	70	0	1000	1
170	75-75	CONSTRUCTN	50	0	1000	1
NEVADA CO.						
171	70-70	CONSTRUCTN	19	0	1000	1
172	71-71	CONSTRUCTN	37	0	1000	1
173	72-72	CONSTRUCTN	21	0	1000	1
174	73-73	CONSTRUCTN	34	0	1000	1
175	74-74	CONSTRUCTN	26	0	1000	1
176	75-75	CONSTRUCTN	28	0	1000	1
ORANGE CO.						
177	69-69	CONSTRUCTN	1140	0	1000	1
178	70-70	CONSTRUCTN	1300	0	1000	1
179	71-71	CONSTRUCTN	2000	0	1000	1
180	72-72	CONSTRUCTN	2110	0	1000	1
181	73-73	CONSTRUCTN	2140	0	1000	1
182	74-74	CONSTRUCTN	1490	0	1000	1
183	75-75	CONSTRUCTN	1410	0	1000	1
PLACER CO.						
184	69-69	CONSTRUCTN	17	0	1000	1
185	70-70	CONSTRUCTN	42	0	1000	1
186	71-71	CONSTRUCTN	47	0	1000	1
187	72-72	CONSTRUCTN	132	0	1000	1
188	73-73	CONSTRUCTN	109	0	1000	1
189	74-74	CONSTRUCTN	86	0	1000	1
190	75-75	CONSTRUCTN	80	0	1000	1
PLUMAS CO.						
191	70-70	CONSTRUCTN	1	0	1000	1
192	71-71	CONSTRUCTN	6	0	1000	1
193	71-71	CONSTRUCTN	1	0	1000	1
194	72-72	CONSTRUCTN	3	0	1000	1
195	73-73	CONSTRUCTN	13	0	1000	1
196	74-74	CONSTRUCTN	23	0	1000	1
197	75-75	CONSTRUCTN	5	0	1000	1
RIVERSIDE CO.						

198	69-69	CONSTRUCTN	1210	0	1000	1
199	70-70	CONSTRUCTN	1220	0	1000	1
200	71-71	CONSTRUCTN	1730	0	1000	1
201	72-72	CONSTRUCTN	2000	0	1000	1
202	73-73	CONSTRUCTN	2100	0	1000	1
203	74-74	CONSTRUCTN	1470	0	1000	1
204	75-75	CONSTRUCTN	1210	0	1000	1
SACRAMENTO CO.						
205	69-69	CONSTRUCTN	334	0	1000	1
206	70-70	CONSTRUCTN	374	0	1000	1
207	71-71	CONSTRUCTN	498	0	1000	1
208	71-71	CONSTRUCTN	519	0	1000	1
209	72-72	CONSTRUCTN	817	0	1000	1
210	73-73	CONSTRUCTN	650	0	1000	1
211	74-74	CONSTRUCTN	432	0	1000	1
212	75-75	CONSTRUCTN	353	0	1000	1
SAN BENITO CO.						
213	74-74	CONSTRUCTN	6	0	1000	1
214	75-75	CONSTRUCTN	16	0	1000	1
SAN BERNARDINO CO.						
215	69-69	CONSTRUCTN	617	0	1000	1
216	70-70	CONSTRUCTN	744	0	1000	1
217	71-71	CONSTRUCTN	1240	0	1000	1
218	72-72	CONSTRUCTN	1170	0	1000	1
219	73-73	CONSTRUCTN	1190	0	1000	1
220	74-74	CONSTRUCTN	910	0	1000	1
221	75-75	CONSTRUCTN	700	0	1000	1
SAN DIEGO CO.						
222	69-69	CONSTRUCTN	1590	0	1000	1
223	70-70	CONSTRUCTN	151	0	1000	1
224	71-71	CONSTRUCTN	2060	0	1000	1
225	72-72	CONSTRUCTN	2080	0	1000	1
226	73-73	CONSTRUCTN	1880	0	1000	1
227	74-74	CONSTRUCTN	1280	0	1000	1
228	75-75	CONSTRUCTN	1010	0	1000	1
SAN JOAQUIN CO.						
229	69-69	CONSTRUCTN	63	0	1000	1
230	70-70	CONSTRUCTN	101	0	1000	1
231	71-71	CONSTRUCTN	213	0	1000	1
232	72-72	CONSTRUCTN	253	0	1000	1
233	73-73	CONSTRUCTN	270	0	1000	1
234	74-74	CONSTRUCTN	231	0	1000	1
235	75-75	CONSTRUCTN	157	0	1000	1
SAN LUIS OBISPO CO.						
236	69-69	CONSTRUCTN	59	0	1000	1
237	70-70	CONSTRUCTN	104	0	1000	1
238	71-71	CONSTRUCTN	242	0	1000	1
239	72-72	CONSTRUCTN	270	0	1000	1
240	73-73	CONSTRUCTN	338	0	1000	1
241	74-74	CONSTRUCTN	300	0	1000	1
242	75-75	CONSTRUCTN	338	0	1000	1
SAN MATEO CO.						
243	69-69	CONSTRUCTN	20	0	1000	1
244	70-70	CONSTRUCTN	25	0	1000	1
245	71-71	CONSTRUCTN	40	0	1000	1
246	72-72	CONSTRUCTN	101	0	1000	1
247	73-73	CONSTRUCTN	141	0	1000	1

248	74-74	CONSTRUCTN	85	0	1000	1
249	75-75	CONSTRUCTN	72	0	1000	1
SANTA BARBARA CO.						
250	69-69	CONSTRUCTN	155	0	1000	1
251	70-70	CONSTRUCTN	157	0	1000	1
252	71-71	CONSTRUCTN	182	0	1000	1
253	72-72	CONSTRUCTN	229	0	1000	1
254	73-73	CONSTRUCTN	376	0	1000	1
255	74-74	CONSTRUCTN	284	0	1000	1
256	75-75	CONSTRUCTN	206	0	1000	1
SANTA CLARA CO.						
257	69-69	CONSTRUCTN	662	0	1000	1
258	70-70	CONSTRUCTN	673	0	1000	1
259	71-71	CONSTRUCTN	811	0	1000	1
260	72-72	CONSTRUCTN	939	0	1000	1
261	73-73	CONSTRUCTN	886	0	1000	1
262	74-74	CONSTRUCTN	763	0	1000	1
263	75-75	CONSTRUCTN	738	0	1000	1
SANTA CRUZ CO.						
264	69-69	CONSTRUCTN	157	0	1000	1
265	70-70	CONSTRUCTN	206	0	1000	1
266	71-71	CONSTRUCTN	277	0	1000	1
267	72-72	CONSTRUCTN	283	0	1000	1
268	73-73	CONSTRUCTN	259	0	1000	1
269	74-74	CONSTRUCTN	153	0	1000	1
270	75-75	CONSTRUCTN	156	0	1000	1
SHASTA CO.						
271	69-69	CONSTRUCTN	150	0	1000	1
272	70-70	CONSTRUCTN	193	0	1000	1
273	71-71	CONSTRUCTN	267	0	1000	1
274	72-72	CONSTRUCTN	306	0	1000	1
275	73-73	CONSTRUCTN	409	0	1000	1
276	74-74	CONSTRUCTN	369	0	1000	1
277	75-75	CONSTRUCTN	321	0	1000	1
SISKIYOU CO.						
278	69-69	CONSTRUCTN	16	0	1000	1
279	70-70	CONSTRUCTN	8	0	1000	1
280	71-71	CONSTRUCTN	17	0	1000	1
281	72-72	CONSTRUCTN	52	0	1000	1
282	73-73	CONSTRUCTN	83	0	1000	1
283	74-74	CONSTRUCTN	73	0	1000	1
284	75-75	CONSTRUCTN	52	0	1000	1
SOLANO CO.						
285	69-69	CONSTRUCTN	132	0	1000	1
286	70-70	CONSTRUCTN	211	0	1000	1
287	71-71	CONSTRUCTN	219	0	1000	1
288	72-72	CONSTRUCTN	306	0	1000	1
289	73-73	CONSTRUCTN	296	0	1000	1
290	74-74	CONSTRUCTN	234	0	1000	1
291	75-75	CONSTRUCTN	164	0	1000	1
SONOMA CO.						
292	69-69	CONSTRUCTN	311	0	1000	1
293	70-70	CONSTRUCTN	325	0	1000	1
294	72-72	CONSTRUCTN	684	0	1000	1
295	73-73	CONSTRUCTN	573	0	1000	1
296	74-74	CONSTRUCTN	491	0	1000	1
297	75-75	CONSTRUCTN	339	0	1000	1

STANISLAUS CO.						
298	69-69	CONSTRUCTN	198	0	1000	1
299	70-70	CONSTRUCTN	276	0	1000	1
300	71-71	CONSTRUCTN	420	0	1000	1
301	72-72	CONSTRUCTN	474	0	1000	1
302	73-73	CONSTRUCTN	549	0	1000	1
303	74-74	CONSTRUCTN	359	0	1000	1
304	75-75	CONSTRUCTN	251	0	1000	1
SUTTER CO.						
305	69-69	CONSTRUCTN	36	0	1000	1
306	70-70	CONSTRUCTN	48	0	1000	1
307	71-71	CONSTRUCTN	67	0	1000	1
308	72-72	CONSTRUCTN	114	0	1000	1
309	73-73	CONSTRUCTN	115	0	1000	1
310	74-74	CONSTRUCTN	109	0	1000	1
311	75-75	CONSTRUCTN	67	0	1000	1
TEHAMA CO.						
312	69-69	CONSTRUCTN	1	0	1000	1
313	70-70	CONSTRUCTN	1	0	1000	1
314	71-71	CONSTRUCTN	5	0	1000	1
315	72-72	CONSTRUCTN	51	0	1000	1
316	73-73	CONSTRUCTN	104	0	1000	1
317	74-74	CONSTRUCTN	92	0	1000	1
318	75-75	CONSTRUCTN	48	0	1000	1
TRINITY CO.						
319	71-71	CONSTRUCTN	1	0	1000	1
320	72-72	CONSTRUCTN	2	0	1000	1
321	74-74	CONSTRUCTN	1	0	1000	1
322	75-75	CONSTRUCTN	3	0	1000	1
TULARE CO.						
323	69-69	CONSTRUCTN	106	0	1000	1
324	70-70	CONSTRUCTN	153	0	1000	1
325	71-71	CONSTRUCTN	291	0	1000	1
326	72-72	CONSTRUCTN	331	0	1000	1
327	73-73	CONSTRUCTN	369	0	1000	1
328	74-74	CONSTRUCTN	311	0	1000	1
329	75-75	CONSTRUCTN	278	0	1000	1
TUOLUMNE CO.						
330	69-69	CONSTRUCTN	25	0	1000	1
331	70-70	CONSTRUCTN	58	0	1000	1
332	71-71	CONSTRUCTN	30	0	1000	1
333	72-72	CONSTRUCTN	45	0	1000	1
334	73-73	CONSTRUCTN	48	0	1000	1
335	74-74	CONSTRUCTN	50	0	1000	1
336	75-75	CONSTRUCTN	40	0	1000	1
VENTURA CO.						
337	69-69	CONSTRUCTN	252	0	1000	1
338	70-70	CONSTRUCTN	298	0	1000	1
339	71-71	CONSTRUCTN	520	0	1000	1
340	72-72	CONSTRUCTN	558	0	1000	1
341	73-73	CONSTRUCTN	573	0	1000	1
342	74-74	CONSTRUCTN	383	0	1000	1
343	75-75	CONSTRUCTN	315	0	1000	1
YOLO CO.						
344	69-69	CONSTRUCTN	120	0	1000	1
345	70-70	CONSTRUCTN	217	0	1000	1
346	71-71	CONSTRUCTN	222	0	1000	1

347	72-72	CONSTRUCTN	227	0	1000	1
348	73-73	CONSTRUCTN	323	0	1000	1
349	74-74	CONSTRUCTN	280	0	1000	1
350	75-75	CONSTRUCTN	219	0	1000	1
YUBA CO.						
351	69-69	CONSTRUCTN	31	0	1000	
352	70-70	CONSTRUCTN	47	0	1000	1
353	71-71	CONSTRUCTN	123	0	1000	1
354	72-72	CONSTRUCTN	175	0	1000	1
355	73-73	CONSTRUCTN	190	0	1000	1
356	74-74	CONSTRUCTN	90	0	1000	1
357	75-75	CONSTRUCTN	59	0	1000	1
AGENCY-DEFINED AREA						
358	69-69	CONSTRUCTN	16	0	1000	1
359	70-70	CONSTRUCTN	195	0	1000	
360	71-71	CONSTRUCTN	144	0	1000	
361	72-72	CONSTRUCTN	259	0	1000	
362	73-73	CONSTRUCTN	333	0	1000	
363	74-74	CONSTRUCTN	483	0	1000	
364	75-75	CONSTRUCTN	278	0	1000	

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10001 SALES FOR EACH COUNTY ALLOCATED BETWEEN DOUBLE + SINGLE UNITS ACCORDING
10001 TO THAT YEAR'S SALES DATA

ALAMEDA CO.						
1	69-69	CONSTRUCTN	37	0	1000	1
2	70-70	CONSTRUCTN	44	0	1000	1
3	71-71	CONSTRUCTN	220	0	1000	1
4	72-72	CONSTRUCTN	206	0	1000	1
5	73-73	CONSTRUCTN	151	0	1000	1
6	74-74	CONSTRUCTN	38	0	1000	1
7	75-75	CONSTRUCTN	54	0	1000	1
AMADOR CO.						
8	69-69	CONSTRUCTN	6	0	1000	1
9	70-70	CONSTRUCTN	11	0	1000	1
10	71-71	CONSTRUCTN	11	0	1000	1
11	72-72	CONSTRUCTN	4	0	1000	1
12	73-73	CONSTRUCTN	8	0	1000	1
13	74-74	CONSTRUCTN	6	0	1000	1
14	75-75	CONSTRUCTN	5	0	1000	1
BUTTE CO.						
15	69-69	CONSTRUCTN	170	0	1000	1
16	70-70	CONSTRUCTN	213	0	1000	1
17	71-71	CONSTRUCTN	359	0	1000	1
18	72-72	CONSTRUCTN	381	0	1000	1
19	73-73	CONSTRUCTN	416	0	1000	1
20	74-74	CONSTRUCTN	321	0	1000	1
21	75-75	CONSTRUCTN	220	0	1000	1
CALAVERAS CO.						
22	69-69	CONSTRUCTN	1	0	1000	1
23	73-73	CONSTRUCTN	3	0	1000	1
24	74-74	CONSTRUCTN	2	0	1000	1
25	75-75	CONSTRUCTN	1	0	1000	1
CONTRA COSTA CO.						
26	69-69	CONSTRUCTN	139	0	1000	1
27	70-70	CONSTRUCTN	226	0	1000	1
28	71-71	CONSTRUCTN	321	0	1000	1
29	72-72	CONSTRUCTN	220	0	1000	1
30	73-73	CONSTRUCTN	197	0	1000	1
31	74-74	CONSTRUCTN	112	0	1000	1
32	75-75	CONSTRUCTN	96	0	1000	1
DEL NORTE CO.						
33	69-69	CONSTRUCTN	12	0	1000	1
34	70-70	CONSTRUCTN	14	0	1000	1
35	71-71	CONSTRUCTN	14	0	1000	1
36	72-72	CONSTRUCTN	22	0	1000	1
37	73-73	CONSTRUCTN	23	0	1000	1
38	74-74	CONSTRUCTN	7	0	1000	1
39	75-75	CONSTRUCTN	8	0	1000	1
EL DORADO CO.						
40	69-69	CONSTRUCTN	1	0	1000	1
41	70-70	CONSTRUCTN	10	0	1000	1
42	71-71	CONSTRUCTN	34	0	1000	1
43	72-72	CONSTRUCTN	35	0	1000	1
44	73-73	CONSTRUCTN	42	0	1000	1
45	74-74	CONSTRUCTN	19	0	1000	1
46	75-75	CONSTRUCTN	17	0	1000	1
FRESNO CO.						
47	69-69	CONSTRUCTN	208	0	1000	1
48	70-70	CONSTRUCTN	262	0	1000	1
49	71-71	CONSTRUCTN	546	0	1000	1

50	72-72	CONSTRUCTN	587	0	1000	1
51	73-73	CONSTRUCTN	521	0	1000	1
52	74-74	CONSTRUCTN	352	0	1000	1
53	75-75	CONSTRUCTN	224	0	1000	1
GLENN CO						
54	70-70	CONSTRUCTN	0	0	1000	1
55	73-73	CONSTRUCTN	0	0	1000	1
56	74-74	CONSTRUCTN	3	0	1000	1
HUMBOLDT CO.						
57	69-69	CONSTRUCTN	983	0	1000	1
58	70-70	CONSTRUCTN	91	0	1000	1
59	71-71	CONSTRUCTN	130	0	1000	1
60	72-72	CONSTRUCTN	153	0	1000	1
61	73-73	CONSTRUCTN	233	0	1000	1
62	74-74	CONSTRUCTN	118	0	1000	1
63	75-75	CONSTRUCTN	65	0	1000	1
IMPERIAL CO.						
64	69-69	CONSTRUCTN	33	0	1000	1
65	70-70	CONSTRUCTN	30	0	1000	1
66	72-72	CONSTRUCTN	54	0	1000	1
67	73-73	CONSTRUCTN	62	0	1000	1
68	74-74	CONSTRUCTN	49	0	1000	1
69	75-75	CONSTRUCTN	41	0	1000	1
INYO CO.						
70	69-69	CONSTRUCTN	33	0	1000	1
71	70-70	CONSTRUCTN	35	0	1000	1
72	71-71	CONSTRUCTN	57	0	1000	1
73	72-72	CONSTRUCTN	64	0	1000	1
74	73-73	CONSTRUCTN	52	0	1000	1
75	74-74	CONSTRUCTN	45	0	1000	1
76	75-75	CONSTRUCTN	32	0	1000	1
KERN CO.						
77	69-69	CONSTRUCTN	170	0	1000	1
78	70-70	CONSTRUCTN	151	0	1000	1
79	72-72	CONSTRUCTN	242	0	1000	1
80	73-73	CONSTRUCTN	209	0	1000	1
81	74-74	CONSTRUCTN	130	0	1000	1
82	75-75	CONSTRUCTN	119	0	1000	1
KINGS CO.						
83	69-69	CONSTRUCTN	2	0	1000	1
84	70-70	CONSTRUCTN	0	0	1000	1
85	71-71	CONSTRUCTN	6	0	1000	1
86	72-72	CONSTRUCTN	41	0	1000	1
87	73-73	CONSTRUCTN	46	0	1000	1
88	74-74	CONSTRUCTN	40	0	1000	1
89	75-75	CONSTRUCTN	28	0	1000	1
LAKE CO.						
90	69-69	CONSTRUCTN	54	0	1000	1
91	70-70	CONSTRUCTN	65	0	1000	1
92	71-71	CONSTRUCTN	111	0	1000	1
93	72-72	CONSTRUCTN	124	0	1000	1
94	73-73	CONSTRUCTN	159	0	1000	1
95	74-74	CONSTRUCTN	95	0	1000	1
96	75-75	CONSTRUCTN	60	0	1000	1
LASSEN CO.						
97	69-69	CONSTRUCTN	2	0	1000	1
98	70-70	CONSTRUCTN	12	0	1000	1

99	71-71	CONSTRUCTN	23	0	1000	1
100	72-72	CONSTRUCTN	19	0	1000	1
101	73-73	CONSTRUCTN	32	0	1000	1
102	74-74	CONSTRUCTN	28	0	1000	1
103	75-75	CONSTRUCTN	24	0	1000	1
LOS ANGELES CO.						
104	69-69	CONSTRUCTN	1230	0	1000	1
105	70-70	CONSTRUCTN	847	0	1000	1
106	72-72	CONSTRUCTN	1040	0	1000	1
107	73-73	CONSTRUCTN	904	0	1000	1
108	74-74	CONSTRUCTN	494	0	1000	1
109	75-75	CONSTRUCTN	344	0	1000	1
MADERA CO.						
110	69-69	CONSTRUCTN	16	0	1000	1
111	70-70	CONSTRUCTN	15	0	1000	1
112	71-71	CONSTRUCTN	31	0	1000	1
113	72-72	CONSTRUCTN	30	0	1000	1
114	73-73	CONSTRUCTN	36	0	1000	1
115	74-74	CONSTRUCTN	31	0	1000	1
116	75-75	CONSTRUCTN	22	0	1000	1
MARIN CO.						
117	69-69	CONSTRUCTN	8	0	1000	1
118	70-70	CONSTRUCTN	44	0	1000	1
119	71-71	CONSTRUCTN	47	0	1000	1
120	72-72	CONSTRUCTN	23	0	1000	1
121	73-73	CONSTRUCTN	30	0	1000	1
122	74-74	CONSTRUCTN	38	0	1000	1
123	75-75	CONSTRUCTN	39	0	1000	1
MARIPOSA C						
124	71-71	CONSTRUCTN	2	0	1000	1
125	73-73	CONSTRUCTN	7	0	1000	1
126	74-74	CONSTRUCTN	11	0	1000	1
127	75-75	CONSTRUCTN	4	0	1000	1
MENDOCINO CO.						
128	69-69	CONSTRUCTN	52	0	1000	1
129	70-70	CONSTRUCTN	65	0	1000	1
130	72-72	CONSTRUCTN	129	0	1000	1
131	73-73	CONSTRUCTN	104	0	1000	1
132	74-74	CONSTRUCTN	95	0	1000	1
133	75-75	CONSTRUCTN	40	0	1000	1
MERCED CO.						
134	69-69	CONSTRUCTN	26	0	1000	1
135	70-70	CONSTRUCTN	28	0	1000	1
136	72-72	CONSTRUCTN	157	0	1000	1
137	73-73	CONSTRUCTN	96	0	1000	1
138	74-74	CONSTRUCTN	59	0	1000	1
139	75-75	CONSTRUCTN	18	0	1000	1
MODOC CO.						
140	70-70	CONSTRUCTN	2	0	1000	1
141	72-72	CONSTRUCTN	7	0	1000	1
142	73-73	CONSTRUCTN	13	0	1000	1
143	74-74	CONSTRUCTN	9	0	1000	1
144	75-75	CONSTRUCTN	4	0	1000	1
MONO CO.						
145	69-69	CONSTRUCTN	1	0	1000	1
146	70-70	CONSTRUCTN	2	0	1000	1
147	72-72	CONSTRUCTN	4	0	1000	1

MOBILE HOME SINGLE WIDTH

148	73-73	CONSTRUCTN	5	0	1000	1
149	74-74	CONSTRUCTN	4	0	1000	1
MONTEREY CO.						
150	69-69	CONSTRUCTN	123	0	1000	1
151	70-70	CONSTRUCTN	95	0	1000	1
152	72-72	CONSTRUCTN	158	0	1000	1
153	73-73	CONSTRUCTN	175	0	1000	1
154	74-74	CONSTRUCTN	98	0	1000	1
155	75-75	CONSTRUCTN	88	0	1000	1
NAPA CO.						
156	69-69	CONSTRUCTN	48	0	1000	1
157	70-70	CONSTRUCTN	84	0	1000	1
158	72-72	CONSTRUCTN	83	0	1000	1
159	73-73	CONSTRUCTN	68	0	1000	1
160	74-74	CONSTRUCTN	41	0	1000	1
161	75-75	CONSTRUCTN	18	0	1000	1
NEVADA CO.						
162	70-70	CONSTRUCTN	17	0	1000	1
163	72-72	CONSTRUCTN	16	0	1000	1
164	73-73	CONSTRUCTN	25	0	1000	1
165	74-74	CONSTRUCTN	15	0	1000	1
166	75-75	CONSTRUCTN	14	0	1000	1
ORANGE CO.						
167	69-69	CONSTRUCTN	726	0	1000	1
168	70-70	CONSTRUCTN	701	0	1000	1
169	71-71	CONSTRUCTN	969	0	1000	1
170	72-72	CONSTRUCTN	950	0	1000	1
171	73-73	CONSTRUCTN	833	0	1000	1
172	74-74	CONSTRUCTN	522	0	1000	1
173	75-75	CONSTRUCTN	445	0	1000	1
PLACER CO.						
174	69-69	CONSTRUCTN	19	0	1000	1
175	70-70	CONSTRUCTN	37	0	1000	1
176	72-72	CONSTRUCTN	61	0	1000	1
177	73-73	CONSTRUCTN	63	0	1000	1
178	74-74	CONSTRUCTN	51	0	1000	1
179	75-75	CONSTRUCTN	44	0	1000	1
PLUMAS CO.						
180	70-70	CONSTRUCTN	1	0	1000	1
181	72-72	CONSTRUCTN	2	0	1000	1
182	73-73	CONSTRUCTN	9	0	1000	1
183	74-74	CONSTRUCTN	14	0	1000	1
184	75-75	CONSTRUCTN	4	0	1000	1
RIVERSIDE CO.						
185	69-69	CONSTRUCTN	775	0	1000	1
186	70-70	CONSTRUCTN	628	0	1000	1
187	71-71	CONSTRUCTN	836	0	1000	1
188	72-72	CONSTRUCTN	900	0	1000	1
189	73-73	CONSTRUCTN	618	0	1000	1
190	74-74	CONSTRUCTN	516	0	1000	1
191	75-75	CONSTRUCTN	384	0	1000	1
SACRAMENTO CO.						
192	69-69	CONSTRUCTN	392	0	1000	1
193	70-70	CONSTRUCTN	332	0	1000	1
194	72-72	CONSTRUCTN	642	0	1000	1
195	73-73	CONSTRUCTN	491	0	1000	1
196	74-74	CONSTRUCTN	294	0	1000	1

197	75-75	CONSTRUCTN	182	0	1000	1
SAN BENITO CO.						
198	74-74	CONSTRUCTN	4	0	1000	1
199	75-75	CONSTRUCTN	8	0	1000	1
SAN BERNARDINO CO.						
200	69-69	CONSTRUCTN	395	0	1000	1
201	70-70	CONSTRUCTN	384	0	1000	1
202	71-71	CONSTRUCTN	584	0	1000	1
203	72-72	CONSTRUCTN	525	0	1000	1
204	73-73	CONSTRUCTN	463	0	1000	1
205	74-74	CONSTRUCTN	320	0	1000	1
206	75-75	CONSTRUCTN	221	0	1000	1
SAN DIEGO CO.						
207	69-69	CONSTRUCTN	866	0	1000	1
208	70-70	CONSTRUCTN	770	0	1000	1
209	71-71	CONSTRUCTN	967	0	1000	1
210	72-72	CONSTRUCTN	933	0	1000	1
211	73-73	CONSTRUCTN	733	0	1000	1
212	74-74	CONSTRUCTN	445	0	1000	1
213	75-75	CONSTRUCTN	318	0	1000	1
SAN JOAQUIN CO.						
214	69-69	CONSTRUCTN	740	0	1000	1
215	70-70	CONSTRUCTN	90	0	1000	1
216	72-72	CONSTRUCTN	206	0	1000	1
217	73-73	CONSTRUCTN	203	0	1000	1
218	74-74	CONSTRUCTN	136	0	1000	1
219	75-75	CONSTRUCTN	81	0	1000	1
SAN LUIS OBISPO CO.						
220	69-69	CONSTRUCTN	57	0	1000	1
221	70-70	CONSTRUCTN	94	0	1000	1
222	71-71	CONSTRUCTN	114	0	1000	1
223	72-72	CONSTRUCTN	121	0	1000	1
224	73-73	CONSTRUCTN	131	0	1000	1
225	74-74	CONSTRUCTN	129	0	1000	1
226	75-75	CONSTRUCTN	107	0	1000	1
SAN MATEO CO.						
227	69-69	CONSTRUCTN	50	0	1000	1
228	70-70	CONSTRUCTN	23	0	1000	1
229	72-72	CONSTRUCTN	127	0	1000	1
230	73-73	CONSTRUCTN	106	0	1000	1
231	74-74	CONSTRUCTN	50	0	1000	1
232	75-75	CONSTRUCTN	37	0	1000	1
SANTA BARBARA CO.						
233	69-69	CONSTRUCTN	39	0	1000	1
234	70-70	CONSTRUCTN	31	0	1000	1
235	71-71	CONSTRUCTN	95	0	1000	1
236	72-72	CONSTRUCTN	103	0	1000	1
237	73-73	CONSTRUCTN	148	0	1000	1
238	74-74	CONSTRUCTN	110	0	1000	1
239	75-75	CONSTRUCTN	65	0	1000	1
SANTA CLARA CO.						
240	69-69	CONSTRUCTN	777	0	1000	1
241	70-70	CONSTRUCTN	596	0	1000	1
242	72-72	CONSTRUCTN	738	0	1000	1
243	73-73	CONSTRUCTN	663	0	1000	1
244	74-74	CONSTRUCTN	445	0	1000	1
245	75-75	CONSTRUCTN	379	0	1000	1

SANTA CRUZ CO.						
246	69-69	CONSTRUCTN	184	0	1000	1
247	70-70	CONSTRUCTN	178	0	1000	1
248	72-72	CONSTRUCTN	222	0	1000	1
249	73-73	CONSTRUCTN	195	0	1000	1
250	74-74	CONSTRUCTN	90	0	1000	1
251	75-75	CONSTRUCTN	77	0	1000	1
SHASTA CO.						
252	69-69	CONSTRUCTN	177	0	1000	1
253	70-70	CONSTRUCTN	172	0	1000	1
254	72-72	CONSTRUCTN	235	0	1000	1
255	73-73	CONSTRUCTN	308	0	1000	1
256	74-74	CONSTRUCTN	217	0	1000	1
257	75-75	CONSTRUCTN	166	0	1000	1
SISKIYOU CO.						
258	69-69	CONSTRUCTN	11	0	1000	1
259	70-70	CONSTRUCTN	8	0	1000	1
260	72-72	CONSTRUCTN	41	0	1000	1
261	73-73	CONSTRUCTN	63	0	1000	1
262	74-74	CONSTRUCTN	43	0	1000	1
263	75-75	CONSTRUCTN	27	0	1000	1
SOLANO CO.						
264	69-69	CONSTRUCTN	194	0	1000	1
265	70-70	CONSTRUCTN	186	0	1000	1
266	72-72	CONSTRUCTN	241	0	1000	1
267	73-73	CONSTRUCTN	224	0	1000	1
268	74-74	CONSTRUCTN	138	0	1000	1
269	75-75	CONSTRUCTN	84	0	1000	1
SONOMA CO.						
270	69-69	CONSTRUCTN	366	0	1000	1
271	70-70	CONSTRUCTN	288	0	1000	1
272	72-72	CONSTRUCTN	537	0	1000	1
273	73-73	CONSTRUCTN	433	0	1000	1
274	74-74	CONSTRUCTN	265	0	1000	1
275	75-75	CONSTRUCTN	175	0	1000	1
STANISLAUS CO.						
276	69-69	CONSTRUCTN	232	0	1000	1
277	70-70	CONSTRUCTN	245	0	1000	1
278	72-72	CONSTRUCTN	373	0	1000	1
279	73-73	CONSTRUCTN	414	0	1000	1
280	74-74	CONSTRUCTN	211	0	1000	1
281	75-75	CONSTRUCTN	130	0	1000	1
SUTTER CO.						
282	69-69	CONSTRUCTN	42	0	1000	1
283	70-70	CONSTRUCTN	43	0	1000	1
284	72-72	CONSTRUCTN	90	0	1000	1
285	73-73	CONSTRUCTN	87	0	1000	1
286	74-74	CONSTRUCTN	64	0	1000	1
287	75-75	CONSTRUCTN	34	0	1000	1
TEHAMA CO.						
288	69-69	CONSTRUCTN	2	0	1000	1
289	70-70	CONSTRUCTN	0	0	1000	1
290	72-72	CONSTRUCTN	40	0	1000	1
291	73-73	CONSTRUCTN	79	0	1000	1
292	74-74	CONSTRUCTN	54	0	1000	1
293	75-75	CONSTRUCTN	25	0	1000	1
TRINITY CO.						

294	72-72	CONSTRUCTN	1	0	1000	1
295	74-74	CONSTRUCTN	1	0	1000	1
296	75-75	CONSTRUCTN	1	0	1000	1
TULARE CO.						
297	69-69	CONSTRUCTN	124	0	1000	1
298	70-70	CONSTRUCTN	136	0	1000	1
299	72-72	CONSTRUCTN	260	0	1000	1
300	73-73	CONSTRUCTN	278	0	1000	1
301	74-74	CONSTRUCTN	182	0	1000	1
302	75-75	CONSTRUCTN	142	0	1000	1
TUOLUMNE CO.						
303	69-69	CONSTRUCTN	32	0	1000	1
304	70-70	CONSTRUCTN	54	0	1000	1
305	72-72	CONSTRUCTN	35	0	1000	1
306	73-73	CONSTRUCTN	37	0	1000	1
307	74-74	CONSTRUCTN	29	0	1000	1
308	75-75	CONSTRUCTN	20	0	1000	1
VENTURA CO.						
309	69-69	CONSTRUCTN	180	0	1000	1
310	70-70	CONSTRUCTN	152	0	1000	1
311	71-71	CONSTRUCTN	244	0	1000	1
312	72-72	CONSTRUCTN	295	0	1000	1
313	73-73	CONSTRUCTN	223	0	1000	1
314	74-74	CONSTRUCTN	135	0	1000	1
315	75-75	CONSTRUCTN	100	0	1000	1
YOLO CO.						
316	69-69	CONSTRUCTN	140	0	1000	1
317	70-70	CONSTRUCTN	192	0	1000	1
318	72-72	CONSTRUCTN	170	0	1000	1
319	73-73	CONSTRUCTN	243	0	1000	1
320	74-74	CONSTRUCTN	164	0	1000	1
321	75-75	CONSTRUCTN	113	0	1000	1
YUBA CO.						
322	69-69	CONSTRUCTN	36	0	1000	1
323	70-70	CONSTRUCTN	41	0	1000	1
324	72-72	CONSTRUCTN	137	0	1000	1
325	73-73	CONSTRUCTN	144	0	1000	1
326	74-74	CONSTRUCTN	93	0	1000	1
327	75-75	CONSTRUCTN	30	0	1000	1
AGENCY-DEFINED AREA						
328	69-69	CONSTRUCTN	12	0	1000	*
329	69-69	CONSTRUCTN	19	0	1000	*
330	70-70	CONSTRUCTN	132	0	1000	1

- - - - - F O O T N O T E S - - - - -

328 X A) DEALER UNKNOWN - NORTHERN CALIFORNIA
328 X B) SEE FOOTNOTE 1 FOR SOURCE 1000
329 X A) DEALER UNKNOWN - NORTHERN CALIFORNIA
329 X B) SEE FOOTNOTE 1 FOR SOURCE 1000

- - - - - S O U R C E F O O T N O T E S - - - - -

10001 SALES FOR EACH COUNTY ALLOCATED BETWEEN DOUBLE + SINGLE UNITS ACCORDIN
10001 TO THAT YEAR'S SALES DATA

CALIFORNIA					
1	67-67	CONSTRUCTN	43600	0	CT69
2	68-68	CONSTRUCTN	72900	0	CT69
3	69-69	CONSTRUCTN	104000	0	CT69
4	70-70	CONSTRUCTN	124000	0	CT70
5	71-71	CONSTRUCTN	144000	0	CT72
6	72-72	CONSTRUCTN	157000	0	CT72
7	73-73	CONSTRUCTN	114000	0	CT73
8	74-74	CONSTRUCTN	53300	0	CT74
ALAMEDA CO.					
9	67-67	CONSTRUCTN	2810	0	CT69
10	68-68	CONSTRUCTN	3870	0	CT69
11	69-69	CONSTRUCTN	4490	0	CT69
12	70-70	CONSTRUCTN	5520	0	CT70
13	71-71	CONSTRUCTN	6970	0	CT72
14	72-72	CONSTRUCTN	7190	0	CT72
15	73-73	CONSTRUCTN	3660	0	CT73
16	74-74	CONSTRUCTN	1210	0	CT74
ALPINE CO.					
17	71-71	CONSTRUCTN	60	0	CT72
18	73-73	CONSTRUCTN	58	0	CT73
19	74-74	CONSTRUCTN	44	0	CT74
AMADOR CO.					
20	67-67	CONSTRUCTN	2	0	CT69
21	68-68	CONSTRUCTN	2	0	CT69
22	69-69	CONSTRUCTN	2	0	CT69
23	71-71	CONSTRUCTN	42	0	CT71
24	72-72	CONSTRUCTN	92	0	CT72
25	73-73	CONSTRUCTN	8	0	CT73
26	74-74	CONSTRUCTN	24	0	CT74
BUTTE CO.					
27	67-67	CONSTRUCTN	114	0	CT69
28	68-68	CONSTRUCTN	123	0	CT69
29	69-69	CONSTRUCTN	236	0	CT69
30	70-70	CONSTRUCTN	541	0	CT70
31	71-71	CONSTRUCTN	462	0	CT71
32	72-72	CONSTRUCTN	482	0	CT72
33	73-73	CONSTRUCTN	930	0	CT73
34	74-74	CONSTRUCTN	373	0	CT74
CALAVERAS CO.					
35	67-67	CONSTRUCTN	8	0	CT69
36	68-68	CONSTRUCTN	6	0	CT69
37	69-69	CONSTRUCTN	16	0	CT69
38	70-70	CONSTRUCTN	12	0	CT70
39	71-71	CONSTRUCTN	4	0	CT71
40	72-72	CONSTRUCTN	58	0	CT72
41	73-73	CONSTRUCTN	39	0	CT73
42	74-74	CONSTRUCTN	12	0	CT74
COLUSA CO.					
43	67-67	CONSTRUCTN	2	0	CT69
44	69-69	CONSTRUCTN	2	0	CT69
45	71-71	CONSTRUCTN	6	0	CT71
46	72-72	CONSTRUCTN	4	0	CT72
CONTRA COSTA CO.					
47	67-67	CONSTRUCTN	1640	0	CT69
48	68-68	CONSTRUCTN	1260	0	CT69
49	69-69	CONSTRUCTN	3490	0	CT69

50	70-70	CONSTRUCTN	4560	0	CT70
51	71-71	CONSTRUCTN	6630	0	CT71
52	72-72	CONSTRUCTN	3680	0	CT72
53	73-73	CONSTRUCTN	2110	0	CT73
54	74-74	CONSTRUCTN	768	0	CT74
DEL NORTE CO.					
55	67-67	CONSTRUCTN	6	0	CT69
56	68-68	CONSTRUCTN	84	0	CT69
57	69-69	CONSTRUCTN	36	0	CT69
58	73-73	CONSTRUCTN	12	0	CT73
EL DORADO CO.					
59	67-67	CONSTRUCTN	4	0	CT69
60	68-68	CONSTRUCTN	6	0	CT69
61	69-69	CONSTRUCTN	97	0	CT69
62	70-70	CONSTRUCTN	286	0	CT70
63	71-71	CONSTRUCTN	477	0	CT71
64	72-72	CONSTRUCTN	306	0	CT72
65	73-73	CONSTRUCTN	444	0	CT73
66	74-74	CONSTRUCTN	277	0	CT74
FRESNO CO.					
67	67-67	CONSTRUCTN	1250	0	CT69
68	68-68	CONSTRUCTN	1210	0	CT69
69	69-69	CONSTRUCTN	1070	0	CT69
70	70-70	CONSTRUCTN	2970	0	CT70
71	71-71	CONSTRUCTN	3940	0	CT71
72	72-72	CONSTRUCTN	2930	0	CT72
73	73-73	CONSTRUCTN	2800	0	CT73
74	74-74	CONSTRUCTN	1650	0	CT74
GLENN CO					
75	67-67	CONSTRUCTN	2	0	CT69
76	70-70	CONSTRUCTN	4	0	CT70
77	71-71	CONSTRUCTN	14	0	CT71
78	72-72	CONSTRUCTN	14	0	CT72
79	73-73	CONSTRUCTN	4	0	CT73
80	74-74	CONSTRUCTN	6	0	CT74
HUMBOLDT CO.					
81	67-67	CONSTRUCTN	34	0	CT69
82	68-68	CONSTRUCTN	21	0	CT69
83	69-69	CONSTRUCTN	22	0	CT69
84	70-70	CONSTRUCTN	159	0	CT70
85	71-71	CONSTRUCTN	74	0	CT71
86	72-72	CONSTRUCTN	209	0	CT72
87	73-73	CONSTRUCTN	266	0	CT73
88	74-74	CONSTRUCTN	203	0	CT74
IMPERIAL CO.					
89	67-67	CONSTRUCTN	159	0	CT69
90	68-68	CONSTRUCTN	93	0	CT69
91	69-69	CONSTRUCTN	44	0	CT69
92	70-70	CONSTRUCTN	75	0	CT70
93	71-71	CONSTRUCTN	340	0	CT72
94	72-72	CONSTRUCTN	100	0	CT72
95	73-73	CONSTRUCTN	51	0	CT73
96	74-74	CONSTRUCTN	110	0	CT74
INYO CO.					
97	67-67	CONSTRUCTN	20	0	CT69
98	71-71	CONSTRUCTN	28	0	CT71
99	72-72	CONSTRUCTN	71	0	CT72

100	73-73	CONSTRUCTN	53	0 CT73
KERN CO.				
101	67-67	CONSTRUCTN	649	0 CT69
102	68-68	CONSTRUCTN	739	0 CT69
103	69-69	CONSTRUCTN	694	0 CT69
104	70-70	CONSTRUCTN	1240	0 CT70
105	71-71	CONSTRUCTN	1000	0 CT71
106	72-72	CONSTRUCTN	1980	0 CT72
107	73-73	CONSTRUCTN	864	0 CT73
108	74-74	CONSTRUCTN	735	0 CT74
KINGS CO.				
109	67-67	CONSTRUCTN	32	0 CT69
110	68-68	CONSTRUCTN	226	0 CT69
111	69-69	CONSTRUCTN	130	0 CT69
112	70-70	CONSTRUCTN	247	0 CT70
113	71-71	CONSTRUCTN	56	0 CT71
114	72-72	CONSTRUCTN	94	0 CT72
115	73-73	CONSTRUCTN	96	0 CT73
116	74-74	CONSTRUCTN	30	0 CT74
LAKE CO.				
117	67-67	CONSTRUCTN	57	0 CT69
118	68-68	CONSTRUCTN	52	0 CT69
119	69-69	CONSTRUCTN	34	0 CT69
120	70-70	CONSTRUCTN	4	0 CT70
121	71-71	CONSTRUCTN	14	0 CT71
122	72-72	CONSTRUCTN	18	0 CT72
123	73-73	CONSTRUCTN	0	0 CT73
124	74-74	CONSTRUCTN	0	0 CT74
LASSEN CO.				
125	67-67	CONSTRUCTN	2	0 CT69
126	73-73	CONSTRUCTN	64	0 CT73
LOS ANGELES CO.				
127	67-67	CONSTRUCTN	13300	0 CT69
128	68-68	CONSTRUCTN	19600	0 CT69
129	69-69	CONSTRUCTN	29000	0 CT72
130	70-70	CONSTRUCTN	38200	0 CT72
131	71-71	CONSTRUCTN	33800	0 CT72
132	72-72	CONSTRUCTN	42300	0 CT72
133	73-73	CONSTRUCTN	33700	0 CT73
134	74-74	CONSTRUCTN	14400	0 CT74
MADERA CO.				
135	67-67	CONSTRUCTN	33	0 CT69
136	68-68	CONSTRUCTN	19	0 CT69
137	69-69	CONSTRUCTN	24	0 CT69
138	70-70	CONSTRUCTN	29	0 CT70
139	71-71	CONSTRUCTN	209	0 CT71
140	72-72	CONSTRUCTN	92	0 CT72
141	73-73	CONSTRUCTN	70	0 CT73
142	74-74	CONSTRUCTN	175	0 CT74
MARIN CO.				
143	67-67	CONSTRUCTN	302	0 CT69
144	68-68	CONSTRUCTN	437	0 CT69
145	69-69	CONSTRUCTN	699	0 CT69
146	70-70	CONSTRUCTN	470	0 CT70
147	71-71	CONSTRUCTN	1270	0 CT71
148	72-72	CONSTRUCTN	2250	0 CT72
149	73-73	CONSTRUCTN	2240	0 CT73

150	74-74	CONSTRUCTN	451	0	CT74
MARIPOSA C					
151	67-67	CONSTRUCTN	4	0	CT69
152	69-69	CONSTRUCTN	4	0	CT69
153	73-73	CONSTRUCTN	48	0	CT73
MENDOCINO CO.					
154	67-67	CONSTRUCTN	2	0	CT69
155	68-68	CONSTRUCTN	10	0	CT69
156	69-69	CONSTRUCTN	34	0	CT69
157	70-70	CONSTRUCTN	22	0	CT70
158	71-71	CONSTRUCTN	54	0	CT71
159	72-72	CONSTRUCTN	83	0	CT72
160	73-73	CONSTRUCTN	222	0	CT73
161	74-74	CONSTRUCTN	16	0	CT74
MERCED CO.					
162	67-67	CONSTRUCTN	56	0	CT69
163	68-68	CONSTRUCTN	12	0	CT69
164	69-69	CONSTRUCTN	109	0	CT69
165	70-70	CONSTRUCTN	258	0	CT70
166	71-71	CONSTRUCTN	707	0	CT71
167	72-72	CONSTRUCTN	515	0	CT72
168	73-73	CONSTRUCTN	329	0	CT73
169	74-74	CONSTRUCTN	94	0	CT74
MODOC CO.					
170	72-72	CONSTRUCTN	46	0	CT72
171	73-73	CONSTRUCTN	68	0	CT73
MONO CO.					
172	67-67	CONSTRUCTN	77	0	CT69
173	68-68	CONSTRUCTN	135	0	CT69
174	69-69	CONSTRUCTN	259	0	CT69
175	70-70	CONSTRUCTN	321	0	CT70
176	71-71	CONSTRUCTN	602	0	CT71
177	72-72	CONSTRUCTN	1110	0	CT72
178	73-73	CONSTRUCTN	444	0	CT73
179	74-74	CONSTRUCTN	85	0	CT74
MONTEREY CO.					
180	67-67	CONSTRUCTN	346	0	CT69
181	68-68	CONSTRUCTN	339	0	CT69
182	69-69	CONSTRUCTN	682	0	CT72
183	70-70	CONSTRUCTN	790	0	CT70
184	71-71	CONSTRUCTN	1690	0	CT71
185	72-72	CONSTRUCTN	2240	0	CT72
186	73-73	CONSTRUCTN	1480	0	CT73
187	74-74	CONSTRUCTN	365	0	CT74
NAPA CO.					
188	67-67	CONSTRUCTN	251	0	CT69
189	68-68	CONSTRUCTN	202	0	CT69
190	69-69	CONSTRUCTN	229	0	CT69
191	70-70	CONSTRUCTN	426	0	CT70
192	71-71	CONSTRUCTN	659	0	CT71
193	72-72	CONSTRUCTN	169	0	CT72
194	73-73	CONSTRUCTN	207	0	CT73
195	74-74	CONSTRUCTN	91	0	CT74
NEVADA CO.					
196	67-67	CONSTRUCTN	4	0	CT69
197	71-71	CONSTRUCTN	48	0	CT71
198	72-72	CONSTRUCTN	130	0	CT72

199	73-73	CONSTRUCTN	112	0 CT73
200	74-74	CONSTRUCTN	16	0 CT74
ORANGE CO.				
201	67-67	CONSTRUCTN	3630	0 CT69
202	68-68	CONSTRUCTN	10500	0 CT69
203	69-69	CONSTRUCTN	19900	0 CT69
204	70-70	CONSTRUCTN	16200	0 CT70
205	71-71	CONSTRUCTN	16150	0 CT71
206	72-72	CONSTRUCTN	17600	0 CT72
207	73-73	CONSTRUCTN	12800	0 CT73
208	74-74	CONSTRUCTN	7720	0 CT74
PLACER CO.				
209	67-67	CONSTRUCTN	85	0 CT69
210	68-68	CONSTRUCTN	103	0 CT69
211	69-69	CONSTRUCTN	399	0 CT69
212	70-70	CONSTRUCTN	771	0 CT70
213	71-71	CONSTRUCTN	324	0 CT71
214	72-72	CONSTRUCTN	261	0 CT72
215	73-73	CONSTRUCTN	119	0 CT73
216	74-74	CONSTRUCTN	110	0 CT74
PLUMAS CO.				
217	67-67	CONSTRUCTN	2	0 CT69
218	69-69	CONSTRUCTN	4	0 CT69
219	70-70	CONSTRUCTN	6	0 CT70
220	71-71	CONSTRUCTN	10	0 CT71
221	72-72	CONSTRUCTN	10	0 CT72
222	73-73	CONSTRUCTN	2	0 CT73
223	74-74	CONSTRUCTN	10	0 CT74
RIVERSIDE CO.				
224	67-67	CONSTRUCTN	603	0 CT69
225	68-68	CONSTRUCTN	946	0 CT69
226	69-69	CONSTRUCTN	1130	0 CT69
227	70-70	CONSTRUCTN	2380	0 CT70
228	71-71	CONSTRUCTN	3940	0 CT71
229	72-72	CONSTRUCTN	4810	0 CT72
230	73-73	CONSTRUCTN	3670	0 CT73
231	74-74	CONSTRUCTN	304	0 CT74
SACRAMENTO CO.				
232	67-67	CONSTRUCTN	1670	0 CT69
233	68-68	CONSTRUCTN	2340	0 CT69
234	69-69	CONSTRUCTN	4120	0 CT69
235	70-70	CONSTRUCTN	5320	0 CT70
236	71-71	CONSTRUCTN	6490	0 CT71
237	72-72	CONSTRUCTN	6210	0 CT72
238	73-73	CONSTRUCTN	5350	0 CT73
239	74-74	CONSTRUCTN	2510	0 CT74
SAN BENITO CO.				
240	67-67	CONSTRUCTN	6	0 CT69
241	68-68	CONSTRUCTN	6	0 CT69
242	69-69	CONSTRUCTN	2	0 CT69
243	70-70	CONSTRUCTN	30	0 CT70
244	71-71	CONSTRUCTN	8	0 CT71
245	72-72	CONSTRUCTN	78	0 CT72
246	73-73	CONSTRUCTN	132	0 CT73
247	74-74	CONSTRUCTN	10	0 CT74
SAN BERNARDINO CO.				
248	67-67	CONSTRUCTN	281	0 CT69

249	68-68	CONSTRUCTN	804	0	CT69
250	69-69	CONSTRUCTN	616	0	CT69
251	70-70	CONSTRUCTN	1790	0	CT70
252	71-71	CONSTRUCTN	3190	0	CT71
253	72-72	CONSTRUCTN	3930	0	CT72
254	73-73	CONSTRUCTN	1960	0	CT73
255	74-74	CONSTRUCTN	634	0	CT74
SAN DIEGO CO.					
256	67-67	CONSTRUCTN	6120	0	CT69
257	68-68	CONSTRUCTN	12100	0	CT69
258	69-69	CONSTRUCTN	14300	0	CT69
259	70-70	CONSTRUCTN	13100	0	CT70
260	71-71	CONSTRUCTN	20300	0	CT71
261	72-72	CONSTRUCTN	24200	0	CT72
262	73-73	CONSTRUCTN	11700	0	CT73
263	74-74	CONSTRUCTN	8470	0	CT74
SAN FRANCISCO CO.					
264	67-67	CONSTRUCTN	1160	0	CT69
265	68-68	CONSTRUCTN	1230	0	CT69
266	69-69	CONSTRUCTN	682	0	CT72
267	70-70	CONSTRUCTN	1630	0	CT70
268	71-71	CONSTRUCTN	3440	0	CT71
269	72-72	CONSTRUCTN	3270	0	CT72
270	73-73	CONSTRUCTN	3870	0	CT73
271	74-74	CONSTRUCTN	1160	0	CT74
SAN JOAQUIN CO.					
272	67-67	CONSTRUCTN	808	0	CT69
273	68-68	CONSTRUCTN	934	0	CT69
274	69-69	CONSTRUCTN	1710	0	CT69
275	70-70	CONSTRUCTN	1610	0	CT70
276	71-71	CONSTRUCTN	1660	0	CT71
277	72-72	CONSTRUCTN	1810	0	CT72
278	73-73	CONSTRUCTN	1290	0	CT73
279	74-74	CONSTRUCTN	1300	0	CT74
SAN LUIS OBISPO CO.					
280	67-67	CONSTRUCTN	170	0	CT69
281	68-68	CONSTRUCTN	90	0	CT69
282	69-69	CONSTRUCTN	267	0	CT69
283	70-70	CONSTRUCTN	637	0	CT70
284	71-71	CONSTRUCTN	675	0	CT71
285	72-72	CONSTRUCTN	1110	0	CT72
286	73-73	CONSTRUCTN	608	0	CT73
287	74-74	CONSTRUCTN	342	0	CT74
SAN MATEO CO.					
288	67-67	CONSTRUCTN	900	0	CT69
289	68-68	CONSTRUCTN	1710	0	CT69
290	69-69	CONSTRUCTN	1440	0	CT69
291	70-70	CONSTRUCTN	4270	0	CT70
292	71-71	CONSTRUCTN	4600	0	CT71
293	72-72	CONSTRUCTN	5430	0	CT72
294	73-73	CONSTRUCTN	4890	0	CT73
295	74-74	CONSTRUCTN	630	0	CT74
SANTA BARBARA CO.					
296	67-67	CONSTRUCTN	1090	0	CT69
297	68-68	CONSTRUCTN	1130	0	CT69
298	69-69	CONSTRUCTN	1930	0	CT72
299	70-70	CONSTRUCTN	1350	0	CT72

300	71-71	CONSTRUCTN	1180	0	CT71
301	72-72	CONSTRUCTN	2270	0	CT72
302	73-73	CONSTRUCTN	2570	0	CT73
303	74-74	CONSTRUCTN	866	0	CT74
SANTA CLARA CO.					
304	67-67	CONSTRUCTN	2760	0	CT69
305	68-68	CONSTRUCTN	8170	0	CT69
306	69-69	CONSTRUCTN	11800	0	CT69
307	70-70	CONSTRUCTN	11430	0	CT70
308	71-71	CONSTRUCTN	10100	0	CT71
309	72-72	CONSTRUCTN	5630	0	CT72
310	73-73	CONSTRUCTN	5430	0	CT73
311	74-74	CONSTRUCTN	3170	0	CT74
SANTA CRUZ CO.					
312	67-67	CONSTRUCTN	104	0	CT69
313	68-68	CONSTRUCTN	245	0	CT69
314	69-69	CONSTRUCTN	233	0	CT69
315	70-70	CONSTRUCTN	922	0	CT70
316	71-71	CONSTRUCTN	1430	0	CT71
317	72-72	CONSTRUCTN	1570	0	CT72
318	73-73	CONSTRUCTN	945	0	CT73
319	74-74	CONSTRUCTN	91	0	CT74
SHASTA CO.					
320	67-67	CONSTRUCTN	24	0	CT69
321	68-68	CONSTRUCTN	118	0	CT69
322	69-69	CONSTRUCTN	10	0	CT69
323	70-70	CONSTRUCTN	12	0	CT70
324	71-71	CONSTRUCTN	310	0	CT71
325	72-72	CONSTRUCTN	327	0	CT72
326	73-73	CONSTRUCTN	266	0	CT73
327	74-74	CONSTRUCTN	234	0	CT74
SIERRA CO.					
328	71-71	CONSTRUCTN	2	0	CT72
329	72-72	CONSTRUCTN	2	0	CT72
330	74-74	CONSTRUCTN	2	0	CT74
SISKIYOU CO.					
331	67-67	CONSTRUCTN	5	0	CT69
332	68-68	CONSTRUCTN	10	0	CT69
333	69-69	CONSTRUCTN	6	0	CT72
334	69-69	CONSTRUCTN	7	0	CT69
335	70-70	CONSTRUCTN	83	0	CT70
336	71-71	CONSTRUCTN	3	0	CT71
337	72-72	CONSTRUCTN	50	0	CT72
338	73-73	CONSTRUCTN	98	0	CT73
339	74-74	CONSTRUCTN	60	0	CT74
SOLANO CO.					
340	67-67	CONSTRUCTN	810	0	CT69
341	68-68	CONSTRUCTN	926	0	CT69
342	69-69	CONSTRUCTN	461	0	CT69
343	70-70	CONSTRUCTN	931	0	CT70
344	71-71	CONSTRUCTN	1150	0	CT72
345	72-72	CONSTRUCTN	926	0	CT72
346	73-73	CONSTRUCTN	1000	0	CT73
347	74-74	CONSTRUCTN	32	0	CT74
SONOMA CO.					
348	67-67	CONSTRUCTN	225	0	CT69
349	68-68	CONSTRUCTN	367	0	CT69

MULTI-UNIT RESIDENTIAL BLDGS.

350	70-70	CONSTRUCTN	1040	0 CT70
351	71-71	CONSTRUCTN	1570	0 CT71
352	72-72	CONSTRUCTN	2050	0 CT72
353	73-73	CONSTRUCTN	1430	0 CT73
354	74-74	CONSTRUCTN	1340	0 CT74
STANISLAUS CO.				
355	67-67	CONSTRUCTN	489	0 CT69
356	68-68	CONSTRUCTN	744	0 CT69
357	69-69	CONSTRUCTN	674	0 CT69
358	70-70	CONSTRUCTN	837	0 CT70
359	71-71	CONSTRUCTN	1380	0 CT72
360	72-72	CONSTRUCTN	1550	0 CT72
361	73-73	CONSTRUCTN	919	0 CT73
362	74-74	CONSTRUCTN	375	0 CT74
SUTTER CO.				
363	67-67	CONSTRUCTN	126	0 CT69
364	68-68	CONSTRUCTN	188	0 CT69
365	69-69	CONSTRUCTN	128	0 CT69
366	70-70	CONSTRUCTN	137	0 CT70
367	71-71	CONSTRUCTN	323	0 CT71
368	72-72	CONSTRUCTN	219	0 CT72
369	73-73	CONSTRUCTN	192	0 CT73
370	74-74	CONSTRUCTN	78	0 CT74
TEHAMA CO.				
371	67-67	CONSTRUCTN	14	0 CT69
372	70-70	CONSTRUCTN	4	0 CT70
373	71-71	CONSTRUCTN	49	0 CT71
374	72-72	CONSTRUCTN	84	0 CT72
375	73-73	CONSTRUCTN	156	0 CT73
376	74-74	CONSTRUCTN	10	0 CT74
TRINITY CO.				
377	73-73	CONSTRUCTN	2	0 CT73
378	74-74	CONSTRUCTN	9	0 CT74
TULARE CO.				
379	67-67	CONSTRUCTN	199	0 CT69
380	68-68	CONSTRUCTN	432	0 CT69
381	69-69	CONSTRUCTN	298	0 CT69
382	70-70	CONSTRUCTN	354	0 CT70
383	71-71	CONSTRUCTN	547	0 CT71
384	72-72	CONSTRUCTN	678	0 CT72
385	73-73	CONSTRUCTN	912	0 CT73
386	74-74	CONSTRUCTN	470	0 CT74
TUOLUMNE CO.				
387	67-67	CONSTRUCTN	4	0 CT69
388	68-68	CONSTRUCTN	17	0 CT69
389	69-69	CONSTRUCTN	14	0 CT69
390	70-70	CONSTRUCTN	6	0 CT70
391	71-71	CONSTRUCTN	37	0 CT71
392	72-72	CONSTRUCTN	46	0 CT72
393	73-73	CONSTRUCTN	110	0 CT73
394	74-74	CONSTRUCTN	17	0 CT74
VENTURA CO.				
395	67-67	CONSTRUCTN	537	0 CT69
396	68-68	CONSTRUCTN	710	0 CT69
397	69-69	CONSTRUCTN	1800	0 CT72
398	70-70	CONSTRUCTN	2710	0 CT70
399	71-71	CONSTRUCTN	4880	0 CT71

400	72-72	CONSTRUCTN	3410	0	CT72
401	73-73	CONSTRUCTN	3040	0	CT73
402	74-74	CONSTRUCTN	888	0	CT74
YOLO CO.					
403	67-67	CONSTRUCTN	377	0	CT69
404	68-68	CONSTRUCTN	535	0	CT69
405	69-69	CONSTRUCTN	474	0	CT69
406	70-70	CONSTRUCTN	776	0	CT70
407	71-71	CONSTRUCTN	944	0	CT71
408	72-72	CONSTRUCTN	847	0	CT72
409	73-73	CONSTRUCTN	1360	0	CT73
410	74-74	CONSTRUCTN	167	0	CT74
YUBA CO.					
411	67-67	CONSTRUCTN	4	0	CT69
412	68-68	CONSTRUCTN	48	0	CT69
413	69-69	CONSTRUCTN	6	0	CT72
414	70-70	CONSTRUCTN	4	0	CT70
415	71-71	CONSTRUCTN	8	0	CT72
416	72-72	CONSTRUCTN	248	0	CT72
417	73-73	CONSTRUCTN	214	0	CT73
418	74-74	CONSTRUCTN	214	0	CT74

CALIFORNIA

1	63-63	CONST.SQFT	8760000	1	DG63	1
2	63-63	CONST.SQFT	8760000	1	DG63	1
3	64-64	CONST.SQFT	9360000	1	DG64	1
4	64-64	CONST.SQFT	9360000	1	DG64	1
5	65-65	CONST.SQFT	9230000	1	DG65	1
6	66-66	CONST.SQFT	7420000	1	DG66	1
7	67-67	CONST.SQFT	7630000	1	DG67	1
8	68-68	CONST.SQFT	9820000	1	DG68	1
9	69-69	CONST.SQFT	12200000	1	DG69	1
10	70-70	CONST.SQFT	9750000	1	DG70	1
11	71-71	CONST.SQFT	7040000	1	DG71	1
12	72-72	CONST.SQFT	9570000	1	DG72	1
13	73-73	CONST.SQFT	10800000	1	DG73	1

- - - - - S O U R C E F O O T N O T E S - - - - -

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DG731 REGION VIII NONRES. CONSTR.)

CALIFORNIA

1	63-63	CONST.SQFT	127000000	0	DG63
2	64-64	CONST.SQFT	131000000	0	DG64
3	65-65	CONST.SQFT	145000000	0	DG65
4	66-66	CONST.SQFT	194000000	0	DG66
5	67-67	CONST.SQFT	127000000	0	DG67
6	68-68	CONST.SQFT	138000000	0	DG68
7	69-69	CONST.SQFT	170000000	0	DG69
8	70-70	CONST.SQFT	131000000	0	DG70
9	71-71	CONST.SQFT	130000000	0	DG71
10	72-72	CONST.SQFT	138000000	0	DG72
11	73-73	CONST.SQFT	157000000	0	DG73

ALAMEDA CO.

12	63-63	CONST.SQFT	5580000	0	DG63
13	64-64	CONST.SQFT	6460000	0	DG64
14	65-65	CONST.SQFT	7640000	0	DG65
15	66-66	CONST.SQFT	9960000	0	DG66
16	67-67	CONST.SQFT	5150000	0	DG67
17	68-68	CONST.SQFT	6390000	0	DG68
18	69-69	CONST.SQFT	10400000	0	DG69
19	70-70	CONST.SQFT	5620000	0	DG70
20	71-71	CONST.SQFT	8660000	0	DG71
21	72-72	CONST.SQFT	6740000	0	DG72
22	73-73	CONST.SQFT	6800000	0	DG73

CONTRA COSTA CO.

23	63-63	CONST.SQFT	2860000	0	DG63
24	64-64	CONST.SQFT	3040000	0	DG64
25	65-65	CONST.SQFT	4420000	0	DG65
26	66-66	CONST.SQFT	5620000	0	DG66
27	67-67	CONST.SQFT	2580000	0	DG67
28	68-68	CONST.SQFT	3770000	0	DG68
29	69-69	CONST.SQFT	2290000	0	DG69
30	70-70	CONST.SQFT	1830000	0	DG70
31	71-71	CONST.SQFT	1980000	0	DG71
32	72-72	CONST.SQFT	3460000	0	DG72
33	73-73	CONST.SQFT	3550000	0	DG73

FRESNO CO.

34	63-63	CONST.SQFT	1700000	0	DG63
35	64-64	CONST.SQFT	2010000	0	DG64
36	65-65	CONST.SQFT	2160000	0	DG65
37	66-66	CONST.SQFT	1880000	0	DG66
38	67-67	CONST.SQFT	1640000	0	DG67
39	68-68	CONST.SQFT	2040000	0	DG68
40	69-69	CONST.SQFT	2920000	0	DG69
41	70-70	CONST.SQFT	2140000	0	DG70
42	71-71	CONST.SQFT	2450000	0	DG71
43	72-72	CONST.SQFT	2260000	0	DG72
44	73-73	CONST.SQFT	2820000	0	DG73

KERN CO.

45	63-63	CONST.SQFT	1130000	0	DG63
46	64-64	CONST.SQFT	1830000	0	DG64
47	65-65	CONST.SQFT	2020000	0	DG65
48	66-66	CONST.SQFT	2080000	0	DG66
49	67-67	CONST.SQFT	1390000	0	DG67
50	68-68	CONST.SQFT	1500000	0	DG68
51	69-69	CONST.SQFT	1810000	0	DG69
52	70-70	CONST.SQFT	1030000	0	DG70

53	71-71	CONST.SQFT	966000	0	DG71
54	72-72	CONST.SQFT	860000	0	DG72
55	73-73	CONST.SQFT	1620000	0	DG73
LOS ANGELES CO.					
56	63-63	CONST.SQFT	47100000	0	DG63
57	64-64	CONST.SQFT	47000000	0	DG64
58	65-65	CONST.SQFT	4840000	0	DG65
59	66-66	CONST.SQFT	52000000	0	DG66
60	67-67	CONST.SQFT	44400000	0	DG67
61	68-68	CONST.SQFT	50900000	0	DG68
62	69-69	CONST.SQFT	71100000	0	DG69
63	70-70	CONST.SQFT	53100000	0	DG70
64	71-71	CONST.SQFT	47600000	0	DG71
65	72-72	CONST.SQFT	48100000	0	DG72
66	73-73	CONST.SQFT	44700000	0	DG73
MARIN CO.					
67	63-63	CONST.SQFT	1060000	0	DG63
68	64-64	CONST.SQFT	1400000	0	DG64
69	65-65	CONST.SQFT	1510000	0	DG65
70	66-66	CONST.SQFT	1270000	0	DG66
71	67-67	CONST.SQFT	858000	0	DG67
72	68-68	CONST.SQFT	750000	0	DG68
73	69-69	CONST.SQFT	1030000	0	DG69
74	70-70	CONST.SQFT	566000	0	DG70
75	71-71	CONST.SQFT	1040000	0	DG71
76	72-72	CONST.SQFT	717000	0	DG72
77	73-73	CONST.SQFT	1120000	0	DG73
MONTEREY CO.					
78	70-70	CONST.SQFT	758000	0	DG70
79	71-71	CONST.SQFT	1380000	0	DG71
80	72-72	CONST.SQFT	1010000	0	DG72
81	73-73	CONST.SQFT	5130000	0	DG73
NAPA CO.					
82	63-63	CONST.SQFT	303000	0	DG63
83	64-64	CONST.SQFT	507000	0	DG64
84	65-65	CONST.SQFT	313000	0	DG65
85	66-66	CONST.SQFT	664000	0	DG66
86	67-67	CONST.SQFT	182000	0	DG67
87	68-68	CONST.SQFT	328000	0	DG68
88	69-69	CONST.SQFT	250000	0	DG69
89	70-70	CONST.SQFT	251000	0	DG70
90	71-71	CONST.SQFT	821000	0	DG71
91	72-72	CONST.SQFT	449000	0	DG72
92	73-73	CONST.SQFT	749000	0	DG73
ORANGE CO.					
93	63-63	CONST.SQFT	11500000	0	DG63
94	64-64	CONST.SQFT	13200000	0	DG64
95	65-65	CONST.SQFT	14600000	0	DG65
96	66-66	CONST.SQFT	14300000	0	DG66
97	67-67	CONST.SQFT	13000000	0	DG67
98	68-68	CONST.SQFT	14100000	0	DG68
99	69-69	CONST.SQFT	19700000	0	DG69
100	70-70	CONST.SQFT	17400000	0	DG70
101	71-71	CONST.SQFT	13500000	0	DG71
102	72-72	CONST.SQFT	18600000	0	DG72
103	73-73	CONST.SQFT	27100000	0	DG73
PLACER CO.					

104	70-70	CONST.SQFT	239000	0	DG70
105	71-71	CONST.SQFT	528000	0	DG71
106	72-72	CONST.SQFT	336000	0	DG72
107	73-73	CONST.SQFT	3470000	0	DG73
RIVERSIDE CO.					
108	63-63	CONST.SQFT	2790000	0	DG63
109	64-64	CONST.SQFT	3930000	0	DG64
110	65-65	CONST.SQFT	3730000	0	DG65
111	66-66	CONST.SQFT	3600000	0	DG66
112	67-67	CONST.SQFT	2940000	0	DG67
113	68-68	CONST.SQFT	2080000	0	DG68
114	69-69	CONST.SQFT	2770000	0	DG69
115	70-70	CONST.SQFT	2440000	0	DG70
116	71-71	CONST.SQFT	2410000	0	DG71
117	72-72	CONST.SQFT	3620000	0	DG72
118	73-73	CONST.SQFT	784000	0	DG73
SACRAMENTO CO.					
119	63-63	CONST.SQFT	4610000	0	DG63
120	64-64	CONST.SQFT	4420000	0	DG64
121	65-65	CONST.SQFT	3980000	0	DG65
122	66-66	CONST.SQFT	4660000	0	DG66
123	67-67	CONST.SQFT	3700000	0	DG67
124	68-68	CONST.SQFT	3190000	0	DG68
125	69-69	CONST.SQFT	3790000	0	DG69
126	70-70	CONST.SQFT	2700000	0	DG70
127	71-71	CONST.SQFT	4030000	0	DG71
128	72-72	CONST.SQFT	4350000	0	DG72
129	73-73	CONST.SQFT	3360000	0	DG73
SAN BERNARDINO CO.					
130	63-63	CONST.SQFT	3380000	0	DG63
131	64-64	CONST.SQFT	5170000	0	DG64
132	65-65	CONST.SQFT	5870000	0	DG65
133	66-66	CONST.SQFT	4990000	0	DG66
134	67-67	CONST.SQFT	4430000	0	DG67
135	68-68	CONST.SQFT	5530000	0	DG68
136	69-69	CONST.SQFT	4170000	0	DG69
137	70-70	CONST.SQFT	3940000	0	DG70
138	71-71	CONST.SQFT	3780000	0	DG71
139	72-72	CONST.SQFT	2570000	0	DG72
140	73-73	CONST.SQFT	1530000	0	DG73
SAN DIEGO CO.					
141	63-63	CONST.SQFT	8290000	0	DG63
142	64-64	CONST.SQFT	5130000	0	DG64
143	65-65	CONST.SQFT	6270000	0	DG65
144	66-66	CONST.SQFT	5500000	0	DG66
145	67-67	CONST.SQFT	7020000	0	DG67
146	68-68	CONST.SQFT	9560000	0	DG68
147	69-69	CONST.SQFT	10200000	0	DG69
148	70-70	CONST.SQFT	9050000	0	DG70
149	71-71	CONST.SQFT	9330000	0	DG71
150	72-72	CONST.SQFT	11100000	0	DG72
151	73-73	CONST.SQFT	14200000	0	DG73
SAN FRANCISCO CO.					
152	63-63	CONST.SQFT	4290000	0	DG63
153	64-64	CONST.SQFT	1870000	0	DG64
154	65-65	CONST.SQFT	6540000	0	DG65
155	66-66	CONST.SQFT	6200000	0	DG66

156	67-67	CONST.SQFT	5520000	0	DG67
157	68-68	CONST.SQFT	4840000	0	DG68
158	69-69	CONST.SQFT	5510000	0	DG69
159	70-70	CONST.SQFT	3250000	0	DG70
160	71-71	CONST.SQFT	7100000	0	DG71
161	72-72	CONST.SQFT	4250000	0	DG72
162	73-73	CONST.SQFT	6660000	0	DG73
SAN JOAQUIN CO.					
163	63-63	CONST.SQFT	1670000	0	DG63
164	64-64	CONST.SQFT	2640000	0	DG64
165	65-65	CONST.SQFT	1970000	0	DG65
166	66-66	CONST.SQFT	1890000	0	DG66
167	67-67	CONST.SQFT	1880000	0	DG67
168	68-68	CONST.SQFT	1660000	0	DG68
169	69-69	CONST.SQFT	1700000	0	DG69
170	70-70	CONST.SQFT	795000	0	DG70
171	71-71	CONST.SQFT	1190000	0	DG71
172	72-72	CONST.SQFT	1040000	0	DG72
173	73-73	CONST.SQFT	1780000	0	DG73
SAN MATEO CO.					
174	63-63	CONST.SQFT	3950000	0	DG63
175	64-64	CONST.SQFT	3470000	0	DG64
176	65-65	CONST.SQFT	4260000	0	DG65
177	66-66	CONST.SQFT	3040000	0	DG66
178	67-67	CONST.SQFT	5300000	0	DG67
179	68-68	CONST.SQFT	3840000	0	DG68
180	69-69	CONST.SQFT	4290000	0	DG69
181	70-70	CONST.SQFT	2990000	0	DG70
182	71-71	CONST.SQFT	3190000	0	DG71
183	72-72	CONST.SQFT	3990000	0	DG72
184	73-73	CONST.SQFT	3830000	0	DG73
SANTA BARBARA CO.					
185	63-63	CONST.SQFT	2140000	0	DG63
186	64-64	CONST.SQFT	2280000	0	DG64
187	65-65	CONST.SQFT	2040000	0	DG65
188	66-66	CONST.SQFT	2580000	0	DG66
189	67-67	CONST.SQFT	1990000	0	DG67
190	68-68	CONST.SQFT	2190000	0	DG68
191	69-69	CONST.SQFT	1700000	0	DG69
192	70-70	CONST.SQFT	915000	0	DG70
193	71-71	CONST.SQFT	970000	0	DG71
194	72-72	CONST.SQFT	1120000	0	DG72
195	73-73	CONST.SQFT	1170000	0	DG73
SANTA CLARA CO.					
196	63-63	CONST.SQFT	8520000	0	DG63
197	64-64	CONST.SQFT	8510000	0	DG64
198	65-65	CONST.SQFT	8080000	0	DG65
199	66-66	CONST.SQFT	9140000	0	DG66
200	67-67	CONST.SQFT	10800000	0	DG67
201	69-69	CONST.SQFT	11400000	0	DG69
202	70-70	CONST.SQFT	11300000	0	DG70
203	71-71	CONST.SQFT	7590000	0	DG71
204	72-72	CONST.SQFT	9200000	0	DG72
205	73-73	CONST.SQFT	11300000	0	DG73
SANTA CRUZ CO.					
206	73-73	CONST.SQFT	400000	0	DG73
SHASTA CO.					

207	68-68	CONST.SQFT	10200000	D	DG68
SOLANO CO.					
208	63-63	CONST.SQFT	836000	D	DG63
209	64-64	CONST.SQFT	787000	D	DG64
210	65-65	CONST.SQFT	1100000	D	DG65
211	66-66	CONST.SQFT	576000	D	DG66
212	67-67	CONST.SQFT	705000	D	DG67
213	68-68	CONST.SQFT	1260000	D	DG68
214	69-69	CONST.SQFT	1080000	D	DG69
215	70-70	CONST.SQFT	609000	D	DG70
216	71-71	CONST.SQFT	1380000	D	DG71
217	72-72	CONST.SQFT	748000	D	DG72
218	73-73	CONST.SQFT	1060000	D	DG73
SONOMA CO.					
219	63-63	CONST.SQFT	1330000	D	DG63
220	64-64	CONST.SQFT	1520000	D	DG64
221	65-65	CONST.SQFT	1430000	D	DG65
222	66-66	CONST.SQFT	1130000	D	DG66
223	67-67	CONST.SQFT	1050000	D	DG67
224	68-68	CONST.SQFT	1090000	D	DG68
225	69-69	CONST.SQFT	1290000	D	DG69
VENTURA CO.					
226	66-66	CONST.SQFT	2930000	D	DG66
227	67-67	CONST.SQFT	1410000	D	DG67
228	68-68	CONST.SQFT	2620000	D	DG68
229	69-69	CONST.SQFT	1140000	D	DG69
230	70-70	CONST.SQFT	2090000	D	DG70
231	71-71	CONST.SQFT	2640000	D	DG71
232	72-72	CONST.SQFT	2650000	D	DG72
233	73-73	CONST.SQFT	2480000	D	DG73
YOLO CO.					
234	64-64	CONST.SQFT	879000	D	DG64
235	65-65	CONST.SQFT	1170000	D	DG65
236	66-66	CONST.SQFT	602000	D	DG66
237	67-67	CONST.SQFT	867000	D	DG67
238	68-68	CONST.SQFT	829000	D	DG68
239	69-69	CONST.SQFT	682000	D	DG69
240	70-70	CONST.SQFT	805000	D	DG70
241	71-71	CONST.SQFT	512000	D	DG71
242	72-72	CONST.SQFT	729000	D	DG72
243	73-73	CONST.SQFT	408000	D	DG73

CALIFORNIA

1	63-63	CONST.SQFT	16400000	1	DG63	1
2	63-63	CONST.SQFT	16400000	1	DG63	1
3	64-64	CONST.SQFT	12900000	1	DG64	1
4	64-64	CONST.SQFT	12900000	1	DG64	1
5	65-65	CONST.SQFT	17000000	1	DG65	1
6	65-65	CONST.SQFT	17000000	1	DG65	1
7	66-66	CONST.SQFT	14700000	1	DG66	1
8	67-67	CONST.SQFT	13700000	1	DG67	1
9	68-68	CONST.SQFT	14500000	1	DG68	1
10	69-69	CONST.SQFT	26600000	1	DG69	1
11	70-70	CONST.SQFT	18300000	1	DG70	1
12	71-71	CONST.SQFT	21300000	1	DG71	1
13	72-72	CONST.SQFT	15100000	1	DG72	1
14	73-73	CONST.SQFT	23600000	1	DG73	1

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DG631 THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES. FIGURES
DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126503/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144989/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137653/219135 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/258381 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212691 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129733/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 133445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 156546/263511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

CALIFORNIA

1	63-63	CONST.SQFT	6860000	1	DG63 1
2	63-63	CONST.SQFT	6860000	1	DG63 1
3	64-64	CONST.SQFT	4380000	1	DG64 1
4	64-64	CONST.SQFT	4380000	1	DG64 1
5	65-65	CONST.SQFT	5420000	1	DG65 1
6	66-66	CONST.SQFT	6020000	1	DG66 1
7	67-67	CONST.SQFT	3530000	1	DG67 1
8	68-68	CONST.SQFT	5050000	1	DG68 1
9	69-69	CONST.SQFT	5260000	1	DG69 1
10	70-70	CONST.SQFT	3610000	1	DG70 1
11	71-71	CONST.SQFT	3880000	1	DG71 1
12	72-72	CONST.SQFT	4610000	1	DG72 1
13	73-73	CONST.SQFT	6590000	1	DG73 1

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DG631 THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES. FIGURES
DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126508/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143415/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137658/219195 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/258391 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129700/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 138445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 1335-6/263511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

CALIFORNIA

1	63-63	CONST.SQFT	4680000	1	DG63 1
2	63-63	CONST.SQFT	4680000	1	DG63 1
3	64-64	CONST.SQFT	4900000	1	DG64 1
4	64-64	CONST.SQFT	4900000	1	DG64 1
5	65-65	CONST.SQFT	4890000	1	DG65 1
6	66-66	CONST.SQFT	4450000	1	DG66 1
7	67-67	CONST.SQFT	3930000	1	DG67 1
8	68-68	CONST.SQFT	3670000	1	DG68 1
9	69-69	CONST.SQFT	3640000	1	DG69 1
10	70-70	CONST.SQFT	2990000	1	DG70 1
11	71-71	CONST.SQFT	2830000	1	DG71 1
12	72-72	CONST.SQFT	2810000	1	DG72 1
13	73-73	CONST.SQFT	2940000	1	DG73 1

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DG631 THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES. FIGURES
DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126508/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137656/219195 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/258361 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129730/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 133445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 156946/263511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

SCE SERVICE AREA

1	50-50	STOCK	802000	0	4000
2	55-55	STOCK	1140000	0	4000
3	60-60	STOCK	1480000	0	4000
4	61-61	STOCK	1540000	0	4000
5	62-62	STOCK	1610000	0	4000
6	63-63	STOCK	1700000	0	4000
7	64-64	STOCK	1780000	0	4000
8	65-65	STOCK	1870000	0	4000
9	66-66	STOCK	1930000	0	4000
10	67-67	STOCK	1980000	0	4000
11	68-68	STOCK	2030000	0	4000
12	69-69	STOCK	2080000	0	4000
13	70-70	STOCK	2130000	0	4000
14	71-71	STOCK	2180000	0	4000
15	72-72	STOCK	2240000	0	4000
16	73-73	STOCK	2300000	0	4000
17	74-74	STOCK	2360000	0	4000

CALIFORNIA

1	63-63	CONST.SQFT	28300000	1	DG63	1
2	63-63	CONST.SQFT	28300000	1	DG63	1
3	64-64	CONST.SQFT	27200000	1	DG64	1
4	64-64	CONST.SQFT	27200000	1	DG64	1
5	65-65	CONST.SQFT	30800000	1	DG65	1
6	65-65	CONST.SQFT	30800000	1	DG65	1
7	66-66	CONST.SQFT	25400000	1	DG66	1
8	67-67	CONST.SQFT	23300000	1	DG67	1
9	68-68	CONST.SQFT	22700000	1	DG68	1
10	69-69	CONST.SQFT	28800000	1	DG69	1
11	70-70	CONST.SQFT	24700000	1	DG70	1
12	71-71	CONST.SQFT	26600000	1	DG71	1
13	72-72	CONST.SQFT	29000000	1	DG72	1
14	73-73	CONST.SQFT	29400000	1	DG73	1

- - - - - S O U R C E F O O T N O T E S - - - - -

DG631 THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES. FIGURES
DG631 FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631 126508/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG631 NON-RESIDENTIAL CONSTRUCTION.)
DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137656/219195 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/258381 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131093/212601 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129760/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 130445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 156546/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

CALIFORNIA									
1	67-67	CONSTRUCTN	67800	0	CT69				
2	68-68	CONSTRUCTN	86800	0	CT69				
3	69-69	CONSTRUCTN	80100	0	CT69				
4	70-70	CONSTRUCTN	71300	0	CT72				
5	71-71	CONSTRUCTN	113000	0	CT71				
6	72-72	CONSTRUCTN	124000	0	CT72				
7	73-73	CONSTRUCTN	103000	0	CT73				
8	74-74	CONSTRUCTN	76200	0	CT74				
ALAMEDA CO.									
9	67-67	CONSTRUCTN	2810	0	CT69				
10	68-68	CONSTRUCTN	4020	0	CT69				
11	69-69	CONSTRUCTN	4050	0	CT72				
12	70-70	STOCK	221000	0	0002	CONSTRUCTN	4760	0	CT70
13	71-71	CONSTRUCTN	7040	0	CT71				
14	72-72	CONSTRUCTN	4570	0	CT72				
15	73-73	CONSTRUCTN	3440	0	CT73				
16	74-74	CONSTRUCTN	1790	0	CT74				
ALPINE CO.									
17	68-68	CONSTRUCTN	42	0	CT69				
18	70-70	STOCK	148	0	0002				
19	72-72	CONSTRUCTN	22	0	CT72				
20	73-73	CONSTRUCTN	17	0	CT73				
21	74-74	CONSTRUCTN	17	0	CT74				
AMADOR CO.									
22	67-67	CONSTRUCTN	135	0	CT69				
23	68-68	CONSTRUCTN	139	0	CT69				
24	69-69	CONSTRUCTN	177	0	CT69				
25	70-70	STOCK	3580	0	0002	CONSTRUCTN	186	0	CT70
26	71-71	CONSTRUCTN	254	0	CT71				
27	72-72	CONSTRUCTN	307	0	CT72				
28	73-73	CONSTRUCTN	369	0	CT73				
29	74-74	CONSTRUCTN	307	0	CT74				
BUTTE CO.									
30	67-67	CONSTRUCTN	316	0	CT69				
31	68-68	CONSTRUCTN	279	0	CT69				
32	69-69	CONSTRUCTN	338	0	CT69				
33	70-70	STOCK	28200	0	0002	CONSTRUCTN	383	0	CT70
34	71-71	CONSTRUCTN	560	0	CT71				
35	72-72	CONSTRUCTN	771	0	CT72				
36	73-73	CONSTRUCTN	576	0	CT73				
37	74-74	CONSTRUCTN	500	0	CT74				
CALAVERAS CO.									
38	67-67	CONSTRUCTN	252	0	CT69				
39	68-68	CONSTRUCTN	320	0	CT69				
40	69-69	CONSTRUCTN	242	0	CT69				
41	70-70	STOCK	4210	0	0002	CONSTRUCTN	242	0	CT70
42	71-71	CONSTRUCTN	320	0	CT71				
43	72-72	CONSTRUCTN	432	0	CT72				
44	73-73	CONSTRUCTN	238	0	CT73				
45	74-74	CONSTRUCTN	198	0	CT74				
COLUSA CO.									
46	67-67	CONSTRUCTN	33	0	CT69				
47	68-68	CONSTRUCTN	73	0	CT69				
48	69-69	CONSTRUCTN	42	0	CT69				
49	70-70	STOCK	3590	0	0002	CONSTRUCTN	10	0	CT70
50	71-71	CONSTRUCTN	49	0	CT71				

51	72-72	CONSTRUCTN	27	0	CT72				
52	73-73	CONSTRUCTN	30	0	CT73				
53	74-74	CONSTRUCTN	39	0	CT74				
CONTRA COSTA CO.									
54	67-67	CONSTRUCTN	3170	0	CT69				
55	68-68	CONSTRUCTN	4170	0	CT69				
56	69-69	CONSTRUCTN	2860	0	CT69				
57	70-70	STOCK	134000	0	0002	CONSTRUCTN	2180	0	CT70
58	71-71	CONSTRUCTN	4850	0	CT71				
59	72-72	CONSTRUCTN	5690	0	CT72				
60	73-73	CONSTRUCTN	4720	0	CT73				
61	74-74	CONSTRUCTN	3270	0	CT74				
DEL NORTE CO.									
62	67-67	CONSTRUCTN	30	0	CT69				
63	68-68	CONSTRUCTN	21	0	CT69				
64	69-69	CONSTRUCTN	18	0	CT69				
65	70-70	STOCK	3670	0	0002	CONSTRUCTN	25	0	CT70
66	71-71	CONSTRUCTN	25	0	CT71				
67	72-72	CONSTRUCTN	45	0	CT72				
68	73-73	CONSTRUCTN	46	0	CT73				
69	74-74	CONSTRUCTN	43	0	CT74				
EL DORADO CO.									
70	67-67	CONSTRUCTN	209	0	CT69				
71	68-68	CONSTRUCTN	198	0	CT69				
72	69-69	CONSTRUCTN	498	0	CT69				
73	70-70	STOCK	11900	0	0002	CONSTRUCTN	660	0	CT70
74	71-71	CONSTRUCTN	895	0	CT71				
75	72-72	CONSTRUCTN	1350	0	CT72				
76	73-73	CONSTRUCTN	1410	0	CT73				
77	74-74	CONSTRUCTN	1310	0	CT74				
FRESNO CO.									
78	67-67	CONSTRUCTN	1720	0	CT69				
79	68-68	CONSTRUCTN	1630	0	CT69				
80	69-69	CONSTRUCTN	1390	0	CT69				
81	70-70	STOCK	105000	0	0002	CONSTRUCTN	1740	0	CT70
82	71-71	CONSTRUCTN	2350	0	CT71				
83	72-72	CONSTRUCTN	4000	0	CT72				
84	73-73	CONSTRUCTN	1890	0	CT73				
85	74-74	CONSTRUCTN	2630	0	CT74				
GLENN CO									
86	67-67	CONSTRUCTN	69	0	CT69				
87	68-68	CONSTRUCTN	52	0	CT69				
88	69-69	CONSTRUCTN	25	0	CT69				
89	70-70	STOCK	4930	0	0002	CONSTRUCTN	40	0	CT70
90	71-71	CONSTRUCTN	57	0	CT71				
91	72-72	CONSTRUCTN	129	0	CT72				
92	73-73	CONSTRUCTN	41	0	CT73				
93	74-74	CONSTRUCTN	85	0	CT74				
HUMBOLDT CO.									
94	67-67	CONSTRUCTN	248	0	CT69				
95	68-68	CONSTRUCTN	237	0	CT69				
96	69-69	CONSTRUCTN	160	0	CT69				
97	70-70	STOCK	25400	0	0002	CONSTRUCTN	172	0	CT7
98	71-71	CONSTRUCTN	270	0	CT71				
99	72-72	CONSTRUCTN	330	0	CT72				
100	73-73	CONSTRUCTN	290	0	CT73				
101	74-74	CONSTRUCTN	340	0	CT74				

IMPERIAL CO.									
102	67-67	CONSTRUCTN	207	0	CT69				
103	68-68	CONSTRUCTN	197	0	CT69				
104	69-69	CONSTRUCTN	133	0	CT69				
105	70-70	STOCK	16600	0	0002	CONSTRUCTN	265	0	CT70
106	71-71	CONSTRUCTN	624	0	CT71				
107	72-72	CONSTRUCTN	653	0	CT72				
108	73-73	CONSTRUCTN	151	0	CT73				
109	74-74	CONSTRUCTN	85	0	CT74				
INYO CO.									
110	67-67	CONSTRUCTN	73	0	CT69				
111	68-68	CONSTRUCTN	50	0	CT69				
112	69-69	CONSTRUCTN	54	0	CT69				
113	70-70	STOCK	3760	0	0002	CONSTRUCTN	45	0	CT70
114	71-71	CONSTRUCTN	68	0	CT71				
115	72-72	CONSTRUCTN	70	0	CT72				
116	73-73	CONSTRUCTN	39	0	CT73				
117	74-74	CONSTRUCTN	26	0	CT74				
KERN CO.									
118	67-67	CONSTRUCTN	1070	0	CT69				
119	68-68	CONSTRUCTN	1260	0	CT69				
120	69-69	CONSTRUCTN	1270	0	CT69				
121	70-70	STOCK	84900	0	0002	CONSTRUCTN	1520	0	CT70
122	71-71	CONSTRUCTN	1330	0	CT71				
123	72-72	CONSTRUCTN	1670	0	CT72				
124	73-73	CONSTRUCTN	1470	0	CT73				
125	74-74	CONSTRUCTN	1320	0	CT74				
KINGS CO.									
126	67-67	CONSTRUCTN	241	0	CT69				
127	68-68	CONSTRUCTN	225	0	CT69				
128	69-69	CONSTRUCTN	208	0	CT69				
129	70-70	STOCK	16200	0	0002	CONSTRUCTN	270	0	CT70
130	71-71	CONSTRUCTN	341	0	CT71				
131	72-72	CONSTRUCTN	421	0	CT72				
132	73-73	CONSTRUCTN	232	0	CT73				
133	74-74	CONSTRUCTN	389	0	CT74				
LAKE CO.									
134	67-67	CONSTRUCTN	208	0	CT69				
135	68-68	CONSTRUCTN	195	0	CT69				
136	69-69	CONSTRUCTN	181	0	CT69				
137	70-70	STOCK	6430	0	0002	CONSTRUCTN	155	0	CT72
138	71-71	CONSTRUCTN	214	0	CT71				
139	72-72	CONSTRUCTN	317	0	CT72				
140	73-73	CONSTRUCTN	219	0	CT73				
141	74-74	CONSTRUCTN	142	0	CT74				
LASSEN CO.									
142	67-67	CONSTRUCTN	53	0	CT69				
143	68-68	CONSTRUCTN	32	0	CT69				
144	69-69	CONSTRUCTN	24	0	CT69				
145	70-70	STOCK	4530	0	0002	CONSTRUCTN	33	0	CT70
146	71-71	CONSTRUCTN	37	0	CT71				
147	72-72	CONSTRUCTN	54	0	CT72				
148	73-73	CONSTRUCTN	58	0	CT73				
149	74-74	CONSTRUCTN	59	0	CT74				
LOS ANGELES CO.									
150	67-67	CONSTRUCTN	10200	0	CT69				
151	68-68	CONSTRUCTN	14300	0	CT69				

152	69-69	CONSTRUCTN	12200	0	CT69				
153	70-70	STOCK	1470000	0	0002	CONSTRUCTN	8400	0	CT
154	71-71	CONSTRUCTN	11300	0	CT71				
155	72-72	CONSTRUCTN	10800	0	CT72				
156	73-73	CONSTRUCTN	9410	0	CT73				
157	74-74	CONSTRUCTN	5950	0	CT74				
MADERA CO.									
158	67-67	CONSTRUCTN	188	0	CT69				
159	68-68	CONSTRUCTN	188	0	CT69				
160	69-69	CONSTRUCTN	153	0	CT69				
161	70-70	STOCK	11500	0	0002	CONSTRUCTN	168	0	CT70
162	71-71	CONSTRUCTN	306	0	CT72				
163	72-72	CONSTRUCTN	302	0	CT72				
164	73-73	CONSTRUCTN	384	0	CT73				
165	74-74	CONSTRUCTN	329	0	CT74				
MARIN CO.									
166	67-67	CONSTRUCTN	800	0	CT69				
167	68-68	CONSTRUCTN	1000	0	CT69				
168	69-69	CONSTRUCTN	933	0	CT69				
169	70-70	STOCK	49300	0	0002	CONSTRUCTN	834	0	CT70
170	71-71	CONSTRUCTN	1640	0	CT71				
171	72-72	CONSTRUCTN	1370	1	CT72				
172	73-73	CONSTRUCTN	1240	0	CT73				
173	74-74	CONSTRUCTN	960	0	CT74				
MARIPOSA C									
174	67-67	CONSTRUCTN	46	0	CT69				
175	68-68	CONSTRUCTN	94	0	CT69				
176	69-69	CONSTRUCTN	41	0	CT69				
177	70-70	STOCK	1700	0	0002	CONSTRUCTN	79	0	CT70
178	71-71	CONSTRUCTN	66	0	CT71				
179	72-72	CONSTRUCTN	93	0	CT72				
180	73-73	CONSTRUCTN	64	0	CT73				
181	74-74	CONSTRUCTN	67	0	CT74				
MENDOCINO CO.									
182	67-67	CONSTRUCTN	273	0	CT69				
183	68-68	CONSTRUCTN	253	0	CT69				
184	69-69	CONSTRUCTN	191	0	CT69				
185	70-70	STOCK	13700	0	0002	CONSTRUCTN	232	0	CT70
186	71-71	CONSTRUCTN	362	0	CT71				
187	72-72	CONSTRUCTN	477	0	CT72				
188	73-73	CONSTRUCTN	408	0	CT73				
189	74-74	CONSTRUCTN	264	0	CT74				
MERCED CO.									
190	67-67	CONSTRUCTN	359	0	CT69				
191	68-68	CONSTRUCTN	391	0	CT69				
192	69-69	CONSTRUCTN	316	0	CT69				
193	70-70	STOCK	26100	0	0002	CONSTRUCTN	517	0	CT70
194	71-71	CONSTRUCTN	672	0	CT71				
195	72-72	CONSTRUCTN	865	0	CT72				
196	73-73	CONSTRUCTN	762	0	CT73				
197	74-74	CONSTRUCTN	599	0	CT74				
MODOC CO.									
198	67-67	CONSTRUCTN	133	0	CT69				
199	68-68	CONSTRUCTN	90	0	CT69				
200	69-69	CONSTRUCTN	14	0	CT69				
201	70-70	STOCK	2240	0	0002	CONSTRUCTN	31	0	CT70
202	71-71	CONSTRUCTN	34	0	CT71				

203	72-72	CONSTRUCTN	34	0	CT72				
204	73-73	CONSTRUCTN	35	0	CT73				
205	74-74	CONSTRUCTN	23	0	CT74				
MONO CO.									
206	67-67	CONSTRUCTN	73	0	CT69				
207	68-68	CONSTRUCTN	106	0	CT69				
208	69-69	CONSTRUCTN	74	0	CT69				
209	70-70	STOCK	880	0	0002	CONSTRUCTN	64	0	CT70
210	71-71	CONSTRUCTN	157	0	CT71				
211	72-72	CONSTRUCTN	116	0	CT72				
212	73-73	CONSTRUCTN	84	0	CT73				
213	74-74	CONSTRUCTN	59	0	CT74				
MONTEREY CO.									
214	67-67	CONSTRUCTN	937	0	CT69				
215	68-68	CONSTRUCTN	899	0	CT69				
216	69-69	CONSTRUCTN	823	0	CT69				
217	70-70	STOCK	53600	0	0002	CONSTRUCTN	902	0	CT70
218	71-71	CONSTRUCTN	1360	0	CT71				
219	72-72	CONSTRUCTN	1010	0	CT72				
220	73-73	CONSTRUCTN	1350	0	CT73				
221	74-74	CONSTRUCTN	1050	0	CT74				
NAPA CO.									
222	67-67	CONSTRUCTN	537	0	CT69				
223	68-68	CONSTRUCTN	618	0	CT69				
224	69-69	CONSTRUCTN	501	0	CT69				
225	70-70	STOCK	19800	0	0002	CONSTRUCTN	487	0	CT70
226	71-71	CONSTRUCTN	791	0	CT71				
227	72-72	CONSTRUCTN	1010	0	CT72				
228	73-73	CONSTRUCTN	819	0	CT73				
229	74-74	CONSTRUCTN	458	0	CT74				
NEVADA CO.									
230	67-67	CONSTRUCTN	209	0	CT69				
231	68-68	CONSTRUCTN	251	0	CT69				
232	69-69	CONSTRUCTN	253	0	CT69				
233	70-70	STOCK	7910	0	0002	CONSTRUCTN	249	0	CT70
234	71-71	CONSTRUCTN	396	0	CT71				
235	72-72	CONSTRUCTN	640	0	CT72				
236	73-73	CONSTRUCTN	789	0	CT73				
237	74-74	CONSTRUCTN	710	0	CT74				
ORANGE CO.									
238	67-67	CONSTRUCTN	8880	0	CT69				
239	68-68	CONSTRUCTN	13200	0	CT69				
240	69-69	CONSTRUCTN	12930	0	CT69				
241	70-70	STOCK	297000	0	0002	CONSTRUCTN	7230	0	CT70
242	71-71	CONSTRUCTN	19100	0	CT71				
243	72-72	CONSTRUCTN	17900	0	CT72				
244	73-73	CONSTRUCTN	15500	0	CT73				
245	74-74	CONSTRUCTN	10300	0	CT74				
PLACER CO.									
246	67-67	CONSTRUCTN	490	0	CT69				
247	68-68	CONSTRUCTN	624	0	CT69				
248	69-69	CONSTRUCTN	591	0	CT69				
249	70-70	STOCK	19800	0	0002	CONSTRUCTN	636	0	CT70
250	71-71	CONSTRUCTN	1110	0	CT71				
251	72-72	CONSTRUCTN	1970	0	CT72				
252	73-73	CONSTRUCTN	2040	0	CT73				
253	74-74	CONSTRUCTN	1510	0	CT74				

PLUMAS CO.									
254	67-67	CONSTRUCTN	92	0	CT69				
255	68-68	CONSTRUCTN	103	0	CT69				
256	69-69	CONSTRUCTN	62	0	CT69				
257	70-70	STOCK	3590	0	0002	CONSTRUCTN	96	0	CT70
258	71-71	CONSTRUCTN	143	0	CT71				
259	72-72	CONSTRUCTN	175	0	CT72				
260	73-73	CONSTRUCTN	140	0	CT73				
261	74-74	CONSTRUCTN	176	0	CT74				
RIVERSIDE CO.									
262	67-67	CONSTRUCTN	1760	0	CT69				
263	68-68	CONSTRUCTN	2120	0	CT69				
264	69-69	CONSTRUCTN	2130	0	CT69				
265	70-70	STOCK	113000	0	0002	CONSTRUCTN	2480	0	CT70
266	71-71	CONSTRUCTN	3700	0	CT71				
267	72-72	CONSTRUCTN	5350	0	CT72				
268	73-73	CONSTRUCTN	4990	0	CT73				
269	74-74	CONSTRUCTN	5220	0	CT74				
SACRAMENTO CO.									
270	67-67	CONSTRUCTN	2530	0	CT69				
271	68-68	CONSTRUCTN	2460	0	CT69				
272	69-69	CONSTRUCTN	2430	0	CT69				
273	70-70	STOCK	150000	0	0002	CONSTRUCTN	3620	0	CT70
274	71-71	CONSTRUCTN	4520	0	CT71				
275	72-72	CONSTRUCTN	4440	0	CT72				
276	73-73	CONSTRUCTN	3120	0	CT73				
277	74-74	CONSTRUCTN	3720	0	CT74				
SAN BENITO CO.									
278	67-67	CONSTRUCTN	73	0	CT69				
279	68-68	CONSTRUCTN	97	0	CT69				
280	69-69	CONSTRUCTN	62	0	CT69				
281	70-70	STOCK	4670	0	0002	CONSTRUCTN	67	0	CT70
282	71-71	CONSTRUCTN	166	0	CT71				
283	72-72	CONSTRUCTN	98	0	CT72				
284	73-73	CONSTRUCTN	87	0	CT73				
285	74-74	CONSTRUCTN	80	0	CT74				
SAN BERNARDINO CO.									
286	67-67	CONSTRUCTN	3050	0	CT69				
287	68-68	CONSTRUCTN	3520	0	CT69				
288	69-69	CONSTRUCTN	3020	0	CT69				
289	70-70	STOCK	173000	0	0002	CONSTRUCTN	3220	0	CT70
290	71-71	CONSTRUCTN	4750	0	CT71				
291	72-72	CONSTRUCTN	5990	0	CT72				
292	73-73	CONSTRUCTN	5190	0	CT73				
293	74-74	CONSTRUCTN	3470	0	CT74				
SAN DIEGO CO.									
294	67-67	CONSTRUCTN	6510	0	CT69				
295	68-68	CONSTRUCTN	9440	0	CT69				
296	69-69	CONSTRUCTN	13750	0	CT69				
297	70-70	STOCK	236000	0	0002	CONSTRUCTN	9740	0	CT70
298	71-71	CONSTRUCTN	17100	0	CT71				
299	72-72	CONSTRUCTN	14900	0	CT72				
300	73-73	CONSTRUCTN	12600	0	CT73				
301	74-74	CONSTRUCTN	7650	0	CT74				
SAN FRANCISCO CO.									
302	67-67	CONSTRUCTN	111	0	CT69				
303	68-68	CONSTRUCTN	118	0	CT69				

304	69-69	CONSTRUCTN	77	0	CT69				
305	70-70	STOCK	97700	0	0002	CONSTRUCTN	144	0	CT70
306	71-71	CONSTRUCTN	175	0	CT71				
307	72-72	CONSTRUCTN	169	0	CT72				
308	73-73	CONSTRUCTN	280	0	CT73				
309	74-74	CONSTRUCTN	223	0	CT74				
SAN JOAQUIN CO.									
310	67-67	CONSTRUCTN	1280	0	CT69				
311	68-68	CONSTRUCTN	1140	0	CT69				
312	69-69	CONSTRUCTN	880	0	CT69				
313	70-70	STOCK	71300	0	0002	CONSTRUCTN	957	0	CT70
314	71-71	CONSTRUCTN	1520	0	CT71				
315	72-72	CONSTRUCTN	1730	0	CT72				
316	73-73	CONSTRUCTN	1620	0	CT73				
317	74-74	CONSTRUCTN	1750	0	CT74				
SAN LUIS OBISPO CO.									
318	67-67	CONSTRUCTN	369	0	CT69				
319	68-68	CONSTRUCTN	470	0	CT69				
320	69-69	CONSTRUCTN	441	0	CT69				
321	70-70	STOCK	26300	0	0002	CONSTRUCTN	612	0	CT70
322	71-71	CONSTRUCTN	1290	0	CT71				
323	72-72	CONSTRUCTN	1570	0	CT72				
324	73-73	CONSTRUCTN	1340	0	CT73				
325	74-74	CONSTRUCTN	1130	0	CT74				
SAN MATEO CO.									
326	67-67	CONSTRUCTN	1770	0	CT69				
327	68-68	CONSTRUCTN	1670	0	CT69				
328	69-69	CONSTRUCTN	1660	0	CT69				
329	70-70	STOCK	132000	0	0002	CONSTRUCTN	1280	0	CT70
330	71-71	CONSTRUCTN	2460	0	CT72				
331	72-72	CONSTRUCTN	3030	0	CT72				
332	73-73	CONSTRUCTN	2110	0	CT73				
333	74-74	CONSTRUCTN	1570	0	CT74				
SANTA BARBARA CO.									
334	67-67	CONSTRUCTN	843	0	CT69				
335	68-68	CONSTRUCTN	825	0	CT69				
336	69-69	CONSTRUCTN	830	0	CT69				
337	70-70	STOCK	56600	0	0002	CONSTRUCTN	634	0	CT70
338	71-71	CONSTRUCTN	994	0	CT71				
339	72-72	CONSTRUCTN	1130	0	CT72				
340	73-73	CONSTRUCTN	1050	0	CT73				
341	74-74	CONSTRUCTN	759	0	CT74				
SANTA CLARA CO.									
342	67-67	CONSTRUCTN	7490	0	CT69				
343	68-68	CONSTRUCTN	9400	0	CT69				
344	69-69	CONSTRUCTN	6810	0	CT69				
345	70-70	STOCK	223000	0	0002	CONSTRUCTN	6320	0	CT70
346	71-71	CONSTRUCTN	9300	0	CT71				
347	72-72	CONSTRUCTN	9270	0	CT72				
348	73-73	CONSTRUCTN	7410	0	CT73				
349	74-74	CONSTRUCTN	5820	0	CT74				
SANTA CRUZ CO.									
350	67-67	CONSTRUCTN	612	0	CT69				
351	68-68	CONSTRUCTN	733	0	CT69				
352	69-69	CONSTRUCTN	844	0	CT69				
353	70-70	STOCK	34600	0	0002	CONSTRUCTN	851	0	CT70
354	71-71	CONSTRUCTN	1320	0	CT71				

355	72-72	CONSTRUCTN	2040	0	CT72				
356	73-73	CONSTRUCTN	1350	0	CT73				
357	74-74	CONSTRUCTN	1030	0	CT74				
SHASTA CO.									
358	67-67	CONSTRUCTN	443	0	CT69				
359	68-68	CONSTRUCTN	342	0	CT69				
360	69-69	CONSTRUCTN	308	0	CT69				
361	70-70	STOCK	20000	0	0002	CONSTRUCTN	334	0	CT70
362	71-71	CONSTRUCTN	449	0	CT71				
363	72-72	CONSTRUCTN	585	0	CT72				
364	73-73	CONSTRUCTN	518	0	CT73				
365	74-74	CONSTRUCTN	467	0	CT74				
SIERRA CO.									
366	69-69	CONSTRUCTN	9	0	CT69				
367	70-70	STOCK	758	0	0002	CONSTRUCTN	18	0	CT70
368	71-71	CONSTRUCTN	12	0	CT72				
369	72-72	CONSTRUCTN	14	0	CT72				
370	73-73	CONSTRUCTN	19	0	CT73				
371	74-74	CONSTRUCTN	46	0	CT74				
SISKIYOU CO.									
372	67-67	CONSTRUCTN	124	0	CT69				
373	68-68	CONSTRUCTN	139	0	CT69				
374	69-69	CONSTRUCTN	72	0	CT69				
375	70-70	CONSTRUCTN	111	0	CT70				
376	71-71	CONSTRUCTN	91	0	CT71				
377	72-72	CONSTRUCTN	125	0	CT72				
378	73-73	CONSTRUCTN	173	0	CT73				
379	74-74	CONSTRUCTN	169	0	CT74				
SOLANO CO.									
380	67-67	CONSTRUCTN	903	0	CT69				
381	68-68	CONSTRUCTN	815	0	CT69				
382	69-69	CONSTRUCTN	721	0	CT69				
383	70-70	CONSTRUCTN	777	0	CT70				
384	71-71	CONSTRUCTN	1630	0	CT72				
385	72-72	CONSTRUCTN	2020	0	CT72				
386	73-73	CONSTRUCTN	2530	0	CT73				
387	74-74	CONSTRUCTN	847	0	CT74				
SONOMA CO.									
388	67-67	CONSTRUCTN	1140	0	CT69				
389	68-68	CONSTRUCTN	1470	0	CT69				
390	69-69	CONSTRUCTN	1570	0	CT69				
391	70-70	CONSTRUCTN	1720	0	CT70				
392	71-71	CONSTRUCTN	2350	0	CT71				
393	72-72	CONSTRUCTN	3260	0	CT72				
394	73-73	CONSTRUCTN	2590	0	CT73				
395	74-74	CONSTRUCTN	2360	0	CT74				
STANISLAUS CO.									
396	67-67	CONSTRUCTN	1140	0	CT69				
397	68-68	CONSTRUCTN	963	0	CT69				
398	69-69	CONSTRUCTN	893	0	CT69				
399	70-70	CONSTRUCTN	1210	0	CT70				
400	71-71	CONSTRUCTN	1690	0	CT72				
401	72-72	CONSTRUCTN	2010	0	CT72				
402	73-73	CONSTRUCTN	1850	0	CT73				
403	74-74	CONSTRUCTN	1920	0	CT74				
SUTTER CO.									
404	67-67	CONSTRUCTN	170	0	CT69				

405	68-68	CONSTRUCTN	147	0	CT69
406	69-69	CONSTRUCTN	131	0	CT69
407	70-70	CONSTRUCTN	167	0	CT70
408	71-71	CONSTRUCTN	264	0	CT71
409	72-72	CONSTRUCTN	269	0	CT72
410	73-73	CONSTRUCTN	196	0	CT73
411	74-74	CONSTRUCTN	193	0	CT74
TEHAMA CO.					
412	67-67	CONSTRUCTN	94	0	CT69
413	68-68	CONSTRUCTN	74	0	CT69
414	69-69	CONSTRUCTN	73	0	CT69
415	70-70	CONSTRUCTN	78	0	CT70
416	71-71	CONSTRUCTN	103	0	CT71
417	72-72	CONSTRUCTN	211	0	CT72
418	73-73	CONSTRUCTN	163	0	CT73
419	74-74	CONSTRUCTN	172	0	CT74
TRINITY CO.					
420	67-67	CONSTRUCTN	67	0	CT69
421	68-68	CONSTRUCTN	50	0	CT69
422	69-69	CONSTRUCTN	33	0	CT69
423	70-70	CONSTRUCTN	40	0	CT70
424	71-71	CONSTRUCTN	60	0	CT71
425	72-72	CONSTRUCTN	64	0	CT72
426	73-73	CONSTRUCTN	113	0	CT73
427	74-74	CONSTRUCTN	97	0	CT74
TULARE CO.					
428	67-67	CONSTRUCTN	840	0	CT69
429	68-68	CONSTRUCTN	833	0	CT69
430	69-69	CONSTRUCTN	795	0	CT69
431	70-70	CONSTRUCTN	992	0	CT70
432	71-71	CONSTRUCTN	1370	0	CT71
433	72-72	CONSTRUCTN	1690	0	CT72
434	73-73	CONSTRUCTN	1220	0	CT73
435	74-74	CONSTRUCTN	1420	0	CT74
TUOLUMNE CO.					
436	67-67	CONSTRUCTN	259	0	CT69
437	68-68	CONSTRUCTN	276	0	CT69
438	69-69	CONSTRUCTN	277	0	CT69
439	70-70	CONSTRUCTN	334	0	CT70
440	71-71	CONSTRUCTN	448	0	CT71
441	72-72	CONSTRUCTN	522	0	CT72
442	73-73	CONSTRUCTN	433	0	CT73
443	74-74	CONSTRUCTN	330	0	CT74
VENTURA CO.					
444	67-67	CONSTRUCTN	2300	0	CT69
445	68-68	CONSTRUCTN	4060	0	CT69
446	69-69	CONSTRUCTN	4200	0	CT69
447	70-70	CONSTRUCTN	3410	0	CT70
448	71-71	CONSTRUCTN	3270	0	CT71
449	72-72	CONSTRUCTN	4040	0	CT72
450	73-73	CONSTRUCTN	2970	0	CT73
451	74-74	CONSTRUCTN	1810	0	CT74
YOLO CO.					
452	67-67	CONSTRUCTN	342	0	CT69
453	68-68	CONSTRUCTN	327	0	CT69
454	69-69	CONSTRUCTN	301	0	CT69
455	70-70	CONSTRUCTN	310	0	CT70

456	71-71	CONSTRUCTN	814	0	CT71
457	72-72	CONSTRUCTN	986	0	CT72
458	73-73	CONSTRUCTN	859	0	CT73
459	74-74	CONSTRUCTN	550	0	CT74
YUBA CO.					
460	67-67	CONSTRUCTN	97	0	CT69
461	68-68	CONSTRUCTN	64	0	CT69
462	69-69	CONSTRUCTN	58	0	CT72
463	70-70	CONSTRUCTN	109	0	CT72
464	71-71	CONSTRUCTN	86	0	CT72
465	72-72	CONSTRUCTN	199	0	CT72
466	73-73	CONSTRUCTN	214	0	CT73
467	74-74	CONSTRUCTN	193	0	CT74

TOTAL OCCUPIED HOUSING

CALIFORNIA					
1	60-60	STOCK	5480000	1	2751
ALAMEDA CO.					
2	60-60	STOCK	310000	0	0002
3	70-70	STOCK	365000	0	9000 2
ALPINE CO.					
4	60-60	STOCK	109	0	9600
5	70-70	STOCK	130	0	9000 2
6	70-70	STOCK	370	0	9000 1
AMADOR CO.					
7	60-60	STOCK	3140	0	9600
8	70-70	STOCK	3980	0	9000 2
BUTTE CO.					
9	60-60	STOCK	27300	0	9600
10	70-70	STOCK	35000	0	9000 2
11	70-70	STOCK	37700	0	9000 1
CALAVERAS CO.					
12	60-60	STOCK	3470	0	9600
13	70-70	STOCK	4490	0	9000 2
14	70-70	STOCK	6050	0	9000 1
15	70-70	STOCK	5170	0	9000 1
COLUSA CO.					
16	60-60	STOCK	3920	0	9600
17	70-70	STOCK	4350	0	9000 2
18	70-70	STOCK	4860	0	9000 1
CONTRA COSTA CO.					
19	60-60	STOCK	124000	0	0002
20	70-70	STOCK	178000	0	9000 1
21	70-70	STOCK	173000	0	9000 2
DEL NORTE CO.					
22	60-60	STOCK	5230	0	9600
23	70-70	STOCK	5440	0	9000 1
24	70-70	STOCK	4780	0	9000 2
EL DORADO CO.					
25	60-60	STOCK	6780	0	9600
26	70-70	STOCK	23300	0	9000 1
27	70-70	STOCK	15000	0	9000 2
FRESNO CO.					
28	60-60	STOCK	119000	0	0002
29	70-70	STOCK	127000	0	9000 2
30	70-70	STOCK	134000	0	9000 1
GLENN CO					
31	60-60	STOCK	5320	0	9600
32	70-70	STOCK	5710	0	9000 2
33	70-70	STOCK	6100	0	9000 1
HUMBOLDT CO.					
34	60-60	STOCK	31500	0	9600
35	70-70	STOCK	32400	0	9000 2
36	70-70	STOCK	35100	0	9000 1
IMPERIAL CO.					
37	60-60	STOCK	18000	0	9600
38	70-70	STOCK	21000	0	9000 2
39	70-70	STOCK	23200	0	9000 1
INYO CO.					
40	60-60	STOCK	4000	0	9600
41	70-70	STOCK	6290	0	9000 1
42	70-70	STOCK	5570	0	9000 2

KERN CO.						
43	60-60	STOCK	97600	0	0002	
44	70-70	STOCK	110000	0	9000	1
45	70-70	STOCK	102000	0	9000	2
KINGS CO.						
46	60-60	STOCK	14200	0	9600	
47	70-70	STOCK	19500	0	9000	1
48	70-70	STOCK	18300	0	9000	2
LAKE CO.						
49	60-60	STOCK	5230	0	9600	
50	70-70	STOCK	11700	0	9000	1
51	70-70	STOCK	7550	0	9000	2
LASSEN CO.						
52	60-60	STOCK	4340	0	9600	
53	70-70	STOCK	5130	0	9000	2
54	70-70	STOCK	5850	0	9000	1
LOS ANGELES CO.						
55	60-60	STOCK	2140000	0	0002	
56	70-70	STOCK	2430000	0	9000	2
57	70-70	STOCK	2540000	0	9000	1
MADERA CO.						
58	60-60	STOCK	11700	0	9600	
59	70-70	STOCK	12800	0	9000	2
60	70-70	STOCK	14600	0	9000	1
MARIN CO.						
61	60-60	STOCK	49500	0	0002	
62	70-70	STOCK	67500	0	9000	2
63	70-70	STOCK	3050	0	9000	1
MARIPOSA C						
64	60-60	STOCK	1750	0	9600	
65	70-70	STOCK	18700	0	9000	1
66	70-70	STOCK	2130	0	9000	2
MENDOCINO CO.						
67	60-60	STOCK	15000	0	9600	
68	70-70	STOCK	32500	0	9000	1
69	70-70	STOCK	16000	0	9000	2
MERCED CO.						
70	60-60	STOCK	25500	0	9600	
71	70-70	STOCK	30500	0	9000	2
72	70-70	STOCK	2970	0	9000	1
MODOC CO.						
73	60-60	STOCK	2550	0	9600	
74	70-70	STOCK	2410	0	9000	1
75	70-70	STOCK	2040	0	9000	2
MONO CO.						
76	60-60	STOCK	838	0	9600	
77	70-70	STOCK	1300	0	9000	2
78	70-70	STOCK	7000	0	9000	1
MONTEREY CO.						
79	60-60	STOCK	92200	0	9600	
80	70-70	STOCK	26000	0	9000	1
81	70-70	STOCK	71100	0	9000	2
NAPA CO.						
82	60-60	STOCK	18900	0	9600	
83	70-70	STOCK	11900	0	9000	1
84	70-70	STOCK	25100	0	9000	2
NEVADA CO.						

85	60-60	STOCK	7430	0	9600	
86	70-70	STOCK	462000	0	9000	1
87	70-70	STOCK	9600	0	9000	2
ORANGE CO.						
88	60-60	STOCK	227000	0	0002	
89	70-70	STOCK	28700	0	9000	1
90	70-70	STOCK	436000	0	9000	2
PLACER CO.						
91	60-60	STOCK	17200	0	9600	
92	70-70	STOCK	24600	0	9000	2
93	70-70	STOCK	28700	0	9000	1
PLUMAS CO.						
94	60-60	STOCK	3890	0	9600	
95	70-70	STOCK	5230	0	9000	1
96	70-70	STOCK	4390	0	9000	2
RIVERSIDE CO.						
97	60-60	STOCK	115000	0	0002	
98	70-70	STOCK	168000	0	9000	1
99	70-70	STOCK	190000	0	9000	2
SACRAMENTO CO.						
100	60-60	STOCK	165000	0	0002	
101	70-70	STOCK	212000	0	9000	1
102	70-70	STOCK	203000	0	9000	2
SAN BENITO CO.						
103	60-60	STOCK	4610	0	9600	
104	70-70	STOCK	5900	0	9000	1
105	70-70	STOCK	5440	0	9000	2
SAN BERNARDINO CO.						
106	60-60	STOCK	193000	0	0002	
107	70-70	STOCK	212000	0	9000	2
108	70-70	STOCK	290000	0	9000	1
SAN DIEGO CO.						
109	60-60	STOCK	339000	0	0002	
110	70-70	STOCK	424000	0	9000	2
111	70-70	STOCK	450000	0	9000	1
SAN FRANCISCO CO.						
112	60-60	STOCK	310000	0	0002	
113	70-70	STOCK	310000	0	9000	1
114	70-70	STOCK	290000	0	9000	2
SAN JOAQUIN CO.						
115	60-60	STOCK	88600	0	0002	
116	70-70	STOCK	96000	0	9000	1
117	70-70	STOCK	92400	0	9000	2
SAN LUIS OBISPO CO.						
118	60-60	STOCK	29500	0	9600	
119	70-70	STOCK	33900	0	9000	2
120	70-70	STOCK	37000	0	9000	1
SAN MATEO CO.						
121	60-60	STOCK	141000	0	0002	
122	60-60	STOCK	141000	0	0002	
123	70-70	STOCK	190000	0	9000	1
124	70-70	STOCK	185000	0	9000	2
SANTA BARBARA CO.						
125	60-60	STOCK	57200	0	0002	
126	70-70	STOCK	83900	0	9000	2
127	70-70	STOCK	88800	0	9000	1
SANTA CLARA CO.						

128	60-60	STOCK	199000	0	0002	
129	70-70	STOCK	323000	0	9000	2
130	70-70	STOCK	336000	0	9000	1
SANTA CRUZ CO.						
131	60-60	STOCK	30700	0	9600	
132	70-70	STOCK	51600	0	9000	1
133	70-70	STOCK	44400	0	9000	2
SHASTA CO.						
134	60-60	STOCK	18300	0	9600	
135	70-70	STOCK	27300	0	9000	1
136	70-70	STOCK	25300	0	9000	2
SIERRA CO.						
137	60-60	STOCK	765	0	9600	
138	70-70	STOCK	830	0	9000	2
139	70-70	STOCK	1270	0	9000	1
SISKIYOU CO.						
140	60-60	STOCK	10900	0	9600	
141	70-70	STOCK	12700	0	9000	1
142	70-70	STOCK	11300	0	9000	2
SOLANO CO.						
143	60-60	STOCK	41800	0	0002	
144	60-60	STOCK	41800	0	0002	
145	70-70	STOCK	51100	0	9000	2
146	70-70	STOCK	53500	0	9000	1
SONOMA CO.						
147	60-60	STOCK	47200	0	9600	
148	70-70	STOCK	67900	0	9000	2
149	70-70	STOCK	77000	0	9000	1
STANISLAUS CO.						
150	60-60	STOCK	46000	0	9600	
151	70-70	STOCK	62100	0	9000	2
152	70-70	STOCK	65100	0	9000	1
SUTTER CO.						
153	60-60	STOCK	9970	0	9600	
154	70-70	STOCK	13200	0	9000	2
155	70-70	STOCK	14000	0	9000	1
TEHAMA CO.						
156	60-60	STOCK	8000	0	9600	
157	70-70	STOCK	10400	0	9000	1
158	70-70	STOCK	9570	0	9000	2
TRINITY CO.						
159	60-60	STOCK	3140	0	9600	
160	70-70	STOCK	2790	0	9000	2
161	70-70	STOCK	3760	0	9000	1
TULARE CO.						
162	60-60	STOCK	48600	0	9600	
163	70-70	STOCK	61500	0	9000	1
164	70-70	STOCK	56300	0	9000	2
TUOLUMNE CO.						
165	60-60	STOCK	5040	0	9600	
166	70-70	STOCK	11000	0	9000	1
167	70-70	STOCK	7430	0	9000	2
VENTURA CO.						
168	60-60	STOCK	54700	0	9600	
169	70-70	STOCK	112000	0	9000	1
170	70-70	STOCK	107000	0	9000	2
YOLO CO.						

171	60-60	STOCK	19700	0	9600					
172	70-70	STOCK	29700	0	9000	1				
173	70-70	STOCK	28300	0	9000	2				
YUBA CO.										
174	60-60	STOCK	9860	0	9600					
175	70-70	STOCK	14100	0	9000	1				
176	70-70	STOCK	13100	0	9000	2				
SAN FRANCISCO SMSA										
177	60-60	STOCK	978000	0	0002					
LA - LONG BEACH SMSA										
178	60-60	STOCK	2370000	0	0002					
SACRAMENTO UA										
179	60-60	STOCK	151000	0	0002					
SN BRNADINO-RIV UA										
180	60-60	STOCK	309000	0	0002					
SAN DIEGO UA										
181	60-60	STOCK	270000	0	0002					
SAN JOSE UA										
182	60-60	STOCK	186000	0	0002					
SAN FRAN. HUD DIST.										
183	60-60	STOCK	26900	0	0002					
FRESNO HUD DIST.										
184	60-60	STOCK	47200	0	0002					
POMONA-ONTARIO UA										
185	60-60	STOCK	59600	0	0002					
SMUD SERVICE AREA										
186	64-64	STOCK	165000	1	1875	EN.	CONS.	5230	1	1875
187	65-65	STOCK	170000	1	1876	EN.	CONS.	5420	1	1876
188	66-66	STOCK	175000	1	1876	EN.	CONS.	5820	1	1876
189	67-67	STOCK	180000	1	1876	EN.	CONS.	6510	1	1876
190	68-68	STOCK	184000	1	1876	EN.	CONS.	6530	1	1876
191	69-69	STOCK	189000	1	1876	EN.	CONS.	7170	1	1876
192	70-70	STOCK	190000	1	1876	EN.	CONS.	7360	1	1876
193	71-71	STOCK	203000	1	1876	EN.	CONS.	7930	1	1876
194	72-72	STOCK	213000	1	1876	EN.	CONS.	8120	1	1876
195	73-73	STOCK	220000	1	1876	EN.	CONS.	8420	1	1876
196	74-74	STOCK	231000	1	1876	EN.	CONS.	8240	1	1876
197	75-75	STOCK	239000	1	1876	EN.	CONS.	8500	1	1876

- - - - - S O U R C E F O O T N O T E S - - - - -

90002 ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED

90001 OCCUPIED HOUSING ONLY

SANTA BARBARA UA

1	60-60	STOCK	15200	1	8500
2	61-61	STOCK	23200	1	8500
3	62-62	STOCK	20900	1	8500
4	63-63	STOCK	19600	1	8500
5	64-64	STOCK	13300	1	8500
6	65-65	STOCK	13000	1	8500
7	66-66	STOCK	10300	1	8500
8	67-67	STOCK	12400	1	8500
9	68-68	STOCK	16800	1	8500
10	69-69	STOCK	20500	1	8500
11	70-70	STOCK	18600	1	8500
12	71-71	STOCK	30700	1	8500
13	72-72	STOCK	24700	1	8500
14	73-73	STOCK	16900	1	8500
15	74-74	STOCK	11000	1	8500

CALIFORNIA

1	64-64	CONST.SQFT	5910000	1	DG64	1
2	64-64	CONST.SQFT	5910000	1	DG64	1
3	65-65	CONST.SQFT	7250000	1	DG65	1
4	65-65	CONST.SQFT	7250000	1	DG65	1
5	66-66	CONST.SQFT	9700000	1	DG66	1
6	67-67	CONST.SQFT	6550000	1	DG67	1
7	68-68	CONST.SQFT	9450000	1	DG68	1
8	69-69	CONST.SQFT	14200000	1	DG69	1
9	70-70	CONST.SQFT	14000000	1	DG70	1
10	71-71	CONST.SQFT	13400000	1	DG71	1
11	72-72	CONST.SQFT	24200000	1	DG72	1
12	73-73	CONST.SQFT	24100000	1	DG73	1

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DG641 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641 MULTIPLYING BY 130992/294758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG641 REGION VIII NONRES. CONSTR.)
DG651 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG651 MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG651 REGION VIII NONRES. CONSTR.)
DG661 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG661 MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG661 REGION VIII NONRES. CONSTR.)
DG671 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG671 MULTIPLYING BY 127217/209088 (CALIF. NONRES. CONSTR. DIVIDED BY
DG671 REGION VIII NONRES. CONSTR.)
DG681 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG681 MULTIPLYING BY 137658/219195 (CALIF. NONRES. CONSTR. DIVIDED BY
DG681 REGION VIII NONRES. CONSTR.)
DG691 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG691 MULTIPLYING BY 170222/258381 (CALIF. NONRES. CONSTR. DIVIDED BY
DG691 REGION VIII NONRES. CONSTR.)
DG701 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG701 MULTIPLYING BY 131095/212691 (CALIF. NONRES. CONSTR. DIVIDED BY
DG701 REGION VIII NONRES. CONSTR.)
DG711 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG711 MULTIPLYING BY 129730/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG711 REGION VIII NONRES. CONSTR.)
DG721 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG721 MULTIPLYING BY 133445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721 REGION VIII NONRES. CONSTR.)
DG731 DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731 MULTIPLYING BY 156548/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

SCE SERVICE AREA

1	69-69	STOCK	107000	0	5000
2	70-70	STOCK	118000	0	5000
3	71-71	STOCK	131000	0	5000
4	72-72	STOCK	144000	0	5000
5	73-73	STOCK	153000	0	5000
6	74-74	STOCK	161000	0	5000

SMUD SERVICE AREA									
1	70-70 SAT. RATE	62.4	0	1951	STOCK	122000	1	1951
2	72-72 SAT. RATE	70.7	0	1951	STOCK	151000	1	1951
3	75-75 SAT. RATE	77.9	0	1951	STOCK	183000	1	1951

SCE SERVICE AREA

1	69-69	E.C.ADDNS.	4750	0	4000
2	70-70	E.C.ADDNS.	4150	0	4000
3	71-71	E.C.ADDNS.	4650	0	4000
4	72-72	E.C.ADDNS.	3960	0	4000
5	73-73	E.C.ADDNS.	4000	0	4000
6	74-74	E.C.ADDNS.	3860	0	5000

SCE SERVICE AREA

1	69-69	E.C.ADDNS.	107000	0	4000
2	70-70	E.C.ADDNS.	118000	0	4000
3	71-71	E.C.ADDNS.	131000	0	4000
4	72-72	E.C.ADDNS.	144000	0	4000
5	73-73	E.C.ADDNS.	155000	0	4000
6	74-74	E.C.ADDNS.	161000	0	5000

CALIFORNIA
1 60-60 SAT. RATE 2.5 0 2751 1 STOCK 124000 1 27
ALAMEDA CO.
2 60-60 SAT. RATE .7 0 0001 1 STOCK 2320 0 0001
ALPINE CO.
AMADOR CO.
3 60-60 SAT. RATE 4.5 0 2751 1 STOCK 141 1 2751
BUTTE CO.
4 60-60 SAT. RATE 9.6 0 2751 1 STOCK 2620 1 2751
CALAVERAS CO.
5 60-60 SAT. RATE 5.3 0 2751 1 STOCK 183 1 2751
COLUSA CO.
6 60-60 SAT. RATE 10.2 0 2751 1 STOCK 408 1 2751
CONTRA COSTA CO.
7 60-60 SAT. RATE 1.0 0 0001 1 STOCK 1220 0 0001
DEL NORTE CO.
EL DORADO CO.
8 60-60 SAT. RATE 2.7 0 2751 1 STOCK 264 1 2751
FRESNO CO.
9 60-60 SAT. RATE 12.2 0 0001 1 STOCK 13100 0 0001
GLENN CO
10 60-60 SAT. RATE 11.3 0 2751 1 STOCK 601 1 2751
HUMBOLDT CO.
11 60-60 SAT. RATE .6 0 2751 1 STOCK 189 1 2751
IMPERIAL CO.
12 60-60 SAT. RATE 24.0 0 2751 1 STOCK 4610 1 2751
INYO CO.
13 60-60 SAT. RATE 10.5 0 2751 1 STOCK 418 1 27.
KERN CO.
14 60-60 SAT. RATE 8.0 0 0001 1 STOCK 6910 0 0001
KINGS CO.
15 60-60 SAT. RATE 10.8 0 2751 1 STOCK 1530 1 2751
LAKE CO.
16 60-60 SAT. RATE 3.5 0 2751 1 STOCK 183 1 2751
LASSEN CO.
17 60-60 SAT. RATE .9 0 2751 1 STOCK 39 1 2751
LOS ANGELES CO.
18 60-60 SAT. RATE 1.7 0 0001 1 STOCK 35700 0 0001
MADERA CO.
19 60-60 SAT. RATE 6.7 0 2751 1 STOCK 777 1 2751
MARIN CO.
20 60-60 SAT. RATE .6 0 0001 1 STOCK 308 0 0001
MARIPOSA C
21 60-60 SAT. RATE 1.1 0 2751 1 STOCK 19 1 2751
MENDOCINO CO.
22 60-60 SAT. RATE 1.9 0 2751 1 STOCK 283 1 2751
MERCED CO.
23 60-60 SAT. RATE 8.6 0 2751 1 STOCK 2190 1 2751
MODOC CO.
24 60-60 SAT. RATE .7 0 2751 1 STOCK 19 1 2751
MONO CO.
MONTEREY CO.
25 60-60 SAT. RATE 1.0 0 2751 1 STOCK 522 1 275
NAPA CO.
26 60-60 SAT. RATE 1.5 0 2751 1 STOCK 302 1 2751
NEVADA CO.
27 60-60 SAT. RATE 1.3 0 2751 1 STOCK 97 1 2751

ORANGE CO.										
28	60-60	SAT. RATE	1.0	0	0001	1	STOCK	2200	0	0001
PLACER CO.										
29	60-60	SAT. RATE	5.5	0	2751	1	STOCK	946	1	2751
PLUMAS CO.										
30	60-60	SAT. RATE	.6	0	2751	1	STOCK	23	1	2751
RIVERSIDE CO.										
31	60-60	SAT. RATE	9.7	0	0001	1	STOCK	9270	1	0001
SACRAMENTO CO.										
32	60-60	SAT. RATE	4.7	0	0001	1	STOCK	7140	1	0001
SAN BENITO CO.										
33	60-60	SAT. RATE	.5	0	2751	1	STOCK	23	1	2751
SAN BERNARDINO CO.										
34	60-60	SAT. RATE	5.5	0	0001	1	STOCK	8290	1	0001
SAN DIEGO CO.										
35	60-60	SAT. RATE	.9	0	0001	1	STOCK	2750	1	0001
SAN FRANCISCO CO.										
36	60-60	SAT. RATE	3.5	0	0001	1	STOCK	1020	0	0001
SAN JOAQUIN CO.										
37	60-60	SAT. RATE	4.2	0	0001	1	STOCK	3190	0	0001
SAN LUIS OBISPO CO.										
38	60-60	SAT. RATE	.8	0	2751	1	STOCK	204	1	2751
SAN MATEO CO.										
39	60-60	SAT. RATE	1.0	0	0001	1	STOCK	1430	0	0001
SANTA BARBARA CO.										
40	60-60	SAT. RATE	.9	0	0001	1	STOCK	500	0	0001
SANTA CLARA CO.										
41	60-60	SAT. RATE	1.1	0	0001	1	STOCK	2120	0	0001
SANTA CRUZ CO.										
42	60-60	SAT. RATE	.6	0	2751	1	STOCK	245	1	2751
SHASTA CO.										
43	60-60	SAT. RATE	6.4	0	2751	1	STOCK	1170	1	2751
SIERRA CO.										
SISKIYOU CO.										
44	60-60	SAT. RATE	2.0	0	2751	1	STOCK	218	1	2751
SOLANO CO.										
45	60-60	SAT. RATE	2.0	0	0001	1	STOCK	7910	0	0001
SONOMA CO.										
46	60-60	SAT. RATE	.8	0	2751	1	STOCK	378	1	2751
STANISLAUS CO.										
47	60-60	SAT. RATE	4.1	0	2751	1	STOCK	1970	1	2751
SUTTER CO.										
48	60-60	SAT. RATE	10.5	0	2751	1	STOCK	1050	1	2751
TEHAMA CO.										
49	60-60	SAT. RATE	8.9	0	2751	1	STOCK	552	1	2751
TRINITY CO.										
TULARE CO.										
50	60-60	SAT. RATE	7.1	0	2751	1	STOCK	3450	1	2751
TUOLUMNE CO.										
51	60-60	SAT. RATE	2.9	0	2751	1	STOCK	146	1	2751
VENTURA CO.										
52	60-60	SAT. RATE	.9	0	2751	1	STOCK	492	1	2751
YOLO CO.										
53	60-60	SAT. RATE	3.9	0	2751	1	STOCK	768	1	2751
YUBA CO.										
54	60-60	SAT. RATE	10.7	0	2751	1	STOCK	1050	1	2751
SAN FRANCISCO SMSA										

55	60-60	SAT. RATE	.7	0	0001	1	STOCK	7100	0	0001
BAKERSFIELD UA										
56	60-60	SAT. RATE	10.3	0	0001	1	STOCK	4450	0	0001
FRESNO UA										
57	60-60	SAT. RATE	14.1	0	0001	1	STOCK	9200	0	0001
LA - LONG BEACH SMSA										
58	60-60	SAT. RATE	1.5	0	0001	1	STOCK	33400	0	0001
59	60-60	SAT. RATE	1.7	0	0001	1	STOCK	37900	0	0001
SACRAMENTO UA										
60	60-60	SAT. RATE	4.7	0	0001	1	STOCK	6630	0	0001
SN BRNADINO-RIV UA										
61	60-60	SAT. RATE	6.0	0	0001	1	STOCK	6920	0	0001
SAN DIEGO UA										
62	60-60	SAT. RATE	.8	0	0001	1	STOCK	2010	0	0001
SAN JOSE UA										
63	60-60	SAT. RATE	1.1	0	0001	1	STOCK	1970	0	0001
SANTA BARBARA UA										
64	60-60	SAT. RATE	.8	0	0001	1	STOCK	220	0	0001
STOCKTON UA										
65	60-60	SAT. RATE	4.6	0	0001	1	STOCK	2030	0	0001
POMONA-ONTARIO UA										
66	60-60	SAT. RATE	3.5	0	0001	1	STOCK	1950	0	0001
SN BERN-RIV-ONT SMSA										
67	60-60	SAT. RATE	4.4	0	2751	1	STOCK	28100	1	2751
SMUD SERVICE AREA										
68	70-70	SAT. RATE	25.1	0	1951		STOCK	49000	1	1951
69	72-72	SAT. RATE	34.0	0	1951		STOCK	72600	1	1951
70	75-75	SAT. RATE	44.7	0	1951		STOCK	105000	1	19
LADWP SERVICE AREA										
71	50-50	SAT. RATE	.5	0	1918		STOCK	698000	1	1918
72	60-60	SAT. RATE	2.2	0	1865		STOCK	877000	1	1865
73		UTILIZATN.	2.4	0	1944					
74	70-70	SAT. RATE	9.7	0	1865		STOCK	1030000	1	1865
75		UTILIZATN.	10.4	0	1944					
SF-OAK URBANIZD AREA										
76	60-60	SAT. RATE	.6	0	0001	1	STOCK	5050	0	0001

- - - - - S O U R C E F O O T N O T E S - - - - -

27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK

00011 SATURATION DERIVED FROM STOCK SIZE

CALIFORNIA												
1		60-60	SAT.	RATE	9.8	0	2751	1	STOCK	488000	1	2751
2	G	60-60	SAT.	RATE	5.4	0	2751	1	STOCK	269000	1	2751
ALAMEDA CO.												
3	E	60-60	SAT.	RATE	12.2	0	0001	1	STOCK	36000	0	0001
4	G	60-60	SAT.	RATE	5.2	0	0001	1	STOCK	15600	0	0001
5	0 G	70-70	SAT.	RATE	11.4	0	9000	1	STOCK	41700	0	9000
6	0	70-70	SAT.	RATE	30.8	0	9000	1	STOCK	112000	0	9000
ALPINE CO.												
7		60-60	SAT.	RATE	15.0	0	2751	1	STOCK	16	1	2751
8	0	70-70	SAT.	RATE	54.7	0	9000	2	STOCK	7	0	9000
AMADOR CO.												
9		60-60	SAT.	RATE	19.0	0	2751	1	STOCK	597	1	2751
10	G	60-60	SAT.	RATE	1.0	0	2751	1	STOCK	31	1	2751
11	0 G	70-70	SAT.	RATE	41.5	0	9000	3	STOCK	165	0	9000
12	0	70-70	SAT.	RATE	42.8	0	9000	3	STOCK	1700	0	9000
BUTTE CO.												
13		60-60	SAT.	RATE	20.0	0	2751	1	STOCK	5460	1	2751
14	G	60-60	SAT.	RATE	2.0	0	2751	1	STOCK	546	1	2751
15	0 G	70-70	SAT.	RATE	4.1	0	9000	4	STOCK	1450	0	9000
16	0	70-70	SAT.	RATE	44.4	0	9000	4	STOCK	15600	0	9000
CALAVERAS CO.												
17		60-60	SAT.	RATE	20.0	0	2751	1	STOCK	692	1	2751
18	G	60-60	SAT.	RATE	1.0	0	2751	1	STOCK	35	1	2751
19	0	70-70	SAT.	RATE	54.8	0	9000	5	STOCK	2460	0	9000
20	0 G	70-70	SAT.	RATE	2.9	0	9000	5	STOCK	130	0	9000
COLUSA CO.												
21		60-60	SAT.	RATE	18.0	0	2751	1	STOCK	706	1	2751
22	G	60-60	SAT.	RATE	2.0	0	2751	1	STOCK	78	1	2751
23	0 G	70-70	SAT.	RATE	4.7	0	9000	6	STOCK	203	0	9000
24	0	70-70	SAT.	RATE	50.3	0	9000	6	STOCK	2190	0	9000
CONTRA COSTA CO.												
25	G	60-60	SAT.	RATE	7.5	0	0001	1	STOCK	9050	0	0001
26	E	60-60	SAT.	RATE	21.0	0	0001	1	STOCK	24700	0	0001
27	0 G	70-70	SAT.	RATE	15.4	0	9000	7	STOCK	26600	0	9000
28	0	70-70	SAT.	RATE	43.7	0	9000	7	STOCK	75700	0	9000
DEL NORTE CO.												
29		60-60	SAT.	RATE	29.0	0	2751	1	STOCK	1520	1	2751
30	G	60-60	SAT.	RATE	3.0	0	2751	1	STOCK	157	1	2751
31	0	70-70	SAT.	RATE	52.8	0	9000	8	STOCK	2520	0	9000
32	0 G	70-70	SAT.	RATE	2.3	0	9000	8	STOCK	110	0	9000
EL DORADO CO.												
33	G	60-60	SAT.	RATE	1.0	0	2751	1	STOCK	98	1	2751
34		60-60	SAT.	RATE	21.0	0	2751	1	STOCK	2050	1	2751
35	0	70-70	SAT.	RATE	47.6	0	9000	9	STOCK	7130	0	9000
36	0 G	70-70	SAT.	RATE	4.9	0	9000	9	STOCK	703	0	9000
FRESNO CO.												
37	G	60-60	SAT.	RATE	2.1	0	0001	1	STOCK	2340	0	0001
38	E	60-60	SAT.	RATE	12.8	0	0001	1	STOCK	13700	0	0001
39	0 G	70-70	SAT.	RATE	7.6	0	9000	1	STOCK	9940	0	9000
40	0	70-70	SAT.	RATE	38.1	0	9000	1	STOCK	45800	0	9000
GLENN CO												
41		60-60	SAT.	RATE	22.0	0	2751	1	STOCK	1170	1	2751
42	G	60-60	SAT.	RATE	2.0	0	2751	1	STOCK	106	1	2751
43	0 G	70-70	SAT.	RATE	4.0	0	9000	2	STOCK	231	0	9000
44	0	70-70	SAT.	RATE	51.6	0	9000	2	STOCK	2940	0	9000
HUMBOLDT CO.												

45		G	60-60	SAT. RATE	3.0	0	2751	1	STOCK	945	1	2751
46			60-60	SAT. RATE	31.0	0	2751	1	STOCK	9760	1	275
47	0	G	70-70	SAT. RATE	4.5	0	9000	3	STOCK	1460	0	9000
48	0		70-70	SAT. RATE	46.8	0	9000	3	STOCK	15800	0	9000
IMPERIAL CO.												
49		G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	185	1	2751
50			60-60	SAT. RATE	4.0	0	2751	1	STOCK	740	1	2751
51	0	G	70-70	SAT. RATE	3.5	0	9000	4	STOCK	492	0	9000
52	0		70-70	SAT. RATE	33.9	0	9000	4	STOCK	3450	0	9000
INYO CO.												
53			60-60	SAT. RATE	3.0	0	2751	1	STOCK	122	1	2751
54		G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	41	1	2751
55	0		70-70	SAT. RATE	18.8	0	9000	5	STOCK	1050	0	9000
56	0	G	70-70	SAT. RATE	5.9	0	9000	5	STOCK	329	0	9000
KERN CO.												
57		E	60-60	SAT. RATE	9.0	0	0001	1	STOCK	8300	0	0001
58		G	60-60	SAT. RATE	4.5	0	0001	1	STOCK	3930	0	0001
59	0	G	70-70	SAT. RATE	17.1	0	9000	6	STOCK	17400	0	9000
60	0		70-70	SAT. RATE	26.1	0	9000	6	STOCK	26500	0	9000
KINGS CO.												
61			60-60	SAT. RATE	14.0	0	2751	1	STOCK	1990	1	2751
62		G	60-60	SAT. RATE	3.0	0	2751	1	STOCK	426	1	2751
63	0	G	70-70	SAT. RATE	8.8	0	9000	7	STOCK	1600	0	9000
64	0		70-70	SAT. RATE	43.3	0	9000	7	STOCK	7930	0	9000
LAKE CO.												
65		G	60-60	SAT. RATE	2.0	0	2751	1	STOCK	105	1	2751
66			60-60	SAT. RATE	22.0	0	2751	1	STOCK	1150	1	2751
67	0		70-70	SAT. RATE	46.4	0	9000	8	STOCK	3500	0	900
68	0	G	70-70	SAT. RATE	3.4	0	9000	8	STOCK	260	0	9000
LASSEN CO.												
69		G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	43	1	2751
70			60-60	SAT. RATE	18.0	0	2751	1	STOCK	781	1	2751
71	0	G	70-70	SAT. RATE	1.1	0	9000	9	STOCK	6	0	9000
72	0		70-70	SAT. RATE	34.5	0	9000	9	STOCK	2790	0	9000
LOS ANGELES CO.												
73		G	60-60	SAT. RATE	5.9	0	0001	1	STOCK	119000	0	0001
74		E	60-60	SAT. RATE	4.7	0	0001	1	STOCK	95800	0	0001
75	0		70-70	SAT. RATE	14.5	0	9000	1	STOCK	352000	0	9000
76	0	G	70-70	SAT. RATE	21.0	0	9000	1	STOCK	500000	0	9000
MADERA CO.												
77		G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	116	1	2751
78			60-60	SAT. RATE	15.0	0	2751	1	STOCK	1740	1	2751
79	0		70-70	SAT. RATE	38.3	0	9000	2	STOCK	4890	0	9000
80	0	G	70-70	SAT. RATE	6.3	0	9000	2	STOCK	804	0	9000
MARIN CO.												
81		E	60-60	SAT. RATE	25.1	0	0001	1	STOCK	11100	0	0001
82		G	60-60	SAT. RATE	9.1	0	0001	1	STOCK	4030	0	0001
83	0	G	70-70	SAT. RATE	13.5	0	9000	3	STOCK	9140	0	9000
84	0		70-70	SAT. RATE	43.9	0	9000	3	STOCK	32800	0	9000
MARIPOSA C												
85			60-60	SAT. RATE	10.0	0	2751	1	STOCK	175	1	2751
86	0	G	70-70	SAT. RATE	6.1	0	9000	4	STOCK	129	0	9000
87	0		70-70	SAT. RATE	41.2	0	9000	4	STOCK	875	0	900
MENDOCINO CO.												
88		G	60-60	SAT. RATE	2.0	0	2751	1	STOCK	298	1	2751
89			60-60	SAT. RATE	24.0	0	2751	1	STOCK	3580	1	2751
90	0		70-70	SAT. RATE	31.1	0	9000	5	STOCK	8490	0	9000

91	0	G	70-70	SAT. RATE	1.6	0	9000	5	STOCK	266	0	9000
MERCED CO.												
92		G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	255	1	2751
93			60-60	SAT. RATE	16.0	0	2751	1	STOCK	4080	1	2751
94	0	G	70-70	SAT. RATE	3.5	0	9000	6	STOCK	1060	0	9000
95	0		70-70	SAT. RATE	45.2	0	9000	6	STOCK	13800	0	9000
MODOC CO.												
96		G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	27	1	2751
97			60-60	SAT. RATE	33.0	0	2751	1	STOCK	874	1	2751
98	0	G	70-70	SAT. RATE	1.1	0	9000	7	STOCK	3	0	9000
99	0		70-70	SAT. RATE	55.1	0	9000	7	STOCK	1460	0	9000
MONO CO.												
100		G	60-60	SAT. RATE	3.0	0	2751	1	STOCK	25	1	2751
101			60-60	SAT. RATE	5.0	0	2751	1	STOCK	42	1	2751
MONTEREY CO.												
102		G	60-60	SAT. RATE	3.0	0	2751	1	STOCK	1570	1	2751
103			60-60	SAT. RATE	15.0	0	2751	1	STOCK	7830	1	2751
NAPA CO.												
104		G	60-60	SAT. RATE	5.0	0	2751	1	STOCK	945	1	2751
105			60-60	SAT. RATE	20.0	0	2751	1	STOCK	3780	1	2751
NEVADA CO.												
106			60-60	SAT. RATE	20.0	0	2751	1	STOCK	1490	1	2751
107		G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	74	1	2751
ORANGE CO.												
108		G	60-60	SAT. RATE	8.2	0	0001	1	STOCK	16900	0	0001
109		E	60-60	SAT. RATE	9.3	0	0001	1	STOCK	19000	0	0001
PLACER CO.												
110		G	60-60	SAT. RATE	3.0	0	2751	1	STOCK	516	1	2751
111			60-60	SAT. RATE	15.0	0	2751	1	STOCK	2580	1	2751
PLUMAS CO.												
112			60-60	SAT. RATE	20.0	0	2751	1	STOCK	1010	1	2751
113		G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	39	1	2751
RIVERSIDE CO.												
114		E	60-60	SAT. RATE	5.2	0	0001	1	STOCK	4980	1	0001
115		G	60-60	SAT. RATE	2.0	0	0001	1	STOCK	2730	1	0001
SACRAMENTO CO.												
116		G	60-60	SAT. RATE	2.8	0	0001	1	STOCK	4300	0	0001
117		E	60-60	SAT. RATE	24.8	0	0001	1	STOCK	37500	0	0001
SAN BENITO CO.												
118		G	60-60	SAT. RATE	4.0	0	2751	1	STOCK	184	1	2751
119			60-60	SAT. RATE	13.0	0	2751	1	STOCK	599	1	2751
SAN BERNARDINO CO.												
120		E	60-60	SAT. RATE	4.0	0	0001	1	STOCK	6910	1	0001
121		G	60-60	SAT. RATE	3.0	0	0001	1	STOCK	5430	1	0001
SAN DIEGO CO.												
122		G	60-60	SAT. RATE	4.1	0	0001	1	STOCK	12600	1	0001
123		E	60-60	SAT. RATE	6.5	0	0001	1	STOCK	19900	1	0001
SAN FRANCISCO CO.												
124		G	60-60	SAT. RATE	4.7	0	0001	1	STOCK	13900	0	0001
125		E	60-60	SAT. RATE	3.9	0	0001	1	STOCK	11600	0	0001
SAN JOAQUIN CO.												
126		G	60-60	SAT. RATE	2.2	0	0001	1	STOCK	1710	0	0001
127		E	60-60	SAT. RATE	15.1	0	0001	1	STOCK	13500	0	0001
SAN LUIS OBISPO CO.												
128		G	60-60	SAT. RATE	4.0	0	2751	1	STOCK	1020	1	2751
129			60-60	SAT. RATE	10.0	0	2751	1	STOCK	2550	1	2751
SAN MATEO CO.												

130	E	60-60	SAT. RATE	20.6	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
131	G	60-60	SAT. RATE	12.2	0	0001	1	STOCK	[illegible]	[illegible]	0	00[illegible]
SANTA BARBARA CO.												
132	G	60-60	SAT. RATE	10.3	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
133	E	60-60	SAT. RATE	8.4	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
SANTA CLARA CO.												
134	E	60-60	SAT. RATE	20.0	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
135	G	60-60	SAT. RATE	6.0	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
SANTA CRUZ CO.												
136	G	60-60	SAT. RATE	4.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
137		60-60	SAT. RATE	12.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
SHASTA CO.												
138		60-60	SAT. RATE	24.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
139	G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
SIERRA CO.												
140		60-60	SAT. RATE	25.0	0	2751	1	STOCK	[illegible]	[illegible]		2751
SISKIYOU CO.												
141		60-60	SAT. RATE	26.0	0	2751	1	STOCK	[illegible]	[illegible]		2751
SOLANO CO.												
142	G	60-60	SAT. RATE	4.8	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
143	E	60-60	SAT. RATE	19.3	0	0001	1	STOCK	[illegible]	[illegible]	[illegible]	0001
SONOMA CO.												
144	G	60-60	SAT. RATE	5.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
145		60-60	SAT. RATE	15.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
STANISLAUS CO.												
146		60-60	SAT. RATE	17.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
147	G	60-60	SAT. RATE	2.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	275[illegible]
SUTTER CO.												
148	G	60-60	SAT. RATE	4.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
149		60-60	SAT. RATE	22.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
TEHAMA CO.												
150		60-60	SAT. RATE	22.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
151	G	60-60	SAT. RATE	1.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
TRINITY CO.												
152	G	60-60	SAT. RATE	2.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
153		60-60	SAT. RATE	23.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
TULARE CO.												
154		60-60	SAT. RATE	12.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
155	G	60-60	SAT. RATE	2.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
TUOLUMNE CO.												
156	G	60-60	SAT. RATE	4.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
157		60-60	SAT. RATE	19.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
VENTURA CO.												
158	G	60-60	SAT. RATE	7.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
159		60-60	SAT. RATE	7.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
YOLO CO.												
160		60-60	SAT. RATE	20.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
161	G	60-60	SAT. RATE	2.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
YUBA CO.												
162	G	60-60	SAT. RATE	2.0	0	2751	1	STOCK	[illegible]	[illegible]	[illegible]	2751
SAN FRANCISCO SMSA												
163	E	60-60	SAT. RATE	12.0	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
164	G	60-60	SAT. RATE	6.0	0	0001	1	STOCK	[illegible]	[illegible]	[illegible]	000[illegible]
BAKERSFIELD UA												
165	G	60-60	SAT. RATE	4.9	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
166	E	60-60	SAT. RATE	11.4	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
FRESNO UA												

167	E	60-60	SAT. RATE	12.8	0	0001	1	STOCK	8410	0	0001
168	G	60-60	SAT. RATE	2.5	0	0001	1	STOCK	1690	0	0001
LA - LONG BEACH SMSA											
169	E	60-60	SAT. RATE	5.1	0	0001	1	STOCK	114000	0	0001
170	G	60-60	SAT. RATE	6.1	0	0001	1	STOCK	136000	0	0001
171	G	60-60	SAT. RATE	6.1	0	0001	1	STOCK	132000	0	0001
172	E	60-60	SAT. RATE	5.0	0	0001	1	STOCK	108000	0	0001
SACRAMENTO UA											
173	G	60-60	SAT. RATE	2.1	0	0001	1	STOCK	3070	0	0001
174	E	60-60	SAT. RATE	23.5	0	0001	1	STOCK	33100	0	0001
SN BRNADINO-RIV UA											
175	E	60-60	SAT. RATE	5.1	0	0001	1	STOCK	5840	0	0001
176	G	60-60	SAT. RATE	3.5	0	0001	1	STOCK	3980	0	0001
SAN DIEGO UA											
177	E	60-60	SAT. RATE	6.1	0	0001	1	STOCK	15400	0	0001
178	G	60-60	SAT. RATE	4.4	0	0001	1	STOCK	11600	0	0001
SAN JOSE UA											
179	G	60-60	SAT. RATE	6.1	0	0001	1	STOCK	10700	0	0001
180	E	60-60	SAT. RATE	20.4	0	0001	1	STOCK	35500	0	0001
SANTA BARBARA UA											
181	E	60-60	SAT. RATE	7.7	0	0001	1	STOCK	1960	0	0001
182	G	60-60	SAT. RATE	6.9	0	0001	1	STOCK	1750	0	0001
STOCKTON UA											
183	E	60-60	SAT. RATE	17.6	0	0001	1	STOCK	7780	0	0001
184	G	60-60	SAT. RATE	2.0	0	0001	1	STOCK	900	0	0001
POMONA-ONTARIO UA											
185		60-60	SAT. RATE	108.7	0	2751	1	STOCK	4720000	1	2751
186	G	60-60	SAT. RATE	6.4	0	0001	1	STOCK	36100	0	0001
187	E	60-60	SAT. RATE	5.2	0	0001	1	STOCK	29400	0	0001
188	G	60-60	SAT. RATE	105.7	0	2751	1	STOCK	4590000	1	2751
SN BERN-RIV-ONT SMSA											
189	G	60-60	SAT. RATE	3.3	0	0001	1	STOCK	8170	1	0001
190		60-60	SAT. RATE	16.6	0	2751	1	STOCK	106000	1	2751
191	E	60-60	SAT. RATE	4.5	0	0001	1	STOCK	11900	1	0001
192	G	60-60	SAT. RATE	3.2	0	2751	1	STOCK	20400	1	2751
SF-OAK URBANIZD AREA											
193	E	60-60	SAT. RATE	11.3	0	0001	1	STOCK	92600	0	0001
194	G	60-60	SAT. RATE	6.3	0	0001	1	STOCK	53600	0	0001

- - - - - S O U R C E F O O T N O T E S - - - - -

27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK
00011 SATURATION DERIVED FROM STOCK SIZE
90001 OCCUPIED HOUSING ONLY
90002 ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED
90003 SATURATION RATE DERIVED FROM STOCK SIZE
MISSING FOOTNOTE - 90004
MISSING FOOTNOTE - 90005
MISSING FOOTNOTE - 90006
MISSING FOOTNOTE - 90007
MISSING FOOTNOTE - 90008
MISSING FOOTNOTE - 90009

CALIFORNIA											
1		60-60	SAT. RATE	69.1	0	2751	1	STOCK	[illegible]	1	27[illegible]
2		71-71	ADDITIONS	378000	1	AH01	1				
3		72-72	ADDITIONS	411000	1	AH01	1				
4		73-73	ADDITIONS	436000	1	AH01	1				
5		74-74	ADDITIONS	428000	1	AH01	1				
ALAMEDA CO.											
6		60-60	SAT. RATE	51.9	0	0001	1	STOCK	[illegible]	0	0001
7	0	70-70	SAT. RATE	64.9	0	9000	1	STOCK	[illegible]	0	9000
ALPINE CO.											
8		60-60	SAT. RATE	100.0	0	2751	1	STOCK	[illegible]	1	2751
9	0	70-70	SAT. RATE	83.6	0	9000	2	STOCK	[illegible]	0	9000
AMADOR CO.											
10		60-60	SAT. RATE	89.0	0	2751	1	STOCK	[illegible]	1	2751
11	0	70-70	SAT. RATE	79.4	0	9000	3	STOCK	[illegible]	0	9000
BUTTE CO.											
12		60-60	SAT. RATE	79.0	0	2751	1	STOCK	[illegible]	1	2751
13	0	70-70	SAT. RATE	72.6	0	9000	4	STOCK	[illegible]	0	9000
CALAVERAS CO.											
14		60-60	SAT. RATE	85.0	0	2751	1	STOCK	[illegible]	1	2751
15	0	70-70	SAT. RATE	80.3	0	9000	5	STOCK	[illegible]	0	9000
COLUSA CO.											
16		60-60	SAT. RATE	80.0	0	2751	1	STOCK	[illegible]	1	2751
17	0	70-70	SAT. RATE	78.3	0	9000	6	STOCK	[illegible]	0	9000
CONTRA COSTA CO.											
18		60-60	SAT. RATE	67.9	0	0001	1	STOCK	[illegible]	0	0001
19	0	70-70	SAT. RATE	78.6	0	9000	7	STOCK	[illegible]	0	9000
DEL NORTE CO.											
20		60-60	SAT. RATE	71.0	0	2751	1	STOCK	[illegible]	1	2751
21	0	70-70	SAT. RATE	71.7	0	9000	8	STOCK	[illegible]	0	9000
EL DORADO CO.											
22		60-60	SAT. RATE	76.0	0	2751	1	STOCK	[illegible]	1	2751
23	0	70-70	SAT. RATE	70.3	0	9000	9	STOCK	[illegible]	0	9000
FRESNO CO.											
24		60-60	SAT. RATE	52.2	0	0001	1	STOCK	[illegible]	0	0001
25	0	70-70	SAT. RATE	77.3	0	9000	1	STOCK	[illegible]	0	9000
GLENN CO											
26		60-60	SAT. RATE	84.0	0	2751	1	STOCK	[illegible]	1	2751
27	0	70-70	SAT. RATE	81.0	0	9000	2	STOCK	[illegible]	0	9000
HUMBOLDT CO.											
28		60-60	SAT. RATE	79.0	0	2751	1	STOCK	[illegible]	1	2751
29	0	70-70	SAT. RATE	76.5	0	9000	3	STOCK	[illegible]	0	9000
IMPERIAL CO.											
30		60-60	SAT. RATE	78.0	0	2751	1	STOCK	[illegible]	1	2751
31	0	70-70	SAT. RATE	90.0	0	9000	4	STOCK	[illegible]	0	9000
INYO CO.											
32		60-60	SAT. RATE	62.0	0	2751	1	STOCK	[illegible]	1	2751
33	0	70-70	SAT. RATE	59.0	0	9000	5	STOCK	[illegible]	0	9000
KERN CO.											
34		60-60	SAT. RATE	55.2	0	0001	1	STOCK	[illegible]	0	0001
35	0	70-70	SAT. RATE	77.3	0	9000	6	STOCK	[illegible]	0	9000
KINGS CO.											
36		60-60	SAT. RATE	81.0	0	2751	1	STOCK	[illegible]	1	275[illegible]
37	0	70-70	SAT. RATE	79.0	0	9000	7	STOCK	[illegible]	0	9000
LAKE CO.											
38		60-60	SAT. RATE	81.0	0	2751	1	STOCK	[illegible]	1	2751
39	0	70-70	SAT. RATE	76.0	0	9000	8	STOCK	[illegible]	0	9000

LASSEN CO.										
40		60-60 SAT. RATE	84.0	0	2751	1	STOCK	3650	1	2751
41	0	70-70 SAT. RATE	78.9	0	9000	9	STOCK	4050	0	9000
LOS ANGELES CO.										
42		60-60 SAT. RATE	46.3	0	0001	1	STOCK	931000	0	0001
43	0	70-70 SAT. RATE	59.6	0	9000	1	STOCK	1450000	0	9000
MADERA CO.										
44		60-60 SAT. RATE	81.0	0	2751	1	STOCK	9400	1	2751
45	0	70-70 SAT. RATE	85.4	0	9000	2	STOCK	10900	0	9000
MARIN CO.										
46		60-60 SAT. RATE	51.0	0	0001	1	STOCK	26900	0	0001
47	0	70-70 SAT. RATE	72.1	0	9000	3	STOCK	48700	0	9000
MARIPOSA C										
48		60-60 SAT. RATE	80.0	0	2751	1	STOCK	1400	1	2751
49	0	70-70 SAT. RATE	79.5	0	9000	4	STOCK	1690	0	9000
MENDOCINO CO.										
50		60-60 SAT. RATE	82.0	0	2751	1	STOCK	12200	1	2751
51	0	70-70 SAT. RATE	73.3	0	9000	5	STOCK	12200	0	9000
MERCED CO.										
52		60-60 SAT. RATE	82.0	0	2751	1	STOCK	20900	1	2751
53	0	70-70 SAT. RATE	78.1	0	9000	6	STOCK	23800	0	9000
MODOC CO.										
54		60-60 SAT. RATE	86.0	0	2751	1	STOCK	2280	1	2751
55	0	70-70 SAT. RATE	81.7	0	9000	7	STOCK	2160	0	9000
MONO CO.										
56		60-60 SAT. RATE	58.0	0	2751	1	STOCK	469	1	2751
MONTEREY CO.										
57		60-60 SAT. RATE	73.0	0	2751	1	STOCK	38100	1	2751
NAPA CO.										
58		60-60 SAT. RATE	82.0	0	2751	1	STOCK	15500	1	2751
NEVADA CO.										
59		60-60 SAT. RATE	84.0	0	2751	1	STOCK	6240	1	2751
ORANGE CO.										
60		60-60 SAT. RATE	61.4	0	0001	1	STOCK	125000	0	0001
PLACER CO.										
61		60-60 SAT. RATE	82.0	0	2751	1	STOCK	14100	1	2751
62		-0--0 SAT. RATE	97.0	0	2001		STOCK	67	0	2001
PLUMAS CO.										
63		60-60 SAT. RATE	80.0	0	2751	1	STOCK	3100	1	2751
RIVERSIDE CO.										
64		60-60 SAT. RATE	48.0	0	0001	1	STOCK	45700	1	0001
SACRAMENTO CO.										
65		60-60 SAT. RATE	62.3	0	0001	1	STOCK	94100	1	0001
SAN BENITO CO.										
66		60-60 SAT. RATE	82.0	0	2751	1	STOCK	3780	1	2751
SAN BERNARDINO CO.										
67		60-60 SAT. RATE	53.3	0	0001	1	STOCK	80100	1	0001
SAN DIEGO CO.										
68		60-60 SAT. RATE	49.9	0	0001	1	STOCK	152000	1	0001
SAN FRANCISCO CO.										
69		60-60 SAT. RATE	29.3	0	0001	1	STOCK	85600	0	0001
SAN JOAQUIN CO.										
70		60-60 SAT. RATE	50.0	0	0001	1	STOCK	37800	0	0001
SAN LUIS OBISPO CO.										
71		60-60 SAT. RATE	78.0	0	2751	1	STOCK	19100	1	2751
SAN MATEO CO.										
72		60-60 SAT. RATE	84.0	0	0001	1	STOCK	86500	0	0001

SANTA BARBARA CO.									
73	60-60	SAT. RATE	47.2	0	0001	1	STOCK	24500	0 0001
SANTA CLARA CO.									
74	60-60	SAT. RATE	61.2	0	0001	1	STOCK	113000	0 0001
SANTA CRUZ CO.									
75	60-60	SAT. RATE	72.0	0	2751	1	STOCK	22000	1 2751
SHASTA CO.									
76	60-60	SAT. RATE	79.0	0	2751	1	STOCK	14500	1 2751
SIERRA CO.									
77	60-60	SAT. RATE	87.0	0	2751	1	STOCK	666	1 2751
SISKIYOU CO.									
78	60-60	SAT. RATE	77.0	0	2751	1	STOCK	8390	1 2751
SOLANO CO.									
79	60-60	SAT. RATE	60.2	0	0001	1	STOCK	23100	0 0001
SONOMA CO.									
80	60-60	SAT. RATE	79.0	0	2751	1	STOCK	37300	1 2751
STANISLAUS CO.									
81	60-60	SAT. RATE	86.0	0	2751	1	STOCK	40800	1 2751
SUTTER CO.									
82	60-60	SAT. RATE	88.0	0	2751	1	STOCK	8770	1 2751
TEHAMA CO.									
83	60-60	SAT. RATE	82.0	0	2751	1	STOCK	6560	1 2751
TRINITY CO.									
84	60-60	SAT. RATE	69.0	0	2751	1	STOCK	2170	1 2751
TULARE CO.									
85	60-60	SAT. RATE	83.0	0	2751	1	STOCK	40300	1 2751
TUOLUMNE CO.									
86	60-60	SAT. RATE	79.0	0	2751	1	STOCK	3980	1 27!
VENTURA CO.									
87	60-60	SAT. RATE	78.0	0	2751	1	STOCK	42700	1 2751
YOLO CO.									
88	60-60	SAT. RATE	78.0	0	2751	1	STOCK	15400	1 2751
YUBA CO.									
89	60-60	SAT. RATE	75.0	0	2751	1	STOCK	7390	1 2751
SAN FRANCISCO SMSA									
90	60-60	SAT. RATE	49.2	0	0001	1	STOCK	455000	0 0001
LOS ANGELES SCA									
91	72-72	ADDITIONS	187000	0	LAT1	1			
92	73-73	ADDITIONS	105000	0	LAT1	1			
93	74-74	ADDITIONS	198000	0	LAT1	1			
BAKERSFIELD UA									
94	60-60	SAT. RATE	59.0	0	0001	1	STOCK	25500	0 0001
FRESNO UA									
95	60-60	SAT. RATE	96.5	0	0001	1	STOCK	36800	0 0001
LA - LONG BEACH SMSA									
96	60-60	SAT. RATE	47.4	0	0001	1	STOCK	1010000	0 0001
97	60-60	SAT. RATE	47.6	0	0001	1	STOCK	1050000	0 0001
SACRAMENTO UA									
98	60-60	SAT. RATE	60.8	0	0001	1	STOCK	85600	0 0001
SN BRNADINO-RIV UA									
99	60-60	SAT. RATE	54.8	0	0001	1	STOCK	62400	0 0001
SAN DIEGO UA									
100	60-60	SAT. RATE	49.4	0	0001	1	STOCK	124000	0 000
SAN JOSE UA									
101	60-60	SAT. RATE	62.1	0	0001	1	STOCK	108000	0 0001
SANTA BARBARA UA									
102	60-60	SAT. RATE	39.6	0	0001	1	STOCK	10000	0 0001

STOCKTON UA										
103	60-60 SAT. RATE	48.4	0	0001	1	STOCK	21300	0	0001
POMONA-ONTARIO UA										
104	60-60 SAT. RATE	167.6	0	2751	1	STOCK	7270000	1	2751
105	60-60 SAT. RATE	58.3	0	0001	1	STOCK	32500	0	0001
SN BERN-RIV-ONT SMSA										
106	60-60 SAT. RATE	79.1	0	2751	1	STOCK	505000	1	2751
107	60-60 SAT. RATE	51.3	0	0001	1	STOCK	125000	1	0001
SF-OAK URBANIZD AREA										
108	60-60 SAT. RATE	46.8	0	0001	1	STOCK	382000	0	0001
UNITED STATES										
109	71-71 ADDITIONS	4420000	0	AH01	1				
110	72-72 ADDITIONS	4900000	0	AH01	1				
111	73-73 ADDITIONS	5100000	0	AH01	1				
112	74-74 ADDITIONS	4680000	0	AH01	1				

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27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK
AH011 ADDITIONS COME FROM AH01 +2 PER CENT TO ACCOUNT FOR THE APPROXIMATELY
AH011 PER CENT OF TOTAL SALES WHOSE LOCATION OF SALE IS NOT KNOWN. AHAM
AH011 DATA APPEARS HIGHLY ACCURATE AS A RECORD OF DOMESTIC MANUFACTURERS
AH011 SALES. EXCEPT WHERE NOTED IMPORTS ARE ASSUMED TO BE NEGLIGIBLE (LESS
AH011 THAN 0.5 PER CENT).
00011 SATURATION DERIVED FROM STOCK SIZE
90001 OCCUPIED HOUSING ONLY
90002 ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED
90003 SATURATION RATE DERIVED FROM STOCK SIZE
MISSING FOOTNOTE - 90004
MISSING FOOTNOTE - 90005
MISSING FOOTNOTE - 90006
MISSING FOOTNOTE - 90007
MISSING FOOTNOTE - 90008
MISSING FOOTNOTE - 90009
LAT11 THE LOS ANGELES TIMES CONTINUING HOME AUDIT SURVEYS 6000 HOUSEHOLDS
LAT11 ANNUALLY IN THE LOS ANGELES MARKET AREA.

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CALIFORNIA
   1          71-71 ADDITIONS      233000 1 AHO1 1
   2          72-72 ADDITIONS      278000 1 AHO1 1
   3          73-73 ADDITIONS      292000 1 AHO1 1
   4          74-74 ADDITIONS      261000 1 AHO1 1
ALAMEDA CO.
   5  0       70-70 SAT. RATE        26.6 0 9000 1 STOCK          97000 0 9000
ALPINE CO.
   6  0       70-70 SAT. RATE        18.6 0 9000 2 STOCK              2 0 9000
AMADOR CO.
   7  0       70-70 SAT. RATE        23.8 0 9000 3 STOCK            946 0 9000
BUTTE CO.
   8  0       70-70 SAT. RATE        24.2 0 9000 4 STOCK           8460 0 9000
CALAVERAS CO.
   9  0       70-70 SAT. RATE        23.2 0 9000 5 STOCK           1040 0 9000
COLUSA CO.
  10  0       70-70 SAT. RATE         3.1 0 9000 6 STOCK           1010 0 9000
CONTRA COSTA CO.
  11  0       70-70 SAT. RATE        42.3 0 9000 7 STOCK          73100 0 9000
DEL NORTE CO.
  12  0       70-70 SAT. RATE        23.8 0 9000 8 STOCK            993 0 9000
EL DORADO CO.
  13  0       70-70 SAT. RATE        24.9 0 9000 9 STOCK           3720 0 9000
FRESNO CO.
  14  0       70-70 SAT. RATE        25.5 0 9000 1 STOCK          32400 0 9000
GLENN CO
  15  0       70-70 SAT. RATE        24.0 0 9000 2 STOCK           1370 0 9000
HUMBOLDT CO.
  16  0       70-70 SAT. RATE        22.2 0 9000 3 STOCK           7190 0 9000
IMPERIAL CO.
  17  0       70-70 SAT. RATE        17.7 0 9000 4 STOCK           2830 0 9000
INYO CO.
  18  0       70-70 SAT. RATE        19.2 0 9000 5 STOCK           1070 0 9000
KERN CO.
  19  0       70-70 SAT. RATE        24.6 0 9000 6 STOCK          25000 0 9000
KINGS CO.
  20  0       70-70 SAT. RATE        21.1 0 9000 7 STOCK           3860 0 9000
LAKE CO.
  21  0       70-70 SAT. RATE        21.0 0 9000 8 STOCK           1590 0 9000
LASSEN CO.
  22  0       70-70 SAT. RATE        18.3 0 9000 9 STOCK            939 0 9000
LOS ANGELES CO.
  23  0       70-70 SAT. RATE        22.2 0 9000 1 STOCK         539000 0 9000
MADERA CO.
  24  0       70-70 SAT. RATE        25.2 0 9000 2 STOCK           3210 0 9000
MARIN CO.
  25  0       70-70 SAT. RATE        53.5 0 9000 3 STOCK          36100 0 9000
MARIPOSA C
  26  0       70-70 SAT. RATE        22.9 0 9000 4 STOCK            487 0 9000
MENDOCINO CO.
  27  0       70-70 SAT. RATE        18.7 0 9000 5 STOCK           3100 0 9000
MERCED CO.
  28  0       70-70 SAT. RATE        20.4 0 9000 6 STOCK           8050 0 900
MODOC CO.
  29  0       70-70 SAT. RATE        19.9 0 9000 7 STOCK            526 0 9000
UNITED STATES
  30          71-71 ADDITIONS     1740000 1 AHO1 1
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DISHWASHERS

31	72-72	ADDITIONS	2190000	1	AH01 1
32	73-73	ADDITIONS	2510000	1	AH01 1
33	74-74	ADDITIONS	2270000	1	AH01 1

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AH011 ADDITIONS COME FROM AH01 +2 PER CENT TO ACCOUNT FOR THE APPROXIMATELY
AH011 PER CENT OF TOTAL SALES WHOSE LOCATION OF SALE IS NOT KNOWN. AHAM
AH011 DATA APPEARS HIGHLY ACCURATE AS A RECORD OF DOMESTIC MANUFACTURERS
AH011 SALES. EXCEPT WHERE NOTED IMPORTS ARE ASSUMED TO BE NEGLIGIBLE (LESS
AH011 THAN 0.5 PER CENT).
90001 OCCUPIED HOUSING ONLY
90002 ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED
90003 SATURATION RATE DERIVED FROM STOCK SIZE
MISSING FOOTNOTE - 90004
MISSING FOOTNOTE - 90005
MISSING FOOTNOTE - 90006
MISSING FOOTNOTE - 90007
MISSING FOOTNOTE - 90008
MISSING FOOTNOTE - 90009

SDG+E SERVICE AREA
1 74-74 STOCK 574000 0 2000

CALIFORNIA											
1		60-60 SAT. RATE	1.9	0	2751	1	STOCK	104000	1	2751
2		60-60 SAT. RATE	82.9	0	2751	1	STOCK	4130000	1	2751
3		66-66 STOCK	21500	0	0002					
4		70-70 SAT. RATE	14.2	0	1492		STOCK	32200	1	1492
5		70-70 SAT. RATE	2.9	0	1492		STOCK	46200	1	1492
6		70-70 SAT. RATE	6.2	0	1492		STOCK	2530000	1	1492
7		70-70 SAT. RATE	8.4	0	1492		STOCK	32400	1	1492
ALAMEDA CO.										
8	E	60-60 SAT. RATE	1.1	0	0001	1	STOCK	3470	0	0001
9	0	70-70 SAT. RATE	8.2	0	9000	1	STOCK	29800	0	9000
10		70-70 SAT. RATE	5.7	0	1492		STOCK	533000	1	1492
ALPINE CO.										
11	0	60-60 SAT. RATE	14.7	0	9600	1	STOCK	2	0	9600
AMADOR CO.										
12	0	60-60 SAT. RATE	16.1	0	9600	1	STOCK	570	0	9600
13	0	70-70 SAT. RATE	28.2	0	9000	3	STOCK	1040	0	9000
BUTTE CO.										
14	0	60-60 SAT. RATE	5.0	0	9600	1	STOCK	1650	0	9600
15	0	70-70 SAT. RATE	11.6	0	9000	4	STOCK	4050	0	9000
CALAVERAS CO.										
16	0	60-60 SAT. RATE	14.4	0	9600	1	STOCK	498	0	9600
17	0	70-70 SAT. RATE	53.4	0	9000	5	STOCK	2390	0	9000
COLUSA CO.										
18	0	60-60 SAT. RATE	12.6	0	9600	1	STOCK	494	0	9600
19	0	70-70 SAT. RATE	14.2	0	9000	6	STOCK	617	0	9000
CONTRA COSTA CO.										
20	E	60-60 SAT. RATE	1.5	0	0001	1	STOCK	1790	0	0001
21	0	70-70 SAT. RATE	6.2	0	9000	7	STOCK	10800	0	9000
DEL NORTE CO.										
22	0	60-60 SAT. RATE	29.0	0	9600	1	STOCK	1560	0	9600
23	0	70-70 SAT. RATE	23.3	0	9000	8	STOCK	1110	0	9000
EL DORADO CO.										
24	0	60-60 SAT. RATE	10.9	0	9600	1	STOCK	1060	0	9600
25	0	70-70 SAT. RATE	17.4	0	9000	9	STOCK	2610	0	9000
FRESNO CO.										
26	E	60-60 SAT. RATE	3.2	0	0001	1	STOCK	3450	0	0001
27	0	70-70 SAT. RATE	6.8	0	9000	1	STOCK	8570	0	9000
GLENN CO										
28	0	60-60 SAT. RATE	7.9	0	9600	1	STOCK	420	0	9600
29	0	70-70 SAT. RATE	9.7	0	9000	2	STOCK	552	0	9000
HUMBOLDT CO.										
30	0	60-60 SAT. RATE	8.3	0	9600	1	STOCK	2610	0	9600
31	0	70-70 SAT. RATE	87.2	0	9000	3	STOCK	2830	0	9000
32		70-70 SAT. RATE	8.0	0	1492		STOCK	35400	1	1492
IMPERIAL CO.										
33	0	60-60 SAT. RATE	9.1	0	9600	1	STOCK	3000	0	9600
34	0	70-70 SAT. RATE	32.0	0	9000	4	STOCK	6720	0	9000
INYO CO.										
35	0	60-60 SAT. RATE	3.9	0	9600	1	STOCK	143	0	9600
36	0	70-70 SAT. RATE	13.4	0	9000	5	STOCK	744	0	9000
KERN CO.										
37	E	60-60 SAT. RATE	1.2	0	0001	1	STOCK	1090	0	0001
38	0	70-70 SAT. RATE	4.8	0	9000	6	STOCK	4930	0	9000
KINGS CO.										
39	0	60-60 SAT. RATE	4.1	0	9600	1	STOCK	582	0	9600
40	0	70-70 SAT. RATE	8.0	0	9000	7	STOCK	1460	0	9000

LAKE CO.													
41	0	60-60	SAT. RATE	31.8	0	9600	1	STOCK	1660	0	96		
42	0	70-70	SAT. RATE	38.1	0	9000	8	STOCK	2880	0	9000		
LASSEN CO.													
43	0	60-60	SAT. RATE	15.7	0	9600	1	STOCK	682	0	9600		
44	0	70-70	SAT. RATE	20.4	0	9000	9	STOCK	1050	0	9000		
LOS ANGELES CO.													
45	E	60-60	SAT. RATE	1.6	0	0001	1	STOCK	32800	0	0001		
46	0	70-70	SAT. RATE	7.7	0	9000	1	STOCK	187000	0	9000		
MADERA CO.													
47	0	60-60	SAT. RATE	6.4	0	9600	1	STOCK	748	0	9600		
48	0	70-70	SAT. RATE	7.2	0	9000	2	STOCK	914	0	9000		
MARIN CO.													
49	E	60-60	SAT. RATE	2.9	0	0001	1	STOCK	1270	0	0001		
50		70-70	SAT. RATE	8.7	0	1492		STOCK	224000	1	1492		
51	C	70-70	SAT. RATE	8.7	0	9000	3	STOCK	5880	0	9000		
MARIPOSA C													
52	0	60-60	SAT. RATE	25.4	0	9600	1	STOCK	444	0	9600		
53	0	70-70	SAT. RATE	16.7	0	9000	4	STOCK	397	0	9000		
MENDOCINO CO.													
54	0	60-60	SAT. RATE	24.2	0	9600	1	STOCK	3620	0	9600		
55	0	70-70	SAT. RATE	30.4	0	9000	5	STOCK	5040	0	9000		
MERCED CO.													
56	0	60-60	SAT. RATE	5.6	0	9600	1	STOCK	1430	0	9600		
57	0	70-70	SAT. RATE	6.7	0	9000	6	STOCK	2660	0	9000		
MODOC CO.													
58	0	60-60	SAT. RATE	21.9	0	9600	1	STOCK	581	0	9600		
59	0	70-70	SAT. RATE	31.9	0	9000	7	STOCK	843	0	900		
MONO CO.													
60	0	60-60	SAT. RATE	2.4	0	9600	1	STOCK	2	0	9600		
MONTEREY CO.													
61	0	60-60	SAT. RATE	6.2	0	9600	1	STOCK	3260	0	9600		
NAPA CO.													
62	0	60-60	SAT. RATE	2.7	0	9600	1	STOCK	513	0	9600		
NEVADA CO.													
63	0	60-60	SAT. RATE	10.8	0	9600	1	STOCK	802	0	9600		
ORANGE CO.													
64	E	60-60	SAT. RATE	1.1	0	0001	1	STOCK	2310	0	0001		
PLACER CO.													
65	0	60-60	SAT. RATE	12.6	0	9600	1	STOCK	2180	0	9600		
PLUMAS CO.													
66	0	60-60	SAT. RATE	7.7	0	9600	1	STOCK	300	0	9600		
RIVERSIDE CO.													
67	E	60-60	SAT. RATE	3.7	0	0001	1	STOCK	3550	1	0001		
SACRAMENTO CO.													
68	E	60-60	SAT. RATE	2.1	0	0001	1	STOCK	3260	1	0001		
69		70-70	SAT. RATE	5.5	0	1492		STOCK	185000	0	1492		
SAN BENITO CO.													
70	0	60-60	SAT. RATE	7.2	0	9600	1	STOCK	332	0	9600		
SAN BERNARDINO CO.													
71	E	60-60	SAT. RATE	2.0	0	0001	1	STOCK	3060	1	0001		
SAN DIEGO CO.													
72	E	60-60	SAT. RATE	5.3	0	0001	1	STOCK	16300	1	000		
SAN FRANCISCO CO.													
73	E	60-60	SAT. RATE	1.1	0	0001	1	STOCK	3410	0	0001		
SAN JOAQUIN CO.													
74	E	60-60	SAT. RATE	2.5	0	0001	1	STOCK	1750	0	0001		

75		70-70	SAT. RATE	6.9	0	1492		STOCK	127000	1	1492
76		70-70	SAT. RATE	3.1	0	1492		STOCK	304000	1	1492
SAN LUIS OBISPO CO.											
77	C	60-60	SAT. RATE	9.0	0	9600	1	STOCK	2280	0	9600
SAN MATEO CO.											
78	E	60-60	SAT. RATE	1.2	0	0001	1	STOCK	1690	0	0001
SANTA BARBARA CO.											
79	E	60-60	SAT. RATE	4.6	0	0001	1	STOCK	2430	0	0001
SANTA CLARA CO.											
80	E	60-60	SAT. RATE	2.1	0	0001	1	STOCK	3880	0	0001
81		70-70	SAT. RATE	7.8	0	1492		STOCK	455000	1	1492
SANTA CRUZ CO.											
82	C	60-60	SAT. RATE	6.6	0	9600	1	STOCK	2020	0	9600
SHASTA CO.											
83	C	60-60	SAT. RATE	37.8	0	9600	1	STOCK	6920	0	9600
84		70-70	SAT. RATE	10.9	0	1492		STOCK	31800	1	1492
SIERRA CO.											
85	C	60-60	SAT. RATE	6.7	0	9600	1	STOCK	5	0	9600
SISKIYOU CO.											
86	C	60-60	SAT. RATE	21.2	0	9600	1	STOCK	2290	0	9600
SOLANO CO.											
87	E	60-60	SAT. RATE	2.0	0	0001	1	STOCK	790	0	0001
SONOMA CO.											
88	C	60-60	SAT. RATE	6.0	0	9600	1	STOCK	2810	0	9600
89		70-70	SAT. RATE	6.8	0	1492		STOCK	141000	1	1492
STANISLAUS CO.											
90	C	60-60	SAT. RATE	5.0	0	9600	1	STOCK	2410	0	9600
SUTTER CO.											
91	C	60-60	SAT. RATE	3.9	0	9600	1	STOCK	385	0	9600
TEHAMA CO.											
92	C	60-60	SAT. RATE	3.6	0	9600	1	STOCK	1070	0	9600
TRINITY CO.											
93	C	60-60	SAT. RATE	16.9	0	9600	1	STOCK	531	0	9600
TULARE CO.											
94	C	60-60	SAT. RATE	3.8	0	9600	1	STOCK	1840	0	9600
TUOLUMNE CO.											
95	C	60-60	SAT. RATE	2.1	0	9600	1	STOCK	1040	0	9600
VENTURA CO.											
96	C	60-60	SAT. RATE	2.9	0	9600	1	STOCK	1610	0	9600
YOLO CO.											
97	C	60-60	SAT. RATE	3.0	0	9600	1	STOCK	590	0	9600
YUBA CO.											
98	C	60-60	SAT. RATE	6.0	0	9600	1	STOCK	590	0	9600
SAN FRANCISCO SMSA											
99	E	60-60	SAT. RATE	1.3	0	0001	1	STOCK	12400	0	0001
100		70-70	SAT. RATE	5.0	0	1492		STOCK	379000	1	1492
BAKERSFIELD UA											
101	E	60-60	SAT. RATE	.4	0	0001	1	STOCK	210	0	0001
FRESNO UA											
102	E	60-60	SAT. RATE	.8	0	0001	1	STOCK	550	0	0001
LA - LONG BEACH SMSA											
103	E	60-60	SAT. RATE	1.5	0	0001	1	STOCK	35100	0	0001
104	E	60-60	SAT. RATE	1.4	0	0001	1	STOCK	30600	0	0001
SACRAMENTO UA											
105	E	60-60	SAT. RATE	1.1	0	0001	1	STOCK	1650	0	0001
SN BRNADINO-RIV UA											
106	E	60-60	SAT. RATE	1.0	0	0001	1	STOCK	1910	0	0001

SAN DIEGO UA											
107	E	60-60	SAT. RATE	3.1	0	0001	1	STOCK	7930	0	0001
SAN JOSE UA											
108	E	60-60	SAT. RATE	1.4	0	0001	1	STOCK	9550	0	0001
SANTA BARBARA UA											
109	E	60-60	SAT. RATE	2.8	0	0001	1	STOCK	720	0	0001
110		66-66	STOCK	66700	0	1903					
STOCKTON UA											
111	E	60-60	SAT. RATE	1.1	0	0001	1	STOCK	480	0	0001
POMONA-ONTARIO UA											
112	E	60-60	SAT. RATE	.8	0	0001	1	STOCK	470	0	0001
113		60-60	SAT. RATE	1.3	0	2751	1	STOCK	61200	1	2751
SN BERN-RIV-ONT SMSA											
114		60-60	SAT. RATE	8.8	0	2751	1	STOCK	56100	1	2751
115	E	60-60	SAT. RATE	2.6	0	0001	1	STOCK	6610	1	0001
116		60-60	SAT. RATE	5.9	0	2751	1	STOCK	44200	1	2751
PG+E SERVICE AREA											
117		69-69	EN.CONSUMP	17000	1	1815	1				
118		69-69	EN.CONSUMP	11600	1	1815	2				
119		70-70	STOCK	67600	1	1815		EN.CONSUMP	8000	1	1815
120		70-70	STOCK	67600	1	1815		EN.CONSUMP	15000	1	1815
121		71-71	STOCK	72200	1	1815		EN.CONSUMP	8000	1	1815
122		71-71	STOCK	72200	1	1815		EN.CONSUMP	15000	1	1815
123		72-72	STOCK	76500	1	1815		EN.CONSUMP	15000	1	1815
124		72-72	STOCK	76500	1	1815		EN.CONSUMP	8000	1	1815
125		73-73	STOCK	81000	1	1815		EN.CONSUMP	8000	1	1815
126		73-73	STOCK	81000	1	1815		EN.CONSUMP	15000	1	1815
SMUD SERVICE AREA											
127		69-69	STOCK	2710	1	1815		EN.CONSUMP	17500	1	1815
128		69-69	STOCK	2710	1	1815		EN.CONSUMP	25600	1	1815
129		70-70	STOCK	3020	1	1815		EN.CONSUMP	25600	1	1815
130		70-70	STOCK	3020	1	1815		EN.CONSUMP	17500	1	1815
131		70-70	STOCK	6020	1	1783					
132		70-70	STOCK	3600	1	1783					
133		70-70	SAT. RATE	6.3	0	1933		STOCK	12300	0	1933
134		70-70	STOCK	9620	1	1783					
135		71-71	STOCK	8910	1	1815		EN.CONSUMP	17100	1	1815
136		71-71	STOCK	8910	1	1815		EN.CONSUMP	8500	1	1815
137		72-72	STOCK	11600	1	1815		EN.CONSUMP	16000	1	1815
138		72-72	SAT. RATE	8.5	0	1933		STOCK	18100	0	1933
139		72-72	STOCK	11600	1	1815		EN.CONSUMP	8380	1	1815
140		73-73	STOCK	14300	1	1815		EN.CONSUMP	15100	1	1815
141		73-73	STOCK	14300	1	1815		EN.CONSUMP	7760	1	1815
142		75-75	STOCK	16500	1	1783					
143		75-75	SAT. RATE	12.4	0	1933		STOCK	29100	0	1933
144		75-75	SAT. RATE	9.4	0	1783		STOCK	22900	1	1783
145		75-75	STOCK	6440	1	1783					
SF-OAK URBANIZD AREA											
146	E	60-60	SAT. RATE	1.1	0	0001	1	STOCK	9280	0	0001

- - - - - S O U R C E F O O T N O T E S - - - - -

27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK
00011 SATURATION DERIVED FROM STOCK SIZE
90001 OCCUPIED HOUSING ONLY
96001 DERIVED FROM OCCUPIED UNITS DATA
90003 SATURATION RATE DERIVED FROM STOCK SIZE
MISSING FOOTNOTE - 90004
MISSING FOOTNOTE - 90005

MISSING FOOTNOTE - 90006
MISSING FOOTNOTE - 90007
MISSING FOOTNOTE - 90008
MISSING FOOTNOTE - 90009
90002 ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED
18151 ALL USES
18152 HEATING ONLY

```
PG+E SERVICE AREA
  1          69-69 EN.CONSUMP      11600 1 1815 4
  2     E    70-70 STOCK            6000 1 1815   EN.CONSUMP      17000 1 1815

    - - - - -   S O U R C E   F O O T N O T E S   - - - - -
18154  HEATING ONLY
18153  ALL UNITS
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SMUD SERVICE AREA

1	70-70 SAT. RATE	18.4	J	1951	STOCK	35900	1	1951
2	72-72 SAT. RATE	13.7	J	1951	STOCK	29200	1	1951
3	75-75 SAT. RATE	11.7	J	1951	STOCK	27500	1	1951

CALIFORNIA

1		60-60	SAT. RATE	19.2	0	2751	1	STOCK	[illegible]	0	1	27[illegible]
ALAMEDA CO.												
2	E	60-60	SAT. RATE	14.7	0	0001	1	STOCK	[illegible]	0	0	0001
3	0	70-70	SAT. RATE	21.0	0	9000	1	[illegible]	[illegible]	0	0	9000
ALPINE CO.												
4		60-60	SAT. RATE	18.0	0	2751	1	STOCK	[illegible]	0	1	2751
5	0	70-70	SAT. RATE	54.7	0	9000	2	[illegible]	[illegible]	7	0	9000
AMADOR CO.												
6		60-60	SAT. RATE	37.0	0	2751	1	[illegible]	[illegible]	0	1	2751
7	0	70-70	SAT. RATE	38.2	0	9000	3	[illegible]	[illegible]	0	0	9000
BUTTE CO.												
8		60-60	SAT. RATE	36.0	0	2751	1	[illegible]	[illegible]	1	1	2751
9	0	70-70	SAT. RATE	35.7	0	9000	4	[illegible]	[illegible]	0	0	9000
CALAVERAS CO.												
10		60-60	SAT. RATE	36.0	0	2751	1	[illegible]	[illegible]	1	1	2751
11	0	70-70	SAT. RATE	48.0	0	9000	5	[illegible]	[illegible]	0	0	9000
COLUSA CO.												
12		60-60	SAT. RATE	45.0	0	2751	1	[illegible]	[illegible]	1	1	2751
13	0	70-70	SAT. RATE	45.0	0	9000	6	[illegible]	[illegible]	0	0	9000
CONTRA COSTA CO.												
14	E	60-60	SAT. RATE	24.3	0	0001	1	[illegible]	[illegible]	0	0	0001
15	0	70-70	SAT. RATE	29.9	0	9000	7	[illegible]	[illegible]	0	0	9000
DEL NORTE CO.												
16		60-60	SAT. RATE	31.0	0	2751	1	[illegible]	[illegible]	1	1	2751
17	0	70-70	SAT. RATE	44.5	0	9000	8	[illegible]	[illegible]	0	0	9000
EL DORADO CO.												
18		60-60	SAT. RATE	37.5	0	2751	1	[illegible]	[illegible]	1	1	27[illegible]
19	0	70-70	SAT. RATE	34.8	0	9000	9	[illegible]	[illegible]	0	0	9000
FRESNO CO.												
20	E	60-60	SAT. RATE	23.5	0	0001	1	[illegible]	[illegible]	0	0	0001
21	0	70-70	SAT. RATE	31.2	0	9000	1	[illegible]	[illegible]	0	0	9000
GLENN CO												
22		60-60	SAT. RATE	49.0	0	2751	1	[illegible]	[illegible]	1	1	2751
23	0	70-70	SAT. RATE	56.8	0	9000	2	[illegible]	[illegible]	0	0	9000
HUMBOLDT CO.												
24		60-60	SAT. RATE	36.0	0	2751	1	[illegible]	[illegible]	1	1	2751
25	0	70-70	SAT. RATE	40.6	0	9000	3	[illegible]	[illegible]	0	0	9000
IMPERIAL CO.												
26		60-60	SAT. RATE	29.0	0	2751	1	[illegible]	[illegible]	1	1	2751
27	0	70-70	SAT. RATE	24.7	0	9000	4	[illegible]	[illegible]	0	0	9000
INYO CO.												
28		60-60	SAT. RATE	30.0	0	2751	1	[illegible]	[illegible]	1	1	2751
29	0	70-70	SAT. RATE	30.6	0	9000	5	[illegible]	[illegible]	0	0	9000
KERN CO.												
30	E	60-60	SAT. RATE	22.1	0	0001	1	[illegible]	[illegible]	0	0	0001
31	0	70-70	SAT. RATE	23.9	0	9000	6	[illegible]	[illegible]	0	0	9000
KINGS CO.												
32		60-60	SAT. RATE	36.0	0	2751	1	[illegible]	[illegible]	1	1	2751
33	0	70-70	SAT. RATE	34.0	0	9000	7	[illegible]	[illegible]	0	0	9000
LAKE CO.												
34		60-60	SAT. RATE	42.0	0	2751	1	STOCK	[illegible]	1	1	2751
35	0	70-70	SAT. RATE	43.2	0	9000	8	STOCK	[illegible]	0	0	900[illegible]
LASSEN CO.												
36		60-60	SAT. RATE	41.0	0	2751	1	STOCK	[illegible]	1	1	2751
37	0	70-70	SAT. RATE	56.2	0	9000	9	STOCK	[illegible]	0	0	9000

LOS ANGELES CO.

38	E	60-60	SAT. RATE	11.1	0	0001	1	STOCK	223000	0	0001
39	0	70-70	SAT. RATE	13.7	0	9000	1	STOCK	334000	0	9000
MADERA CO.											
40		60-60	SAT. RATE	38.0	0	2751	1	STOCK	4410	1	2751
41	0	70-70	SAT. RATE	39.8	0	9000	2	STOCK	5080	0	9000
MARIN CO.											
42	E	60-60	SAT. RATE	26.4	0	0001	1	STOCK	9030	0	0001
43	0	70-70	SAT. RATE	26.6	0	9000	3	STOCK	18000	0	9000
MARIPOSA C											
44		60-60	SAT. RATE	55.0	0	2751	1	STOCK	963	1	2751
45	0	70-70	SAT. RATE	52.9	0	9000	4	STOCK	1120	0	9000
MENDOCINO CO.											
46		60-60	SAT. RATE	39.0	0	2751	1	STOCK	5810	1	2751
47	0	70-70	SAT. RATE	38.9	0	9000	5	STOCK	6470	0	9000
MERCED CO.											
48		60-60	SAT. RATE	39.0	0	2751	1	STOCK	9540	1	2751
49	0	70-70	SAT. RATE	39.7	0	9000	6	STOCK	12100	0	9000
MODOC CO.											
50		60-60	SAT. RATE	69.0	0	2751	1	STOCK	18300	1	2751
51	0	70-70	SAT. RATE	60.3	0	9000	7	STOCK	1590	0	9000
MONO CO.											
52		60-60	SAT. RATE	41.0	0	2751	1	STOCK	344	1	2751
MONTEREY CO.											
53		60-60	SAT. RATE	23.0	0	2751	1	STOCK	12000	1	2751
NAPA CO.											
54		60-60	SAT. RATE	32.0	0	2751	1	STOCK	6050	1	2751
NEVADA CO.											
55		60-60	SAT. RATE	40.0	0	2751	1	STOCK	2970	1	2751
ORANGE CO.											
56	E	60-60	SAT. RATE	18.5	0	0001	1	STOCK	37700	0	0001
PLACER CO.											
57		60-60	SAT. RATE	33.0	0	2751	1	STOCK	5680	1	2751
58		70-70	SAT. RATE	55.2	0	2001		STOCK	67	0	2001
PLUMAS CO.											
59		60-60	SAT. RATE	38.0	0	2751	1	STOCK	1470	1	2751
RIVERSIDE CO.											
60	E	60-60	SAT. RATE	15.6	0	0001	1	STOCK	14800	1	0001
SACRAMENTO CO.											
61	E	60-60	SAT. RATE	21.9	0	0001	1	STOCK	33100	0	0001
SAN BENITO CO.											
62		60-60	SAT. RATE	24.0	0	2751	1	STOCK	1110	1	2751
SAN BERNARDINO CO.											
63	E	60-60	SAT. RATE	14.5	0	0001	1	STOCK	21700	1	0001
SAN DIEGO CO.											
64	E	60-60	SAT. RATE	18.6	0	0001	1	STOCK	56800	1	0001
SAN FRANCISCO CO.											
65	E	60-60	SAT. RATE	6.7	0	0001	1	STOCK	19500	0	0001
SAN JOAQUIN CO.											
66	E	60-60	SAT. RATE	28.6	0	0001	1	STOCK	15400	0	0001
SAN LUIS OBISPO CO.											
67		60-60	SAT. RATE	29.0	0	2751	1	STOCK	7390	1	2751
SAN MATEO CO.											
68	E	60-60	SAT. RATE	19.2	0	0001	1	STOCK	26000	0	0001
SANTA BARBARA CO.											
69	E	60-60	SAT. RATE	16.1	0	0001	1	STOCK	8370	0	0001
SANTA CLARA CO.											
70	E	60-60	SAT. RATE	19.3	0	0001	1	STOCK	35700	0	0001

SANTA CRUZ CO.

71		60-60	SAT. RATE	25.0	0	2751	1	STOCK	7650	1	27

SHASTA CO.

72		60-60	SAT. RATE	42.0	0	2751	1	STOCK	7690	1	2751

SIERRA CO.

73		60-60	SAT. RATE	44.0	0	2751	1	STOCK	337	1	2751

SISKIYOU CO.

74		60-60	SAT. RATE	36.0	0	2751	1	STOCK	3920	1	2751

SOLANO CO.

75	E	60-60	SAT. RATE	21.3	0	0001	1	STOCK	8200	0	0001

SONOMA CO.

76		60-60	SAT. RATE	34.0	0	2751	1	STOCK	16000	1	2751

STANISLAUS CO.

77		60-60	SAT. RATE	35.0	0	2751	1	STOCK	16800	1	2751

SUTTER CO.

78		60-60	SAT. RATE	38.0	0	2751	1	STOCK	3790	1	2751

TEHAMA CO.

79		60-60	SAT. RATE	4-.0	0	2751	1	STOCK	3520	1	2751

TRINITY CO.

80		60-60	SAT. RATE	44.0	0	2751	1	STOCK	1380	1	2751

TULARE CO.

81		60-60	SAT. RATE	31.0	0	2751	1	STOCK	15100	1	2751

TUOLUMNE CO.

82		60-60	SAT. RATE	39.0	0	2751	1	STOCK	1970	1	2751

VENTURA CO.

83		60-60	SAT. RATE	22.0	0	2751	1	STOCK	12000	1	2751

YOLO CO.

84		60-60	SAT. RATE	26.0	0	2751	1	STOCK	5120	1	27.

YUBA CO.

85		60-60	SAT. RATE	28.0	0	2751	1	STOCK	2760	1	2751

SAN FRANCISCO SMSA

86	E	60-60	SAT. RATE	14.0	0	0001	1	STOCK	135000	0	0001

BAKERSFIELD UA

87	E	60-60	SAT. RATE	19.7	0	0001	1	STOCK	8490	0	0001

FRESNO UA

88	E	60-60	SAT. RATE	19.9	0	0001	1	STOCK	13000	0	0001

LA - LONG BEACH SMSA

89	E	60-60	SAT. RATE	11.9	0	0001	1	STOCK	246000	0	0001
90	E	60-60	SAT. RATE	11.8	0	0001	1	STOCK	261000	0	0001

SACRAMENTO UA

91	E	60-60	SAT. RATE	19.6	0	0001	1	STOCK	27600	0	0001

SN BRNADINO-RIV UA

92	E	60-60	SAT. RATE	12.9	0	0001	1	STOCK	14700	0	0001

SAN DIEGO UA

93	E	60-60	SAT. RATE	18.9	0	0001	1	STOCK	42600	0	0001

SAN JOSE UA

94	E	60-60	SAT. RATE	18.5	0	0001	1	STOCK	32300	0	0001

SANTA BARBARA UA

95	E	60-60	SAT. RATE	10.1	0	0001	1	STOCK	2500	0	0001

STOCKTON UA

96	E	60-60	SAT. RATE	14.9	0	0001	1	STOCK	6300	0	0001

POMONA-ONTARIO UA

97		60-60	SAT. RATE	117.3	0	2751	1	STOCK	5090000	1	275
98	E	60-60	SAT. RATE	13.8	0	0001	1	STOCK	7720	0	0001

SN BERN-RIV-ONT SMSA

99		60-60	SAT. RATE	32.3	0	2751	1	STOCK	206000	1	2751
100	E	60-60	SAT. RATE	14.9	0	0001	1	STOCK	36300	1	0001

SF-OAK URBANIZD AREA
101 E 60-60 SAT. RATE 12.8 0 0001 1 STOCK 104000 0 0001

- - - - - S O U R C E F O O T N O T E S - - - - -

27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK
00011 SATURATION DERIVED FROM STOCK SIZI
90001 OCCUPIED HOUSING ONLY
90002 ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED
90003 SATURATION RATE DERIVED FROM STOCK SIZE
MISSING FOOTNOTE - 90004
MISSING FOOTNOTE - 90005
MISSING FOOTNOTE - 90006
MISSING FOOTNOTE - 90007
MISSING FOOTNOTE - 90008
MISSING FOOTNOTE - 90009

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CALIFORNIA
   1     G     60-60 SAT. RATE        87.3 0 2751 1 STOCK        4350000 1 27
ALAMEDA CO.
   2     G     60-60 SAT. RATE        94.2 0 0001 1 STOCK         278000 0 0001
   3   0 G     70-70 SAT. RATE        89.3 0 9000 1 STOCK         326000 0 9000
ALPINE CO.
   4   0 G     70-70 SAT. RATE        11.7 0 9000 2 STOCK              2 0 9000
AMADOR CO.
   5   0 G     60-60 SAT. RATE         3.2 0 9600 1 STOCK            100 0 9600
   6   0 G     70-70 SAT. RATE        22.8 0 9000 3 STOCK            908 0 9000
BUTTE CO.
   7   0 G     60-60 SAT. RATE        66.3 0 9600 1 STOCK          18100 0 9600
   8   0 G     70-70 SAT. RATE        72.0 0 9000 4 STOCK          25200 0 9000
CALAVERAS CO.
   9   0 G     60-60 SAT. RATE         8.1 0 9600 1 STOCK            279 0 9600
  10   0 G     70-70 SAT. RATE         2.7 0 9000 5 STOCK            120 0 9000
COLUSA CO.
  11   0 G     60-60 SAT. RATE        54.4 0 9600 1 STOCK           2130 0 9600
  12   0 G     70-70 SAT. RATE        67.8 0 9000 6 STOCK           2960 0 9000
CONTRA COSTA CO.
  13     G     60-60 SAT. RATE        93.7 0 0001 1 STOCK         110000 0 0001
  14   0 G     70-70 SAT. RATE        91.2 0 9000 7 STOCK         158000 0 9000
DEL NORTE CO.
  15   0 G     60-60 SAT. RATE         1.9 0 9600 1 STOCK            101 0 9600
  16   0 G     70-70 SAT. RATE         2.8 0 9000 8 STOCK            135 0 9000
EL DORADO CO.
  17   0 G     60-60 SAT. RATE         2.6 0 9600 1 STOCK            255 0 9600
  18   0 G     70-70 SAT. RATE        21.6 0 9000 9 STOCK           3230 0 9000
FRESNO CO.
  19     G     60-60 SAT. RATE        77.4 0 0001 1 STOCK          82700 0 0001
  20   0 G     70-70 SAT. RATE        80.8 0 9000 1 STOCK         102000 0 9000
GLENN CO
  21   0 G     60-60 SAT. RATE        53.6 0 9600 1 STOCK           2850 0 9600
  22   0 G     70-70 SAT. RATE        57.8 0 9000 2 STOCK           3300 0 9000
HUMBOLDT CO.
  23   0 G     60-60 SAT. RATE        51.9 0 9600 1 STOCK          16200 0 9600
  24   0 G     70-70 SAT. RATE        69.7 0 9000 3 STOCK          22600 0 9000
IMPERIAL CO.
  25   0 G     60-60 SAT. RATE        56.3 0 9600 1 STOCK          10400 0 9600
  26   0 G     70-70 SAT. RATE        54.4 0 9000 4 STOCK          11400 0 9000
INYO CO.
  27   0 G     60-60 SAT. RATE         2.3 0 9600 1 STOCK             10 0 9600
  28   0 G     70-70 SAT. RATE         1.5 0 9000 5 STOCK              8 0 9000
KERN CO.
  29     G     60-60 SAT. RATE        80.4 0 0001 1 STOCK          74000 0 0001
  30   0 G     70-70 SAT. RATE        86.9 0 9000 6 STOCK          88300 0 9000
KINGS CO.
  31   0 G     60-60 SAT. RATE        70.3 0 9600 1 STOCK          10000 0 9600
  32   0 G     70-70 SAT. RATE        79.9 0 9000 7 STOCK          14600 0 9000
LAKE CO.
  33   0 G     60-60 SAT. RATE         .3 0 9600 1 STOCK              2 0 9600
  34   0 G     70-70 SAT. RATE         3.2 0 9000 8 STOCK           238 0 9000
LASSEN CO.
  35   0 G     60-60 SAT. RATE         .5 0 9600 1 STOCK              2 0 9600
  36   0 G     70-70 SAT. RATE         7.6 0 9000 9 STOCK           391 0 9000
LOS ANGELES CO.
  37     G     60-60 SAT. RATE        93.9 0 0001 1 STOCK        1880000 0 0001
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38	0	G	70-70 SAT. RATE	90.1	0	9000	1	STOCK	2190000	0	9000
MADERA CO.											
39	0	G	60-60 SAT. RATE	53.6	0	9600	1	STOCK	6240	0	9600
40	0	G	70-70 SAT. RATE	60.0	0	9000	2	STOCK	7650	0	9000
MARIN CO.											
41		G	60-60 SAT. RATE	87.9	0	0001	1	STOCK	38800	0	0001
42	0	G	70-70 SAT. RATE	87.5	0	9000	3	STOCK	59100	0	9000
MARIPOSA C											
43	0	G	60-60 SAT. RATE	3.3	0	9600	1	STOCK	6	0	9600
44	0	G	70-70 SAT. RATE	6.4	0	9000	4	STOCK	137	0	9000
MENDOCINO CO.											
45	0	G	60-60 SAT. RATE	4.7	0	9600	1	STOCK	700	0	9600
46	0	G	70-70 SAT. RATE	16.4	0	9000	5	STOCK	2720	0	9000
MERCED CO.											
47	0	G	60-60 SAT. RATE	64.2	0	9600	1	STOCK	16500	0	9600
48	0	G	70-70 SAT. RATE	71.8	0	9000	6	STOCK	21900	0	9000
MODOC CO.											
49	0	G	60-60 SAT. RATE	4.5	0	9600	1	STOCK	116	0	9600
50	0	G	70-70 SAT. RATE	4.8	0	9000	7	STOCK	128	0	9000
MONO CO.											
51	0	G	60-60 SAT. RATE	2.9	0	9600	1	STOCK	2	0	9600
MONTEREY CO.											
52	0	G	60-60 SAT. RATE	81.5	0	9600	1	STOCK	42500	0	9600
NAPA CO.											
53	0	G	60-60 SAT. RATE	64.9	0	9600	1	STOCK	16000	0	9600
NEVADA CO.											
54	0	G	60-60 SAT. RATE	6.8	0	9600	1	STOCK	507	0	9600
ORANGE CO.											
55		G	60-60 SAT. RATE	94.7	0	0001	1	STOCK	193000	0	0001
PLACER CO.											
56	0	G	60-60 SAT. RATE	39.2	0	9600	1	STOCK	6750	0	9600
PLUMAS CO.											
57	0	G	60-60 SAT. RATE	3.0	0	9600	1	STOCK	118	0	9600
RIVERSIDE CO.											
58		G	60-60 SAT. RATE	81.7	0	0001	1	STOCK	77700	0	0001
SACRAMENTO CO.											
59		G	60-60 SAT. RATE	91.3	0	0001	1	STOCK	138000	0	0001
SAN BENITO CO.											
60	0	G	60-60 SAT. RATE	63.6	0	9600	1	STOCK	2930	0	9600
SAN BERNARDINO CO.											
61		G	60-60 SAT. RATE	85.8	0	0001	1	STOCK	128000	0	0001
SAN DIEGO CO.											
62		G	60-60 SAT. RATE	61.9	0	0001	1	STOCK	250000	0	0001
SAN FRANCISCO CO.											
63		G	60-60 SAT. RATE	90.2	0	0001	1	STOCK	263000	0	0001
SAN JOAQUIN CO.											
64		G	60-60 SAT. RATE	64.3	0	0001	1	STOCK	62900	0	0001
SAN LUIS OBISPO CO.											
65	0	G	60-60 SAT. RATE	72.7	0	9600	1	STOCK	18500	0	9600
SAN MATEO CO.											
66		G	60-60 SAT. RATE	94.7	0	0001	1	STOCK	128000	0	0001
SANTA BARBARA CO.											
67		G	60-60 SAT. RATE	83.4	0	0001	1	STOCK	43400	0	0001
SANTA CLARA CO.											
68		G	60-60 SAT. RATE	91.6	0	0001	1	STOCK	169000	0	0001
SANTA CRUZ CO.											
69	0	G	60-60 SAT. RATE	75.9	0	9600	1	STOCK	23300	0	9600

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SHASTA CO.
  70  0 G     60-60 SAT. RATE        2.0 0 9600 1 STOCK          [illegible]63 0 9[illegible]
SIERRA CO.
  71  0 G     60-60 SAT. RATE        6.4 0 9600 1 STOCK          [illegible]5 0 9600
SISKIYOU CO.
  72  0 G     60-60 SAT. RATE        5.2 0 9600 1 STOCK          [illegible]61 0 9600
SOLANO CO.
  73    G     60-60 SAT. RATE       88.4 0 0001 1 STOCK          [illegible]00 0 0001
SONOMA CO.
  74  0 G     60-60 SAT. RATE       74.1 0 9600 1 STOCK          [illegible]00 0 9600
STANISLAUS CO.
  75  0 G     60-60 SAT. RATE       79.3 0 9600 1 STOCK          [illegible]00 0 9600
SUTTER CO.
  76  0 G     60-60 SAT. RATE       73.6 0 9600 1 STOCK          [illegible]0 0 9600
TEHAMA CO.
  77  0 G     60-60 SAT. RATE       26.6 0 9600 1 STOCK          [illegible] 0 9600
TRINITY CO.
  78  0 G     60-60 SAT. RATE        2.7 0 9600 1 STOCK          [illegible] 0 9600
TULARE CO.
  79  0 G     60-60 SAT. RATE       70.9 0 9600 1 STOCK          [illegible] 0 9600
TUOLUMNE CO.
  80  0 G     60-60 SAT. RATE        2.9 0 9600 1 STOCK          [illegible]4 0 9600
VENTURA CO.
  81  0 G     60-60 SAT. RATE       87.0 0 9600 1 STOCK          [illegible] 0 9600
YOLO CO.
  82  0 G     60-60 SAT. RATE       80.0 0 9600 1 STOCK          [illegible] 0 9600
YUBA CO.
  83  0 G     60-60 SAT. RATE       73.0 0 9600 1 STOCK          [illegible] 0 96
SAN FRANCISCO SMSA
  84    G     60-60 SAT. RATE       92.4 0 0001 1 STOCK          [illegible] 0 0001
BAKERSFIELD UA
  85    G     60-60 SAT. RATE       97.3 0 0001 1 STOCK          [illegible] 0 0001
FRESNO UA
  86    G     60-60 SAT. RATE       95.5 0 0001 1 STOCK          [illegible] 0 0001
LA - LONG BEACH SMSA
  87    G     60-60 SAT. RATE       94.4 0 0001 1 STOCK          [illegible] 0 0001
  88    G     60-60 SAT. RATE       94.0 0 0001 1 STOCK          [illegible] 0 0001
SACRAMENTO UA
  89    G     60-60 SAT. RATE       95.1 0 0001 1 STOCK          [illegible] 0 0001
SN BRNADINO-RIV UA
  90    G     60-60 SAT. RATE       95.5 0 0001 1 STOCK          [illegible] 0 0001
SAN DIEGO UA
  91    G     60-60 SAT. RATE       88.5 0 0001 1 STOCK          [illegible] 0 0001
SAN JOSE UA
  92    G     60-60 SAT. RATE       94.3 0 0001 1 STOCK          [illegible] 0 0001
SANTA BARBARA UA
  93    G     60-60 SAT. RATE       91.3 0 0001 1 STOCK          [illegible] 0 0001
STOCKTON UA
  94    G     60-60 SAT. RATE       93.2 0 0001 1 STOCK          [illegible] 0 0001
POMONA-ONTARIO UA
  95    G     60-60 SAT. RATE       96.6 0 0001 1 STOCK          [illegible] 0 0001
  96    G     60-60 SAT. RATE       91.2 0 2751 1 STOCK          [illegible] 1 2751
SN BERN-RIV-ONT SMSA
  97    G     60-60 SAT. RATE       84.1 0 0001 1 STOCK          [illegible] 0 0001
  98    G     60-60 SAT. RATE       60.1 0 2751 1 STOCK          [illegible] 1 2751
SF-OAK URBANIZD AREA
  99    G     60-60 SAT. RATE       93.3 0 0001 1 STOCK          [illegible] 0 0001
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27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK
00011 SATURATION DERIVED FROM STOCK SIZE
90001 OCCUPIED HOUSING ONLY
90002 ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED
96001 DERIVED FROM OCCUPIED UNITS DATA
90003 SATURATION RATE DERIVED FROM STOCK SIZE
MISSING FOOTNOTE - 90004
MISSING FOOTNOTE - 90005
MISSING FOOTNOTE - 90006
MISSING FOOTNOTE - 90007
MISSING FOOTNOTE - 90008
MISSING FOOTNOTE - 90009

SMUD SERVICE AREA										
1		70-70	SAT. RATE	.6	0	1951	STOCK	1170	1	19
2		70-70	STOCK	824	1	1783				
3		70-70	STOCK	509	1	1783				
4		70-70	STOCK	1330	1	1783				
5		72-72	SAT. RATE	.9	0	1951	STOCK	1920	1	1951
6		75-75	STOCK	546	1	1783				
7		75-75	SAT. RATE	.6	0	1783	STOCK	1550	1	1783
8		75-75	STOCK	1010	1	1783				
9		75-75	SAT. RATE	.5	0	1951	STOCK	1170	1	1951
SDG+E SERVICE AREA										
10	R	74-74	STOCK	1550	0	2000	ADDITIONS	200	0	2000
11	R	74-74	STOCK	1550	0	2000	ADDITIONS	200	0	2000

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2000T ALL HOMES
2000S NEW INDIVIDUAL (SINGLE-FAMILY) HOMES

SCE SERVICE AREA

1	50-50	E.C.ADDNS.	1520	0	3000
2	55-55	E.C.ADDNS.	2030	0	3000
3	60-60	E.C.ADDNS.	2700	0	3000
4	61-61	E.C.ADDNS.	2850	0	3000
5	62-62	E.C.ADDNS.	3080	0	3000
6	63-63	E.C.ADDNS.	3220	0	3000
7	64-64	E.C.ADDNS.	3570	0	3000
8	65-65	E.C.ADDNS.	3820	0	3000
9	66-66	E.C.ADDNS.	4090	0	3000
10	67-67	E.C.ADDNS.	4430	0	3000
11	68-68	E.C.ADDNS.	4610	0	3000
12	69-69	E.C.ADDNS.	5030	0	3000
13	70-70	E.C.ADDNS.	5240	0	3000
14	71-71	E.C.ADDNS.	5540	0	3000
15	72-72	E.C.ADDNS.	5730	0	3000
16	73-73	E.C.ADDNS.	5890	0	3000
17	74-74	E.C.ADDNS.	5940	0	3000
18	75-75	E.C.ADDNS.	5800	0	3000

SDG+E SERVICE AREA

1	74-74 STOCK	533000	1 2000

CALIFORNIA										
1	60-60	SAT.	RATE	8.9	0	2751	1	STOCK	443000	1 2751
ALPINE CO.										
AMADOR CO.										
2	60-60	SAT.	RATE	25.4	0	2751	1	STOCK	798	1 2751
BUTTE CO.										
3	60-60	SAT.	RATE	19.4	0	2751	1	STOCK	5300	1 2751
CALAVERAS CO.										
4	60-60	SAT.	RATE	18.6	0	2751	1	STOCK	644	1 2751
COLUSA CO.										
5	60-60	SAT.	RATE	41.4	0	2751	1	STOCK	1620	1 2751
DEL NORTE CO.										
6	60-60	SAT.	RATE	1.6	0	2751	1	STOCK	84	1 2751
EL DORADO CO.										
7	60-60	SAT.	RATE	19.6	0	2751	1	STOCK	1920	1 2751
GLENN CO										
8	60-60	SAT.	RATE	32.4	0	2751	1	STOCK	1720	1 2751
HUMBOLDT CO.										
9	60-60	SAT.	RATE	21.4	0	2751	1	STOCK	6740	1 2751
IMPERIAL CO.										
10	60-60	SAT.	RATE	46.9	0	2751	1	STOCK	8680	1 2751
INYO CO.										
11	60-60	SAT.	RATE	17.5	0	2751	1	STOCK	710	1 2751
KINGS CO.										
12	60-60	SAT.	RATE	15.2	0	2751	1	STOCK	2300	1 2751
LAKE CO.										
13	60-60	SAT.	RATE	22.3	0	2751	1	STOCK	1170	1 2751
LASSEN CO.										
14	60-60	SAT.	RATE	2.3	0	2751	1	STOCK	100	1 2751
MADERA CO.										
15	60-60	SAT.	RATE	21.4	0	2751	1	STOCK	2480	1 2751
MARIPOSA C										
16	60-60	SAT.	RATE	2.5	0	2751	1	STOCK	44	1 2751
MENDOCINO CO.										
17	60-60	SAT.	RATE	6.6	0	2751	1	STOCK	1280	1 2751
MERCED CO.										
18	60-60	SAT.	RATE	25.3	0	2751	1	STOCK	6580	1 2751
MODOC CO.										
19	60-60	SAT.	RATE	1.5	0	2751	1	STOCK	40	1 2751
MONO CO.										
MONTEREY CO.										
20	60-60	SAT.	RATE	3.1	0	2751	1	STOCK	1620	1 2751
NAPA CO.										
21	60-60	SAT.	RATE	6.0	0	2751	1	STOCK	1290	1 2751
NEVADA CO.										
22	60-60	SAT.	RATE	5.8	0	2751	1	STOCK	431	1 2751
PLACER CO.										
23	60-60	SAT.	RATE	25.0	0	2751	1	STOCK	4300	1 2751
PLUMAS CO.										
24	60-60	SAT.	RATE	2.3	0	2751	1	STOCK	89	1 2751
SAN BENITO CO.										
25	60-60	SAT.	RATE	5.8	0	2751	1	STOCK	175	1 2751
SAN LUIS OBISPO CO.										
26	60-60	SAT.	RATE	6.4	0	2751	1	STOCK	1630	1 2751
SANTA CRUZ CO.										
27	60-60	SAT.	RATE	1.2	0	2751	1	STOCK	367	1 2751
SIERRA CO.										

28	60-60	SAT. RATE	9.3	0	2751	1	STOCK	1700	1	2751
SISKIYOU CO.										
29	60-60	SAT. RATE	4.3	0	2751	1	STOCK	469	1	2751
SONOMA CO.										
30	60-60	SAT. RATE	4.7	0	2751	1	STOCK	2220	1	2751
STANISLAUS CO.										
31	60-60	SAT. RATE	24.9	0	2751	1	STOCK	12000	1	2751
SUTTER CO.										
32	60-60	SAT. RATE	31.1	0	2751	1	STOCK	3100	1	2751
TEHAMA CO.										
33	60-60	SAT. RATE	16.2	0	2751	1	STOCK	1300	1	2751
TRINITY CO.										
34	60-60	SAT. RATE	7.3	0	2751	1	STOCK	229	1	2751
TULARE CO.										
35	60-60	SAT. RATE	11.6	0	2751	1	STOCK	5640	1	2751
TUOLUMNE CO.										
36	60-60	SAT. RATE	8.7	0	2751	1	STOCK	438	1	2751
VENTURA CO.										
37	60-60	SAT. RATE	5.2	0	2751	1	STOCK	2840	1	2751
YOLO CO.										
38	60-60	SAT. RATE	16.6	0	2751	1	STOCK	3270	1	2751
YUBA CO.										
39	60-60	SAT. RATE	30.7	0	2751	1	STOCK	3020	1	2751
POMONA-ONTARIO UA										
40	60-60	SAT. RATE	108.3	0	2751	1	STOCK	4700000	1	2751
SN BERN-RIV-ONT SMSA										
41	60-60	SAT. RATE	12.9	0	2751	1	STOCK	82300	1	2751
SMUD SERVICE AREA										
42	70-70	SAT. RATE	36.7	0	1951		STOCK	71600	1	1951
43	72-72	SAT. RATE	35.6	0	1951		STOCK	76000	1	1951
44	75-75	SAT. RATE	32.7	0	1951		STOCK	76800	1	1951

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27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK

CALIFORNIA												
1	G	60-60	SAT. RATE	75.4	0	2751	1	STOCK	3750000	1	2751
2		60-60	SAT. RATE	17.9	0	2751	1	STOCK	891000	1	2751
3		71-71	ADDITIONS	176000	0	AH01					
4		72-72	ADDITIONS	193000	0	AH01					
5		73-73	ADDITIONS	211000	0	AH01					
6		74-74	ADDITIONS	170000	0	AH01					
ALAMEDA CO.											
7	G	60-60	SAT. RATE	74.6	0	0001	1	STOCK	220000	0	0001
8	E	60-60	SAT. RATE	22.7	0	0001	1	STOCK	67300	0	0001
9	0	70-70	SAT. RATE	43.4	0	9000	1	STOCK	159000	0	9000
10	0 G	70-70	SAT. RATE	55.1	0	9000	1	STOCK	201000	0	9000
ALPINE CO.											
11	0	60-60	SAT. RATE	43.1	0	9600	1	STOCK	5	0	9600
12	0	70-70	SAT. RATE	69.5	0	9000	2	STOCK	9	0	9000
AMADOR CO.											
13	0	60-60	SAT. RATE	47.4	0	9600	1	STOCK	1490	0	9600
14	0 G	60-60	SAT. RATE	3.8	0	9600	1	STOCK	119	0	9600
15	0	70-70	SAT. RATE	56.4	0	9000	3	STOCK	2250	0	9000
16	0 G	70-70	SAT. RATE	16.6	0	9000	3	STOCK	661	0	9000
BUTTE CO.											
17	0	60-60	SAT. RATE	33.8	0	9600	1	STOCK	9230	0	9600
18	0 G	60-60	SAT. RATE	49.2	0	9600	1	STOCK	13400	0	9600
19	0 G	70-70	SAT. RATE	41.0	0	9000	4	STOCK	14300	0	9000
20	0	70-70	SAT. RATE	49.5	0	9000	4	STOCK	17200	0	9000
CALAVERAS CO.											
21	0	60-60	SAT. RATE	41.5	0	9600	1	STOCK	1440	0	9600
22	0 G	60-60	SAT. RATE	8.5	0	9600	1	STOCK	296	0	9600
23	0	70-70	SAT. RATE	58.9	0	9000	5	STOCK	2640	0	9000
24	0 G	70-70	SAT. RATE	3.7	0	9000	5	STOCK	164	0	9000
COLUSA CO.											
25	0	60-60	SAT. RATE	41.6	0	9600	1	STOCK	1630	0	9600
26	0 G	60-60	SAT. RATE	35.8	0	9600	1	STOCK	1400	0	9600
27	0 G	70-70	SAT. RATE	42.6	0	9000	6	STOCK	1860	0	9000
28	0	70-70	SAT. RATE	46.8	0	9000	6	STOCK	2040	0	9000
CONTRA COSTA CO.											
29	G	60-60	SAT. RATE	64.9	0	0001	1	STOCK	76500	0	0001
30	E	60-60	SAT. RATE	31.5	0	0001	1	STOCK	37100	0	0001
31	0 G	70-70	SAT. RATE	44.0	0	9000	7	STOCK	76100	0	9000
32	0	70-70	SAT. RATE	54.5	0	9000	7	STOCK	94400	0	9000
DEL NORTE CO.											
33	0	60-60	SAT. RATE	55.2	0	9600	1	STOCK	2940	0	9600
34	0 G	60-60	SAT. RATE	1.5	0	9600	1	STOCK	8	0	9600
35	0 G	70-70	SAT. RATE	2.3	0	9000	8	STOCK	110	0	9000
36	0	70-70	SAT. RATE	74.4	0	9000	8	STOCK	3560	0	9000
EL DORADO CO.											
37	0 G	60-60	SAT. RATE	4.6	0	9600	1	STOCK	451	0	9600
38	0	60-60	SAT. RATE	44.5	0	9600	1	STOCK	4380	0	9600
39	0	70-70	SAT. RATE	65.3	0	9000	9	STOCK	9770	0	9000
40	0 G	70-70	SAT. RATE	7.0	0	9000	9	STOCK	1140	0	9000
FRESNO CO.											
41	G	60-60	SAT. RATE	55.1	0	0001	1	STOCK	60000	0	0001
42	E	60-60	SAT. RATE	29.4	0	0001	1	STOCK	31400	0	0001
43	0 G	70-70	SAT. RATE	48.1	0	9000	1	STOCK	58400	0	9000
44	0	70-70	SAT. RATE	45.6	0	9000	1	STOCK	57800	0	9000
GLENN CO											
45	0	60-60	SAT. RATE	47.1	0	9600	1	STOCK	2510	0	9600

46	0	G	60-60	SAT. RATE	34.3	0	9600	1	STOCK	[illegible]	0	9600
47	0	G	70-70	SAT. RATE	36.0	0	9000	2	STOCK	[illegible]	0	90
48	0		70-70	SAT. RATE	48.6	0	9000	2	STOCK	[illegible]	0	9000
HUMBOLDT CO.												
49	0		60-60	SAT. RATE	38.1	0	9600	1	STOCK	[illegible]	0	9600
50	0	G	60-60	SAT. RATE	34.9	0	9600	1	STOCK	[illegible]	0	9600
51	0		70-70	SAT. RATE	52.3	0	9000	3	STOCK	[illegible]	0	9000
52	0	G	70-70	SAT. RATE	37.9	0	9000	3	STOCK	[illegible]	0	9000
IMPERIAL CO.												
53	0	G	60-60	SAT. RATE	49.3	0	9600	1	STOCK	[illegible]	0	9600
54	0		60-60	SAT. RATE	34.2	0	9600	1	STOCK	[illegible]	0	9600
55	0	G	70-70	SAT. RATE	49.9	0	9000	4	STOCK	[illegible]	0	9000
56	0		70-70	SAT. RATE	38.0	0	9000	4	STOCK	[illegible]	0	9000
INYO CO.												
57	0	G	60-60	SAT. RATE	3.7	0	9600	1	STOCK	[illegible]	0	9600
58	0		60-60	SAT. RATE	37.8	0	9600	1	STOCK	[illegible]	0	9600
59	0		70-70	SAT. RATE	41.9	0	9000	5	STOCK	[illegible]	0	9000
60	0	G	70-70	SAT. RATE	1.7	0	9000	5	STOCK	[illegible]	0	9000
KERN CO.												
61		E	60-60	SAT. RATE	13.9	0	0001	1	STOCK	[illegible]	0	0001
62		G	60-60	SAT. RATE	77.1	0	0001	1	STOCK	[illegible]	0	0001
63	0		70-70	SAT. RATE	26.0	0	9000	6	STOCK	[illegible]	0	9000
64	0	G	70-70	SAT. RATE	67.4	0	9000	6	STOCK	[illegible]	0	9000
KINGS CO.												
65	0		60-60	SAT. RATE	23.6	0	9600	1	STOCK	[illegible]	0	9600
66	0	G	60-60	SAT. RATE	59.4	0	9600	1	STOCK	[illegible]	0	9600
67	0	G	70-70	SAT. RATE	61.7	0	9000	7	STOCK	[illegible]	0	9000
68	0		70-70	SAT. RATE	36.6	0	9000	7	STOCK	[illegible]	0	90[illegible]
LAKE CO.												
69	0		60-60	SAT. RATE	54.2	0	9600	1	STOCK	[illegible]	0	9600
70	0	G	60-60	SAT. RATE	.7	0	9600	1	STOCK	[illegible]	0	9600
71	0		70-70	SAT. RATE	63.9	0	9000	8	STOCK	[illegible]	0	9000
72	0	G	70-70	SAT. RATE	2.6	0	9000	8	STOCK	[illegible]	0	9000
LASSEN CO.												
73	0	G	60-60	SAT. RATE	2.2	0	9600	1	STOCK	[illegible]	0	9600
74	0		60-60	SAT. RATE	49.6	0	9600	1	STOCK	[illegible]	0	9600
75	0		70-70	SAT. RATE	54.6	0	9000	9	STOCK	[illegible]	0	9000
76	0	G	70-70	SAT. RATE	6.9	0	9000	9	STOCK	[illegible]	0	9000
LOS ANGELES CO.												
77		G	60-60	SAT. RATE	87.7	0	0001	1	STOCK	[illegible]	0	0001
78		E	60-60	SAT. RATE	9.0	0	0001	1	STOCK	[illegible]	0	0001
79	0		70-70	SAT. RATE	16.0	0	9000	1	STOCK	[illegible]	0	9000
80	0	G	70-70	SAT. RATE	82.7	0	9000	1	STOCK	[illegible]	0	9000
MADERA CO.												
81	0		60-60	SAT. RATE	27.4	0	9600	1	STOCK	[illegible]	0	9600
82	0	G	60-60	SAT. RATE	43.3	0	9600	1	STOCK	[illegible]	0	9600
83	0	G	70-70	SAT. RATE	40.0	0	9000	2	STOCK	[illegible]	0	9000
84	0		70-70	SAT. RATE	41.7	0	9000	2	STOCK	[illegible]	0	9000
MARIN CO.												
85		E	60-60	SAT. RATE	38.9	0	0001	1	STOCK	[illegible]	0	0001
86		G	60-60	SAT. RATE	55.2	0	0001	1	STOCK	[illegible]	0	0001
87	0		70-70	SAT. RATE	60.2	0	9000	3	STOCK	[illegible]	0	9000
88	0	G	70-70	SAT. RATE	37.4	0	9000	3	STOCK	[illegible]	0	900
MARIPOSA C												
89	0		60-60	SAT. RATE	54.1	0	9600	1	STOCK	[illegible]	0	9600
90	0	G	60-60	SAT. RATE	2.9	0	9600	1	STOCK	[illegible]	0	9600
91	0	G	70-70	SAT. RATE	5.1	0	9000	4	STOCK	[illegible]	0	9000

92	0	70-70	SAT.	RATE	47.9	0	9000	4	STOCK	1020	0	9000
MENDOCINO CO.												
93	0 G	60-60	SAT.	RATE	6.2	0	9600	1	STOCK	932	0	9600
94	0	60-60	SAT.	RATE	51.3	0	9600	1	STOCK	7670	0	9600
95	0 G	70-70	SAT.	RATE	11.8	0	9000	5	STOCK	1950	0	9000
96	0	70-70	SAT.	RATE	61.2	0	9000	5	STOCK	10200	0	9000
MERCED CO.												
97	0 G	60-60	SAT.	RATE	49.9	0	9600	1	STOCK	12800	0	9600
98	0	60-60	SAT.	RATE	29.4	0	9600	1	STOCK	7550	0	9600
99	0 G	70-70	SAT.	RATE	42.3	0	9000	6	STOCK	12900	0	9000
100	0	70-70	SAT.	RATE	46.7	0	9000	6	STOCK	14200	0	9000
MODOC CO.												
101	0	60-60	SAT.	RATE	59.0	0	9600	1	STOCK	1560	0	9600
102	0 G	60-60	SAT.	RATE	5.6	0	9600	1	STOCK	149	0	9600
103	0 G	70-70	SAT.	RATE	3.9	0	9000	7	STOCK	104	0	9000
104	0	70-70	SAT.	RATE	72.3	0	9000	7	STOCK	1910	0	9000
MONO CO.												
105	0	60-60	SAT.	RATE	11.0	0	9600	1	STOCK	9	0	9600
106	0 G	60-60	SAT.	RATE	2.9	0	9600	1	STOCK	2	0	9600
MONTEREY CO.												
107	0 G	60-60	SAT.	RATE	66.6	0	9600	1	STOCK	34800	0	9600
108	0	60-60	SAT.	RATE	24.8	0	9600	1	STOCK	13000	0	9600
NAPA CO.												
109	0 G	60-60	SAT.	RATE	62.2	0	9600	1	STOCK	11700	0	9600
110	0	60-60	SAT.	RATE	30.5	0	9600	1	STOCK	5750	0	9600
NEVADA CO.												
111	0 G	60-60	SAT.	RATE	17.0	0	9600	1	STOCK	1260	0	9600
112	0	60-60	SAT.	RATE	43.2	0	9600	1	STOCK	3210	0	9600
ORANGE CO.												
113	E	60-60	SAT.	RATE	14.5	0	0001	1	STOCK	29600	0	0001
114	G	60-60	SAT.	RATE	82.5	0	0001	1	STOCK	168000	0	0001
PLACER CO.												
115	0	60-60	SAT.	RATE	42.5	0	9600	1	STOCK	7320	0	9600
116	0 G	60-60	SAT.	RATE	29.4	0	9600	1	STOCK	5060	0	9600
117		-0--0	SAT.	RATE	100.0	0	2001		STOCK	67	0	2001
PLUMAS CO.												
118	0 G	60-60	SAT.	RATE	3.0	0	9600	1	STOCK	116	0	9600
119	0	60-60	SAT.	RATE	49.0	0	9600	1	STOCK	1910	0	9600
RIVERSIDE CO.												
120	E	60-60	SAT.	RATE	18.2	0	0001	1	STOCK	17300	1	0001
121	G	60-60	SAT.	RATE	72.0	0	0001	1	STOCK	68400	1	0001
SACRAMENTO CO.												
122	E	60-60	SAT.	RATE	31.1	0	0001	1	STOCK	47100	0	0001
123	G	60-60	SAT.	RATE	65.4	0	0001	1	STOCK	95700	0	0001
SAN BENITO CO.												
124	0	60-60	SAT.	RATE	24.2	0	9600	1	STOCK	1120	0	9600
125	0 G	60-60	SAT.	RATE	54.9	0	9600	1	STOCK	2530	0	9600
SAN BERNARDINO CO.												
126	G	60-60	SAT.	RATE	78.5	0	0001	1	STOCK	117000	1	0001
127	E	60-60	SAT.	RATE	12.8	0	0001	1	STOCK	19300	1	0001
SAN DIEGO CO.												
128	G	60-60	SAT.	RATE	73.6	0	0001	1	STOCK	224000	1	0001
129	E	60-60	SAT.	RATE	17.4	0	0001	1	STOCK	53100	1	0001
SAN FRANCISCO CO.												
130	E	60-60	SAT.	RATE	8.1	0	0001	1	STOCK	23700	0	0001
131	G	60-60	SAT.	RATE	65.1	0	0001	1	STOCK	248000	0	0001
SAN JOAQUIN CO.												

132		E	60-60	SAT. RATE	23.5	0	0001	1	STOCK	17500	0	0001
133		G	60-60	SAT. RATE	65.9	0	0001	1	STOCK	49200	0	00
SAN LUIS OBISPO CO.												
134	0		60-60	SAT. RATE	25.3	0	9600	1	STOCK	6460	0	9600
135	0	G	60-60	SAT. RATE	62.8	0	9600	1	STOCK	16000	0	9600
SAN MATEO CO.												
136		G	60-60	SAT. RATE	64.6	0	0001	1	STOCK	87300	0	0001
137		E	60-60	SAT. RATE	32.5	0	0001	1	STOCK	43900	0	0001
SANTA BARBARA CO.												
138		G	60-60	SAT. RATE	77.5	0	0001	1	STOCK	40300	0	0001
139		E	60-60	SAT. RATE	13.5	0	0001	1	STOCK	7050	0	0001
SANTA CLARA CO.												
140		E	60-60	SAT. RATE	37.8	0	0001	1	STOCK	70000	0	0001
141		G	60-60	SAT. RATE	57.6	0	0001	1	STOCK	106000	0	0001
SANTA CRUZ CO.												
142	0		60-60	SAT. RATE	23.6	0	9600	1	STOCK	7240	0	9600
143	0	G	60-60	SAT. RATE	64.5	0	9600	1	STOCK	19800	0	9600
SHASTA CO.												
144	0		60-60	SAT. RATE	72.0	0	9600	1	STOCK	13200	0	9600
145	0	G	60-60	SAT. RATE	3.3	0	9600	1	STOCK	611	0	9600
SIERRA CO.												
146	0		60-60	SAT. RATE	61.7	0	9600	1	STOCK	472	0	9600
147	0	G	60-60	SAT. RATE	2.4	0	9600	1	STOCK	2	0	9600
SISKIYOU CO.												
148	0		60-60	SAT. RATE	68.9	0	9600	1	STOCK	7440	0	9600
149	0	G	60-60	SAT. RATE	4.6	0	9600	1	STOCK	492	0	9600
SOLANO CO.												
150		G	60-60	SAT. RATE	69.4	0	0001	1	STOCK	26700	0	000
151		E	60-60	SAT. RATE	23.7	0	0001	1	STOCK	9130	0	0001
SONOMA CO.												
152	0	G	60-60	SAT. RATE	56.6	0	9600	1	STOCK	26800	0	9600
153	0		60-60	SAT. RATE	29.3	0	9600	1	STOCK	13800	0	9600
STANISLAUS CO.												
154	0	G	60-60	SAT. RATE	57.9	0	9600	1	STOCK	27800	0	9600
155	0		60-60	SAT. RATE	32.7	0	9600	1	STOCK	15700	0	9600
SUTTER CO.												
156	0		60-60	SAT. RATE	29.3	0	9600	1	STOCK	2920	0	9600
157	0	G	60-60	SAT. RATE	55.9	0	9600	1	STOCK	5570	0	9600
TEHAMA CO.												
158	0		60-60	SAT. RATE	58.1	0	9600	1	STOCK	4650	0	9600
159	0	G	60-60	SAT. RATE	14.5	0	9600	1	STOCK	1160	0	9600
TRINITY CO.												
160	0	G	60-60	SAT. RATE	9.7	0	9600	1	STOCK	305	0	9600
161	0		60-60	SAT. RATE	29.9	0	9600	1	STOCK	940	0	9600
TULARE CO.												
162	0		60-60	SAT. RATE	22.4	0	9600	1	STOCK	10900	0	9600
163	0	G	60-60	SAT. RATE	61.1	0	9600	1	STOCK	29700	0	9600
TUOLUMNE CO.												
164	0	G	60-60	SAT. RATE	2.9	0	9600	1	STOCK	146	0	9600
165	0		60-60	SAT. RATE	43.1	0	9600	1	STOCK	2170	0	9600
VENTURA CO.												
166	0		60-60	SAT. RATE	13.0	0	9600	1	STOCK	7140	0	9600
167	0	G	60-60	SAT. RATE	81.0	0	9600	1	STOCK	44400	0	960
YOLO CO.												
168	0	G	60-60	SAT. RATE	50.0	0	9600	1	STOCK	11800	0	9600
169	0		60-60	SAT. RATE	29.3	0	9600	1	STOCK	5770	0	9600
YUBA CO.												

170	0	G	60-60	SAT. RATE	62.8	0	9600	1	STOCK	6190	0	9600
171	0		60-60	SAT. RATE	22.9	0	9600	1	STOCK	2260	0	9600
SAN FRANCISCO SMSA												
172		G	60-60	SAT. RATE	74.1	0	0001	1	STOCK	684000	0	0001
173		E	60-60	SAT. RATE	21.5	0	0001	1	STOCK	198000	0	0001
BAKERSFIELD UA												
174		G	60-60	SAT. RATE	85.1	0	0001	1	STOCK	36600	0	0001
175		E	60-60	SAT. RATE	13.1	0	0001	1	STOCK	5640	0	0001
FRESNO UA												
176		E	60-60	SAT. RATE	30.6	0	0001	1	STOCK	19900	0	0001
177		G	60-60	SAT. RATE	65.6	0	0001	1	STOCK	42800	0	0001
LA - LONG BEACH SMSA												
178		G	60-60	SAT. RATE	87.2	0	0001	1	STOCK	1930000	0	0001
179		G	60-60	SAT. RATE	87.8	0	0001	1	STOCK	1880000	0	0001
180		E	60-60	SAT. RATE	9.1	0	0001	1	STOCK	195000	0	0001
181		G	60-60	SAT. RATE	87.8	0	0001	1	STOCK	1880000	0	0001
SACRAMENTO UA												
182		G	60-60	SAT. RATE	67.1	0	0001	1	STOCK	94500	0	0001
183		E	60-60	SAT. RATE	29.1	0	0001	1	STOCK	41000	0	0001
SN BRNADINO-RIV UA												
184		G	60-60	SAT. RATE	64.9	0	0001	1	STOCK	96600	0	0001
185		E	60-60	SAT. RATE	13.0	0	0001	1	STOCK	14800	0	0001
SAN DIEGO UA												
186		E	60-60	SAT. RATE	13.5	0	0001	1	STOCK	34000	0	0001
187		G	60-60	SAT. RATE	79.6	0	0001	1	STOCK	200000	0	0001
SAN JOSE UA												
188		G	60-60	SAT. RATE	58.8	0	0001	1	STOCK	102000	0	0001
189		E	60-60	SAT. RATE	58.0	0	0001	1	STOCK	66200	0	0001
SAN FRANCISCO SMSA												
190		E	60-60	SAT. RATE	9.5	0	0001	1	STOCK	212000	0	0001
SANTA BARBARA UA												
191		E	60-60	SAT. RATE	11.2	0	0001	1	STOCK	2840	0	0001
192		G	60-60	SAT. RATE	85.6	0	0001	1	STOCK	21600	0	0001
STOCKTON UA												
193		E	60-60	SAT. RATE	18.8	0	0001	1	STOCK	8310	0	0001
194		G	60-60	SAT. RATE	74.8	0	0001	1	STOCK	32900	0	0001
POMONA-ONTARIO UA												
195		E	60-60	SAT. RATE	10.1	0	0001	1	STOCK	5650	0	0001
196		G	60-60	SAT. RATE	87.7	0	0001	1	STOCK	49100	0	0001
197		G	60-60	SAT. RATE	179.3	0	2751	1	STOCK	7780000	1	2751
198			60-60	SAT. RATE	115.8	0	2751	1	STOCK	5030000	1	2751
SN BERN-RIV-ONT SMSA												
199		G	60-60	SAT. RATE	75.9	0	0001	1	STOCK	186000	1	0001
200			60-60	SAT. RATE	32.3	0	2751	1	STOCK	206000	1	2751
201		G	60-60	SAT. RATE	48.8	0	2751	1	STOCK	311000	1	2751
202		E	60-60	SAT. RATE	14.9	0	0001	1	STOCK	36700	1	0001
SF-OAK URBANIZD AREA												
203		G	60-60	SAT. RATE	76.5	0	0001	1	STOCK	624000	0	0001
204		E	60-60	SAT. RATE	19.4	0	0001	1	STOCK	158000	0	0001
UNITED STATES												
205			71-71	ADDITIONS	2300000	1	AH01					
206			72-72	ADDITIONS	2060000	1	AH01					
207			73-73	ADDITIONS	2830000	1	AH01					
208			74-74	ADDITIONS	2530000	1	AH01					

- - - - - S O U R C E F O O T N O T E S - - - - -

27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK

00011 SATURATION DERIVED FROM STOCK SIZE

90001 OCCUPIED HOUSING ONLY
96001 DERIVED FROM OCCUPIED UNITS DATA
90002 ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED
90003 SATURATION RATE DERIVED FROM STOCK SIZE
MISSING FOOTNOTE - 90004
MISSING FOOTNOTE - 90005
MISSING FOOTNOTE - 90006
MISSING FOOTNOTE - 90007
MISSING FOOTNOTE - 90008
MISSING FOOTNOTE - 90009

CALIFORNIA												
1		60-60	SAT. RATE	102.0	0	2751	1	STOCK	5080000	1	2751
ALAMEDA CO.												
2	E	60-60	SAT. RATE	25.8	0	0001	1	STOCK	76300	0	0001
3	E	60-60	SAT. RATE	77.0	0	0001	1	STOCK	227000	0	0001
4	0	70-70	SAT. RATE	129.5	0	9000	A	STOCK	473000	2	9000
ALPINE CO.											
5		60-60	SAT. RATE	56.9	0	2751	1	STOCK	62	1	2751
6	0	70-70	SAT. RATE	103.1	0	9000	B	STOCK	132	2	9000
AMADOR CO.											
7		60-60	SAT. RATE	90.2	0	2751	1	STOCK	2830	1	2751
8	0	70-70	SAT. RATE	111.8	0	9000	C	STOCK	4450	2	9000
BUTTE CO.											
9		60-60	SAT. RATE	88.8	0	2751	1	STOCK	24200	1	2751
10	0	70-70	SAT. RATE	113.3	0	9000	D	STOCK	396000	2	9000
CALAVERAS CO.											
11		60-60	SAT. RATE	89.2	0	2751	1	STOCK	3090	1	2751
12	0	70-70	SAT. RATE	123.3	0	9000	E	STOCK	553000	2	9000
COLUSA CO.											
13		60-60	SAT. RATE	88.8	0	2751	1	STOCK	3480	1	2751
14	0	70-70	SAT. RATE	111.2	0	9000	F	STOCK	4850	2	9000
CONTRA COSTA CO.											
15	E	60-60	SAT. RATE	80.3	0	0001	1	STOCK	95300	0	0001
16	E	60-60	SAT. RATE	24.8	0	0001	1	STOCK	29200	0	0001
17	0	70-70	SAT. RATE	137.5	0	9000	G	STOCK	237000	2	9000
DEL NORTE CO.											
18		60-60	SAT. RATE	80.3	0	2751	1	STOCK	4200	1	2751
19	0	70-70	SAT. RATE	104.5	0	9000	H	STOCK	4990	2	9000
EL DORADO CO.											
20		60-60	SAT. RATE	96.0	0	2751	1	STOCK	9390	1	2751
21	0	70-70	SAT. RATE	119.2	0	9000	I	STOCK	17800	2	9000
FRESNO CO.											
22	E	60-60	SAT. RATE	15.8	0	0001	1	STOCK	17900	0	0001
23	E	60-60	SAT. RATE	78.7	0	0001	1	STOCK	84100	0	0001
24	0	70-70	SAT. RATE	124.4	0	9000	J	STOCK	158000	2	9000
GLENN CO											
25		60-60	SAT. RATE	96.1	0	2751	1	STOCK	5110	1	2751
26	0	70-70	SAT. RATE	121.3	0	9000	K	STOCK	6930	2	9000
HUMBOLDT CO.											
27		60-60	SAT. RATE	93.8	0	2751	1	STOCK	29500	1	2751
28	0	70-70	SAT. RATE	116.2	0	9000	L	STOCK	38300	2	9000
IMPERIAL CO.											
29		60-60	SAT. RATE	78.5	0	2751	1	STOCK	14600	1	2751
30	0	70-70	SAT. RATE	84.8	0	9000	M	STOCK	17800	2	9000
INYO CO.											
31		60-60	SAT. RATE	67.3	0	2751	1	STOCK	2730	1	2751
32	0	70-70	SAT. RATE	102.3	0	9000	N	STOCK	5700	2	9000
KERN CO.											
33	E	60-60	SAT. RATE	80.2	0	0001	1	STOCK	68700	0	0001
34	E	60-60	SAT. RATE	15.4	0	0001	1	STOCK	13200	0	0001
35	0	70-70	SAT. RATE	123.5	0	9000	O	STOCK	126000	2	9000
KINGS CO.											
36		60-60	SAT. RATE	87.2	0	2751	1	STOCK	12400	1	2751
37	0	70-70	SAT. RATE	116.5	0	9000	P	STOCK	21600	2	9000
LAKE CO.											
38		60-60	SAT. RATE	78.3	0	2751	1	STOCK	3990	1	2751
39	0	70-70	SAT. RATE	109.2	0	9000	Q	STOCK	8240	2	9000

LASSEN CO.												
40		60-60	SAT. RATE	77.7	0	2751	1	STOCK	[illegible]	[illegible]	1	275
41	0	70-70	SAT. RATE	106.6	0	9000	R	STOCK	[illegible]	[illegible]	2	900
LOS ANGELES CO.												
42	E	60-60	SAT. RATE	76.8	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
43	E	60-60	SAT. RATE	29.5	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
44	0	70-70	SAT. RATE	133.9	0	9000	S	STOCK	[illegible]	[illegible]	2	9000
MADERA CO.												
45		60-60	SAT. RATE	90.4	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
46	0	70-70	SAT. RATE	115.8	0	9000	T	STOCK	[illegible]	[illegible]	2	9000
MARIN CO.												
47	E	60-60	SAT. RATE	26.9	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
48	E	60-60	SAT. RATE	76.9	0	0001	1	STOCK	[illegible]	[illegible]	0	0001
49	0	70-70	SAT. RATE	136.2	0	9000	U	STOCK	[illegible]	[illegible]	2	9000
MARIPOSA C												
50		60-60	SAT. RATE	74.0	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
51	0	70-70	SAT. RATE	101.5	0	9000	V	STOCK	[illegible]	[illegible]	2	9000
MENDOCINO CO.												
52		60-60	SAT. RATE	76.2	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
53	0	70-70	SAT. RATE	104.1	0	9000	W	STOCK	[illegible]	[illegible]	2	9000
MERCED CO.												
54		60-60	SAT. RATE	93.5	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
55	0	70-70	SAT. RATE	117.9	0	9000	X	STOCK	[illegible]	[illegible]	2	9000
MODOC CO.												
56		60-60	SAT. RATE	75.1	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
57	0	70-70	SAT. RATE	101.7	0	9000	Y	STOCK	[illegible]	[illegible]	2	9000
MONO CO.												
58		60-60	SAT. RATE	60.2	0	2751	1	STOCK	[illegible]	[illegible]	1	275
MONTEREY CO.												
59		60-60	SAT. RATE	96.4	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
NAPA CO.												
60		60-60	SAT. RATE	97.4	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
NEVADA CO.												
61		60-60	SAT. RATE	90.4	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
ORANGE CO.												
62	E	60-60	SAT. RATE	79.0	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
63	E	60-60	SAT. RATE	32.6	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
PLACER CO.												
64		60-60	SAT. RATE	94.4	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
PLUMAS CO.												
65		60-60	SAT. RATE	78.9	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
RIVERSIDE CO.												
66	E	60-60	SAT. RATE	19.9	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
67	E	60-60	SAT. RATE	77.2	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
SACRAMENTO CO.												
68	E	60-60	SAT. RATE	25.4	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
69	E	60-60	SAT. RATE	78.6	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
SAN BENITO CO.												
70		60-60	SAT. RATE	89.6	0	2751	1	STOCK	[illegible]	[illegible]	1	2751
SAN BERNARDINO CO.												
71	E	60-60	SAT. RATE	20.3	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
72	E	60-60	SAT. RATE	79.2	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
SAN DIEGO CO.												
73	E	60-60	SAT. RATE	79.1	0	0001	1	STOCK	[illegible]	[illegible]	1	000
74	E	60-60	SAT. RATE	25.8	0	0001	1	STOCK	[illegible]	[illegible]	1	0001
SAN FRANCISCO CO.												
75	E	60-60	SAT. RATE	67.4	0	0001	1	STOCK	[illegible]	[illegible]	1	0001

76	E	60-60	SAT. RATE	18.8	0	0001	1	STOCK	55000	0	0001
SAN JOAQUIN CO.											
77	E	60-60	SAT. RATE	12.5	0	0001	1	STOCK	9390	0	0001
78	E	60-60	SAT. RATE	79.0	0	0001	1	STOCK	59000	0	0001
SAN LUIS OBISPO CO.											
79		60-60	SAT. RATE	90.9	0	2751	1	STOCK	23200	1	2751
SAN MATEO CO.											
80	E	60-60	SAT. RATE	36.4	0	0001	1	STOCK	49200	0	0001
81	E	60-60	SAT. RATE	75.9	0	0001	1	STOCK	103000	0	0001
SANTA BARBARA CO.											
82	E	60-60	SAT. RATE	17.1	0	0001	1	STOCK	8940	0	0001
83	E	60-60	SAT. RATE	78.0	0	0001	1	STOCK	40500	0	0001
SANTA CLARA CO.											
84	E	60-60	SAT. RATE	79.4	0	0001	1	STOCK	146000	0	0001
85	E	60-60	SAT. RATE	24.5	0	0001	1	STOCK	45300	0	0001
SANTA CRUZ CO.											
86		60-60	SAT. RATE	93.4	0	2751	1	STOCK	28600	1	2751
SHASTA CO.											
87		60-60	SAT. RATE	95.7	0	2751	1	STOCK	17500	1	2751
SIERRA CO.											
88		60-60	SAT. RATE	76.4	0	2751	1	STOCK	584	1	2751
SISKIYOU CO.											
89		60-60	SAT. RATE	78.4	0	2751	1	STOCK	8550	1	2751
SOLANO CO.											
90	E	60-60	SAT. RATE	24.3	0	0001	1	STOCK	9350	0	0001
91	E	60-60	SAT. RATE	60.8	0	0001	1	STOCK	31000	0	0001
SONOMA CO.											
92		60-60	SAT. RATE	92.1	0	2751	1	STOCK	43500	1	2751
STANISLAUS CO.											
93		60-60	SAT. RATE	87.9	0	2751	1	STOCK	42200	1	2751
SUTTER CO.											
94		60-60	SAT. RATE	95.2	0	2751	1	STOCK	9490	1	2751
TEHAMA CO.											
95		60-60	SAT. RATE	98.2	0	2751	1	STOCK	7860	1	2751
TRINITY CO.											
96		60-60	SAT. RATE	73.7	0	2751	1	STOCK	2310	1	2751
TULARE CO.											
97		60-60	SAT. RATE	90.4	0	2751	1	STOCK	43900	1	2751
TUOLUMNE CO.											
98		60-60	SAT. RATE	85.9	0	2751	1	STOCK	4330	1	2751
VENTURA CO.											
99		60-60	SAT. RATE	105.2	0	2751	1	STOCK	56500	1	2751
YOLO CO.											
100		60-60	SAT. RATE	95.5	0	2751	1	STOCK	18800	1	2751
YUBA CO.											
101		60-60	SAT. RATE	95.2	0	2751	1	STOCK	9380	1	2751
SAN FRANCISCO SMSA											
102	E	60-60	SAT. RATE	75.0	0	0001	1	STOCK	692000	0	0001
103	E	60-60	SAT. RATE	25.0	0	0001	1	STOCK	231000	0	0001
BAKERSFIELD UA											
104	E	60-60	SAT. RATE	15.0	0	0001	1	STOCK	7770	0	0001
105	E	60-60	SAT. RATE	80.0	0	0001	1	STOCK	34700	0	0001
FRESNO UA											
106	E	60-60	SAT. RATE	79.8	0	0001	1	STOCK	52100	0	0001
107	E	60-60	SAT. RATE	19.1	0	0001	1	STOCK	12400	0	0001
LA - LONG BEACH SMSA											
108	E	60-60	SAT. RATE	77.0	0	0001	1	STOCK	1640000	0	0001

109	E	60-60	SAT. RATE	29.9	0	0001	1	STOCK	641000	0	0001
110	E	60-60	SAT. RATE	77.6	0	0001	1	STOCK	1700000	0	0[illegible]
111	E	60-60	SAT. RATE	29.8	0	0001	1	STOCK	661000	0	0001
SACRAMENTO UA											
112	E	60-60	SAT. RATE	78.4	0	0001	1	STOCK	110000	0	0001
113	E	60-60	SAT. RATE	24.8	0	0001	1	STOCK	35000	0	0001
SN BRNADINO-RIV UA											
114	E	60-60	SAT. RATE	81.0	0	0001	1	STOCK	92200	0	0001
115	E	60-60	SAT. RATE	21.5	0	0001	1	STOCK	24500	0	0001
SAN DIEGO UA											
116	E	60-60	SAT. RATE	78.7	0	0001	1	STOCK	198000	0	0001
117	E	60-60	SAT. RATE	25.1	0	0001	1	STOCK	63300	0	0001
SAN JOSE UA											
118	E	60-60	SAT. RATE	79.4	0	0001	1	STOCK	138000	0	0001
119	E	60-60	SAT. RATE	24.8	0	0001	1	STOCK	43300	0	0001
SANTA BARBARA UA											
120	E	60-60	SAT. RATE	75.6	0	0001	1	STOCK	19100	0	0001
121	E	60-60	SAT. RATE	14.4	0	0001	1	STOCK	3640	0	0001
STOCKTON UA											
122	E	60-60	SAT. RATE	77.2	0	0001	1	STOCK	34000	0	0001
123	E	60-60	SAT. RATE	13.5	0	0001	1	STOCK	5950	0	0001
POMONA-ONTARIO UA											
124	E	60-60	SAT. RATE	28.1	0	0001	1	STOCK	15700	0	0001
125	E	60-60	SAT. RATE	80.3	0	0001	1	STOCK	44900	0	0001
126		60-60	SAT. RATE	103.6	0	2751	1	STOCK	4500000	1	2751
SN BERN-RIV-ONT SMSA											
127	E	60-60	SAT. RATE	20.2	0	0001	1	STOCK	49500	1	0001
128		60-60	SAT. RATE	21.6	0	2751	1	STOCK	134000	1	27
129	E	60-60	SAT. RATE	78.4	0	0001	1	STOCK	192000	1	0001
SF-OAK URBANIZD AREA											
130	E	60-60	SAT. RATE	74.2	0	0001	1	STOCK	605000	0	0001
131	E	60-60	SAT. RATE	29.4	0	0001	1	STOCK	207000	0	0001

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27511 SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK
00011 SATURATION DERIVED FROM STOCK SIZE
MISSING FOOTNOTE - 9000A
MISSING FOOTNOTE - 9000B
MISSING FOOTNOTE - 9000C
MISSING FOOTNOTE - 9000D
MISSING FOOTNOTE - 9000E
MISSING FOOTNOTE - 9000F
MISSING FOOTNOTE - 9000G
MISSING FOOTNOTE - 9000H
MISSING FOOTNOTE - 9000I
MISSING FOOTNOTE - 9000J
MISSING FOOTNOTE - 9000K
MISSING FOOTNOTE - 9000L
MISSING FOOTNOTE - 9000M
MISSING FOOTNOTE - 9000N
MISSING FOOTNOTE - 9000O
MISSING FOOTNOTE - 9000P
MISSING FOOTNOTE - 9000Q
MISSING FOOTNOTE - 9000R
MISSING FOOTNOTE - 9000S
MISSING FOOTNOTE - 9000T
MISSING FOOTNOTE - 9000U
MISSING FOOTNOTE - 9000V

MISSING FOOTNOTE - 9000W
MISSING FOOTNOTE - 9000X
MISSING FOOTNOTE - 9000Y

SDG+E SERVICE AREA

1		E	74-74 STOCK	9	0	2000	ADDITIONS	9200	0	20[illegible]
2	2	E	74-74 STOCK	62500	0	2000	ADDITIONS	7390	0	20[illegible]
3	3	E	74-74 STOCK	1930	0	2000	ADDITIONS	80	0	2000
4	1	E	74-74 STOCK	28700	0	2000	ADDITIONS	1560	0	2000

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2000T ALL HOMES
2000F MULTI-FAMILY UNITS
2000A MOBILE HOMES
2000S NEW INDIVIDUAL (SINGLE-FAMILY) HOMES

CALIFORNIA													
1		G	60-60	SAT. RATE	87.0	0	2751	1	STOCK	4330000	1	2751
2			60-60	SAT. RATE	6.6	0	2751	1	STOCK	329000	1	2751
ALAMEDA CO.												
3		E	60-60	SAT. RATE	2.1	0	0001	1	STOCK	6430	0	0001
4		G	60-60	SAT. RATE	94.8	0	0001	1	STOCK	280000	0	0001
5	0	G	70-70	SAT. RATE	92.6	0	9000	1	STOCK	338000	0	9000
6	0		70-70	SAT. RATE	5.0	0	9000	1	STOCK	18400	0	9000
ALPINE CO.												
7	0		60-60	SAT. RATE	28.4	0	9600	1	STOCK	3	0	9600
8	0		70-70	SAT. RATE	52.3	0	9000	2	STOCK	67	0	9000
AMADOR CO.												
9	0	G	60-60	SAT. RATE	3.6	0	9600	1	STOCK	113	0	9600
10	0		60-60	SAT. RATE	44.6	0	9600	1	STOCK	1400	0	9600
11	0	G	70-70	SAT. RATE	22.7	0	9000	3	STOCK	901	0	9000
12	0		70-70	SAT. RATE	49.3	0	9000	3	STOCK	1960	0	9000
BUTTE CO.												
13	0		60-60	SAT. RATE	20.0	0	9600	1	STOCK	5450	0	9600
14	0	G	60-60	SAT. RATE	61.6	0	9600	1	STOCK	16800	0	9600
15	0		70-70	SAT. RATE	20.5	0	9000	4	STOCK	7190	0	9000
16	0	G	70-70	SAT. RATE	68.3	0	9000	4	STOCK	23900	0	9000
CALAVERAS CO.												
17	0	G	60-60	SAT. RATE	6.3	0	9600	1	STOCK	218	0	9600
18	0		60-60	SAT. RATE	38.1	0	9600	1	STOCK	1320	0	9600
19	0		70-70	SAT. RATE	53.3	0	9000	5	STOCK	2390	0	9000
20	0	G	70-70	SAT. RATE	2.7	0	9000	5	STOCK	120	0	9000
COLUSA CO.												
21	0	G	60-60	SAT. RATE	47.1	0	9600	1	STOCK	1840	0	9600
22	0		60-60	SAT. RATE	31.8	0	9600	1	STOCK	1240	0	9600
23	0	G	70-70	SAT. RATE	58.1	0	9000	6	STOCK	2530	0	9000
24	0		70-70	SAT. RATE	29.4	0	9000	6	STOCK	1280	0	9000
CONTRA COSTA CO.												
25		G	60-60	SAT. RATE	92.2	0	0001	1	STOCK	108000	0	0001
26		E	60-60	SAT. RATE	4.3	0	0001	1	STOCK	5160	0	0001
27	0	G	70-70	SAT. RATE	92.0	0	9000	7	STOCK	160000	0	9000
28	0		70-70	SAT. RATE	4.0	0	9000	7	STOCK	8030	0	9000
DEL NORTE CO.												
29	0	G	60-60	SAT. RATE	1.5	0	9600	1	STOCK	8	0	9600
30	0		60-60	SAT. RATE	67.6	0	9600	1	STOCK	3540	0	9600
31	0		70-70	SAT. RATE	74.6	0	9000	8	STOCK	3560	0	9000
32	0	G	70-70	SAT. RATE	3.2	0	9000	8	STOCK	154	0	9000
EL DORADO CO.												
33	0	G	60-60	SAT. RATE	3.3	0	9600	1	STOCK	321	0	9600
34	0		60-60	SAT. RATE	47.2	0	9600	1	STOCK	4610	0	9600
35	0	G	70-70	SAT. RATE	19.4	0	9000	9	STOCK	2900	0	9000
36	0		70-70	SAT. RATE	38.7	0	9000	9	STOCK	5790	0	9000
FRESNO CO.												
37		G	60-60	SAT. RATE	74.8	0	0001	1	STOCK	79900	0	0001
38		E	60-60	SAT. RATE	8.9	0	0001	1	STOCK	9560	0	0001
39	0	G	70-70	SAT. RATE	96.9	0	9000	1	STOCK	103000	0	9000
40	0		70-70	SAT. RATE	8.1	0	9000	1	STOCK	10200	0	9000
GLENN CO												
41	0	G	60-60	SAT. RATE	40.0	0	9600	1	STOCK	2160	0	9600
42	0		60-60	SAT. RATE	40.5	0	9600	1	STOCK	2150	0	9600
43	0		70-70	SAT. RATE	38.2	0	9000	2	STOCK	2070	0	9000
44	0	G	70-70	SAT. RATE	47.7	0	9000	2	STOCK	2720	0	9000
HUMBOLDT CO.												

45	0		60-60	SAT. RATE	28.4	0	9600	1	STOCK	[illegible]	0	9600
46	0	G	60-60	SAT. RATE	48.3	0	9600	1	STOCK	[illegible]	0	96[illegible]
47	0		70-70	SAT. RATE	26.6	0	9000	3	STOCK	[illegible]	0	90[illegible]
48	0	G	70-70	SAT. RATE	64.1	0	9000	3	STOCK	[illegible]	0	9000
IMPERIAL CO.												
49	0		60-60	SAT. RATE	25.6	0	9600	1	STOCK	[illegible]	0	9600
50	0	G	60-60	SAT. RATE	53.7	0	9600	1	STOCK	[illegible]	0	9600
51	0		70-70	SAT. RATE	30.7	0	9000	4	STOCK	[illegible]	0	9000
52	0	G	70-70	SAT. RATE	58.9	0	9000	4	STOCK	[illegible]	0	9000
INYO CO.												
53	0	G	60-60	SAT. RATE	2.3	0	9600	1	STOCK	[illegible]	0	9600
54	0		60-60	SAT. RATE	45.7	0	9600	1	STOCK	[illegible]	0	9600
55	0	G	70-70	SAT. RATE	2.9	0	9000	5	STOCK	[illegible]	0	9000
56	0		70-70	SAT. RATE	36.2	0	9000	5	STOCK	[illegible]	0	9000
KERN CO.												
57		E	60-60	SAT. RATE	5.1	0	0001	1	STOCK	[illegible]	0	0001
58		G	60-60	SAT. RATE	83.7	0	0001	1	STOCK	[illegible]	0	0001
59	0		70-70	SAT. RATE	5.4	0	9000	6	STOCK	[illegible]	0	9000
60	0	G	70-70	SAT. RATE	88.0	0	9000	6	STOCK	[illegible]	0	9000
KINGS CO.												
61	0		60-60	SAT. RATE	12.8	0	9600	1	STOCK	[illegible]	0	9600
62	0	G	60-60	SAT. RATE	64.0	0	9600	1	STOCK	[illegible]	0	9600
63	0	G	70-70	SAT. RATE	77.5	0	9000	7	STOCK	[illegible]	0	9000
64	0		70-70	SAT. RATE	12.5	0	9000	7	STOCK	[illegible]	0	9000
LAKE CO.												
65	0	G	60-60	SAT. RATE	.7	0	9600	1	STOCK	[illegible]	0	9600
66	0		60-60	SAT. RATE	44.0	0	9600	1	STOCK	[illegible]	0	9600
67	0		70-70	SAT. RATE	53.6	0	9000	8	STOCK	[illegible]	0	90[illegible]
68	0	G	70-70	SAT. RATE	2.8	0	9000	8	STOCK	[illegible]	0	9000
LASSEN CO.												
69	0		60-60	SAT. RATE	53.0	0	9600	1	STOCK	[illegible]	0	9600
70	0	G	60-60	SAT. RATE	1.6	0	9600	1	STOCK	[illegible]	0	9600
71	0	G	70-70	SAT. RATE	5.2	0	9000	9	STOCK	[illegible]	0	9000
72	0		70-70	SAT. RATE	64.5	0	9000	9	STOCK	[illegible]	0	9000
LOS ANGELES CO.												
73		E	60-60	SAT. RATE	2.8	0	0001	1	STOCK	[illegible]	0	0001
74		G	60-60	SAT. RATE	94.4	0	0001	1	STOCK	[illegible]	0	0001
75	0		70-70	SAT. RATE	5.9	0	9000	1	STOCK	[illegible]	0	9000
76	0	G	70-70	SAT. RATE	92.4	0	9000	1	STOCK	[illegible]	0	9000
MADERA CO.												
77	0		60-60	SAT. RATE	15.9	0	9600	1	STOCK	[illegible]	0	9600
78	0	G	60-60	SAT. RATE	51.2	0	9600	1	STOCK	[illegible]	0	9600
79	0		70-70	SAT. RATE	17.3	0	9000	2	STOCK	[illegible]	0	9000
80	0	G	70-70	SAT. RATE	56.2	0	9000	2	STOCK	[illegible]	0	9000
MARIN CO.												
81		G	60-60	SAT. RATE	87.6	0	0001	1	STOCK	[illegible]	0	0001
82		E	60-60	SAT. RATE	5.5	0	0001	1	STOCK	[illegible]	0	0001
83	0		70-70	SAT. RATE	7.8	0	9000	3	STOCK	[illegible]	0	9000
84	0	G	70-70	SAT. RATE	85.0	0	9000	3	STOCK	[illegible]	0	9000
MARIPOSA C												
85	0	G	60-60	SAT. RATE	2.2	0	9600	1	STOCK	[illegible]	0	9600
86	0		60-60	SAT. RATE	44.6	0	9600	1	STOCK	[illegible]	0	9600
87	0		70-70	SAT. RATE	54.1	0	9000	4	STOCK	[illegible]	0	9000
88	0	G	70-70	SAT. RATE	3.1	0	9000	4	STOCK	[illegible]	0	9000
MENDOCINO CO.												
89	0		60-60	SAT. RATE	50.8	0	9600	1	STOCK	[illegible]	0	9600
90	0	G	60-60	SAT. RATE	7.2	0	9600	1	STOCK	[illegible]	0	9600

91	0	70-70	SAT.	RATE	59.7	0	9000	5	STOCK	9920	0	9000
92	0 G	70-70	SAT.	RATE	12.8	0	9000	5	STOCK	2130	0	9000
MERCED CO.												
93	0 G	60-60	SAT.	RATE	59.9	0	9600	1	STOCK	15400	0	9600
94	0	60-60	SAT.	RATE	17.1	0	9600	1	STOCK	4400	0	9600
95	0	70-70	SAT.	RATE	16.5	0	9000	6	STOCK	5040	0	9000
96	0 G	70-70	SAT.	RATE	69.4	0	9000	6	STOCK	21200	0	9000
MODOC CO.												
97	0 G	60-60	SAT.	RATE	3.4	0	9600	1	STOCK	9	0	9600
98	0	60-60	SAT.	RATE	72.6	0	9600	1	STOCK	1920	0	9600
99	0	70-70	SAT.	RATE	82.6	0	9000	7	STOCK	2180	0	9000
100	0 G	70-70	SAT.	RATE	1.3	0	9000	7	STOCK	4	0	9000
MONO CO.												
101	0	60-60	SAT.	RATE	12.5	0	9600	1	STOCK	105	0	9600
102	0 G	60-60	SAT.	RATE	2.9	0	9600	1	STOCK	2	0	9600
MONTEREY CO.												
103	0	60-60	SAT.	RATE	9.7	0	9600	1	STOCK	5680	0	9600
104	0 G	60-60	SAT.	RATE	81.2	0	9600	1	STOCK	42400	0	9600
NAPA CO.												
105	0	60-60	SAT.	RATE	11.8	0	9600	1	STOCK	2230	0	9600
106	0 G	60-60	SAT.	RATE	80.2	0	9600	1	STOCK	15100	0	9600
NEVADA CO.												
107	0 G	60-60	SAT.	RATE	17.0	0	9600	1	STOCK	1270	0	9600
108	0	60-60	SAT.	RATE	41.1	0	9600	1	STOCK	3050	0	9600
ORANGE CO.												
109	G	60-60	SAT.	RATE	94.1	0	0001	1	STOCK	191000	0	0001
110	E	60-60	SAT.	RATE	3.1	0	0001	1	STOCK	6430	0	0001
PLACER CO.												
111	0 G	60-60	SAT.	RATE	35.4	0	9600	1	STOCK	6100	0	9600
112	0	60-60	SAT.	RATE	36.6	0	9600	1	STOCK	6300	0	9600
PLUMAS CO.												
113	0 G	60-60	SAT.	RATE	2.0	0	9600	1	STOCK	8	0	9600
114	0	60-60	SAT.	RATE	58.2	0	9600	1	STOCK	2260	0	9600
RIVERSIDE CO.												
115	E	60-60	SAT.	RATE	8.7	0	0001	1	STOCK	8310	1	0001
116	G	60-60	SAT.	RATE	60.9	0	0001	1	STOCK	76900	1	0001
SACRAMENTO CO.												
117	G	60-60	SAT.	RATE	85.4	0	0001	1	STOCK	129000	0	0001
118	E	60-60	SAT.	RATE	9.9	0	0001	1	STOCK	14900	1	0001
SAN BENITO CO.												
119	0 G	60-60	SAT.	RATE	63.0	0	9600	1	STOCK	2910	0	9600
120	0	60-60	SAT.	RATE	15.9	0	9600	1	STOCK	733	0	9600
SAN BERNARDINO CO.												
121	E	60-60	SAT.	RATE	6.5	0	0001	1	STOCK	9900	1	0001
122	G	60-60	SAT.	RATE	84.5	0	0001	1	STOCK	126000	1	0001
SAN DIEGO CO.												
123	E	60-60	SAT.	RATE	13.4	0	0001	1	STOCK	31900	1	0001
124	G	60-60	SAT.	RATE	82.6	0	0001	1	STOCK	253000	1	0001
SAN FRANCISCO CO.												
125	G	60-60	SAT.	RATE	95.0	0	0001	1	STOCK	278000	0	0001
126	E	60-60	SAT.	RATE	1.1	0	0001	1	STOCK	3470	0	0001
SAN JOAQUIN CO.												
127	G	60-60	SAT.	RATE	83.4	0	0001	1	STOCK	62300	0	0001
128	E	60-60	SAT.	RATE	6.1	0	0001	1	STOCK	4590	0	0001
SAN LUIS OBISPO CO.												
129	0	60-60	SAT.	RATE	16.1	0	9600	1	STOCK	4110	0	9600
130	0 G	60-60	SAT.	RATE	72.8	0	9600	1	STOCK	18500	0	9600

SAN MATEO CO.												
131	E	60-60	SAT.	RATE	3.0	0	0001	1	STOCK	4170	0	000
132	G	60-60	SAT.	RATE	94.1	0	0001	1	STOCK	127000	0	000
SANTA BARBARA CO.												
133	G	60-60	SAT.	RATE	84.5	0	0001	1	STOCK	43900	0	0001
134	E	60-60	SAT.	RATE	8.0	0	0001	1	STOCK	4200	0	0001
SANTA CLARA CO.												
135	E	60-60	SAT.	RATE	4.2	0	0001	1	STOCK	7820	0	0001
136	G	60-60	SAT.	RATE	91.1	0	0001	1	STOCK	168000	0	0001
SANTA CRUZ CO.												
137	O	60-60	SAT.	RATE	12.6	0	9600	1	STOCK	3860	0	9600
138	O G	60-60	SAT.	RATE	75.3	0	9600	1	STOCK	23100	0	9600
SHASTA CO.												
139	O G	60-60	SAT.	RATE	2.3	0	9600	1	STOCK	417	0	9600
140	O	60-60	SAT.	RATE	77.8	0	9600	1	STOCK	14200	0	9600
SIERRA CO.												
141	O	60-60	SAT.	RATE	57.3	0	9600	1	STOCK	438	0	9600
142	O G	60-60	SAT.	RATE	2.4	0	9600	1	STOCK	2	0	9600
SISKIYOU CO.												
143	O G	60-60	SAT.	RATE	3.7	0	9600	1	STOCK	403	0	9600
144	O	60-60	SAT.	RATE	74.6	0	9600	1	STOCK	8050	0	9600
SOLANO CO.												
145		60-60	SAT.	RATE	6.6	0	0001	1				
146	G	60-60	SAT.	RATE	87.2	0	0001	1	STOCK	33500	0	0001
SONOMA CO.												
147	O	60-60	SAT.	RATE	14.4	0	9600	1	STOCK	6810	0	9600
148	O G	60-60	SAT.	RATE	72.3	0	9600	1	STOCK	34100	0	9600
STANISLAUS CO.												
149	O	60-60	SAT.	RATE	13.6	0	9600	1	STOCK	6630	0	9600
150	O G	60-60	SAT.	RATE	75.3	0	9600	1	STOCK	36100	0	9600
SUTTER CO.												
151	O G	60-60	SAT.	RATE	69.1	0	9600	1	STOCK	6880	0	9600
152	O	60-60	SAT.	RATE	13.3	0	9600	1	STOCK	1330	0	9600
TEHAMA CO.												
153	O	60-60	SAT.	RATE	54.5	0	9600	1	STOCK	4360	0	9600
154	O G	60-60	SAT.	RATE	18.0	0	9600	1	STOCK	1440	0	9600
TRINITY CO.												
155	O G	60-60	SAT.	RATE	2.5	0	9600	1	STOCK	8	0	9600
156	O	60-60	SAT.	RATE	54.5	0	9600	1	STOCK	1710	0	9600
TULARE CO.												
157	O	60-60	SAT.	RATE	15.7	0	9600	1	STOCK	7640	0	9600
158	O G	60-60	SAT.	RATE	64.0	0	9600	1	STOCK	31400	0	9600
TUOLUMNE CO.												
159	O	60-60	SAT.	RATE	43.9	0	9600	1	STOCK	2210	0	9600
160	O G	60-60	SAT.	RATE	2.0	0	9600	1	STOCK	103	0	9600
VENTURA CO.												
161	O G	60-60	SAT.	RATE	86.1	0	9600	1	STOCK	47100	0	9600
162	O	60-60	SAT.	RATE	7.3	0	9600	1	STOCK	4000	0	9600
YOLO CO.												
163	O	60-60	SAT.	RATE	12.4	0	9600	1	STOCK	2430	0	9600
164	O G	60-60	SAT.	RATE	76.8	0	9600	1	STOCK	15100	0	9600
YUBA CO.												
165	O	60-60	SAT.	RATE	14.5	0	9600	1	STOCK	1430	0	960
166	O G	60-60	SAT.	RATE	70.7	0	9600	1	STOCK	6970	0	960
SAN FRANCISCO SMSA												
167	G	60-60	SAT.	RATE	93.8	0	0001	1	STOCK	866000	0	0001
168	E	60-60	SAT.	RATE	2.6	0	0001	1	STOCK	24100	0	0001

BAKERSFIELD UA												
169	E	60-60	SAT. RATE	1.2	0	0001	1	STOCK	540	0	0001
170	G	60-60	SAT. RATE	96.1	0	0001	1	STOCK	41400	0	0001
FRESNO UA												
171	G	60-60	SAT. RATE	92.9	0	0001	1	STOCK	60600	0	0001
172	E	60-60	SAT. RATE	3.3	0	0001	1	STOCK	2150	0	0001
LA - LONG BEACH SMSA												
173	G	60-60	SAT. RATE	94.3	0	0001	1	STOCK	2090000	0	0001
174	E	60-60	SAT. RATE	2.8	0	0001	1	STOCK	62300	0	0001
SACRAMENTO UA												
175	G	60-60	SAT. RATE	89.9	0	0001	1	STOCK	127000	0	0001
176	E	60-60	SAT. RATE	6.7	0	0001	1	STOCK	9520	0	0001
SN BRNADINO-RIV UA												
177	G	60-60	SAT. RATE	95.3	0	0001	1	STOCK	108000	0	0001
178	E	60-60	SAT. RATE	2.3	0	0001	1	STOCK	2650	0	0001
SAN DIEGO UA												
179	E	60-60	SAT. RATE	6.0	0	0001	1	STOCK	15200	0	0001
180	G	60-60	SAT. RATE	89.6	0	0001	1	STOCK	225000	0	0001
SAN JOSE UA												
181	E	60-60	SAT. RATE	3.2	0	0001	1	STOCK	5510	0	0001
182	G	60-60	SAT. RATE	93.6	0	0001	1	STOCK	163000	0	0001
SANTA BARBARA UA												
183	E	60-60	SAT. RATE	3.3	0	0001	1	STOCK	840	0	0001
184	G	60-60	SAT. RATE	92.9	0	0001	1	STOCK	23500	0	0001
STOCKTON UA												
185	G	60-60	SAT. RATE	93.3	0	0001	1	STOCK	41100	0	0001
186	E	60-60	SAT. RATE	1.7	0	0001	1	STOCK	760	0	0001
POMONA-ONTARIO UA												
187	E	60-60	SAT. RATE	1.8	0	0001	1	STOCK	1040	0	0001
188		60-60	SAT. RATE	104.2	0	2751	1	STOCK	4520000	1	2751
SN BERN-RIV-ONT SMSA												
189	E	60-60	SAT. RATE	7.4	0	0001	1	STOCK	18200	1	0001
190	G	60-60	SAT. RATE	83.1	0	0001	1	STOCK	204000	1	0001
SF-OAK URBANIZD AREA												
191	E	60-60	SAT. RATE	1.7	0	0001	1	STOCK	14600	0	0001
192	G	60-60	SAT. RATE	95.2	0	0001	1	STOCK	777000	0	0001

S O U R C E S

AH01 AHAM SALES DATA BY STATE. COVERS MAJOR APPLIANCES EXCEPT TV. IMPORTS
AH01 PARTIALLY COUNTED. WE HAVE 71-74. BIAS LOW.
CT69 MONTHLY REPORT OF BUILDING PERMIT ACTIVITY IN THE CITIES AND COUNTIES
CT69 OF CALIFORNIA, ECONOMIC RESEARCH DEPARTMENT, SECURITY PACIFIC NATL
CT69 BANK, DECEMBER 1969, LOS ANGELES, CA
CT70 MONTHLY REPORT OF BUILDING PERMIT ACTIVITY IN THE CITIES AND COUNTIES
CT70 OF CALIFORNIA, ECONOMIC RESEARCH DEPARTMENT, SECURITY PACIFIC NATL
CT70 BANK, DECEMBER 1970, LOS ANGELES, CA
CT71 MONTHLY REPORT OF BUILDING PERMIT ACTIVITY IN THE CITIES AND COUNTIES
CT71 OF CALIFORNIA, ECONOMIC RESEARCH DEPARTMENT, SECURITY PACIFIC NATL
CT71 BANK, DECEMBER 1971, LOS ANGELES, CA
CT72 MONTHLY REPORT OF BUILDING PERMIT ACTIVITY IN THE CITIES AND COUNTIES
CT72 OF CALIFORNIA, ECONOMIC RESEARCH DEPARTMENT, SECURITY PACIFIC NATL
CT72 BANK, DECEMBER 1972, LOS ANGELES, CA
CT73 MONTHLY REPORT OF BUILDING PERMIT ACTIVITY IN THE CITIES AND COUNTIES
CT73 OF CALIFORNIA, ECONOMIC RESEARCH DEPARTMENT, SECURITY PACIFIC NATL
CT73 BANK, DECEMBER 1973, LOS ANGELES, CA
CT74 CALIFORNIA CONSTRUCTION TRENDS, ECONOMIC RESEARCH DEPARTMENT, SECURITY
CT74 PACIFIC NATIONAL BANK, DECEMBER 1974, LOS ANGELES, CA
CT75 CALIFORNIA CONSTRUCTION TRENDS, ECONOMIC RESEARCH DEPARTMENT, SECURITY
CT75 PACIFIC NATIONAL BANK, DECEMBER 1975, LOS ANGELES, CA
DG63 F.W. DODGE CORPORATION, CONSTRUCTION CONTRACTS SUMMARY FOR REGION VIII,
DG63 DECEMBER 1963? MCGRAW-HILL COMPANY
DG64 F.W. DODGE CORPORATION, CONSTRUCTION CONTRACTS SUMMARY FOR REGION VIII,
DG64 DECEMBER 1964? MCGRAW-HILL COMPANY
DG65 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG65 DECEMBER 1965? MCGRAW-HILL COMPANY
DG66 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG66 DECEMBER 1966? MCGRAW-HILL COMPANY
DG67 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG67 DECEMBER 1967? MCGRAW-HILL COMPANY
DG68 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG68 DECEMBER 1968? MCGRAW-HILL COMPANY
DG69 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG69 DECEMBER 1969? MCGRAW-HILL COMPANY
DG70 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG70 DECEMBER 1970? MCGRAW-HILL COMPANY
DG71 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG71 DECEMBER 1971? MCGRAW-HILL COMPANY
DG72 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG72 DECEMBER 1972? MCGRAW-HILL COMPANY
DG73 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG73 DECEMBER 1973? MCGRAW-HILL COMPANY
DG74 F.W. DODGE CORPORATION, CONSTRUCTION STATISTICS FOR REGION VIII,
DG74 DECEMBER 1974? MCGRAW-HILL COMPANY
LAT1 LOS ANGELES TIMES CONTINUING HOME AUDIT, JAN-JUNE, 1975
MW01 ANNUAL STATISTICAL ISSUES OF MERCHANDISING WEEK (NAME NOW MERCHANDISING
MW01 SINCE MARCH 1975). SHIPPING,SATURATION,PRICE AND SOME DETAIL
MW01 INFORMATION.
PG01 PG+E TABULATION OF STOCK AND SATURATION CENSUS DATA FOR THEIR AREA
SC01 SOUTHERN CALIFORNIA EDISON 1973 RESIDENTIAL ELECTRIC APPLIANCE SATURATI
SC01 SURVEY.
SC02 SOUTHERN CALIFORNIA EDISON 1 PAGE RESIDENTIAL CUSTOMERS AND APPLIANCES
SC02 BY DIVISION 1975.
SC03 SOUTHERN CALIFORNIA EDISON SYSTEM FORECASTS. 73 SATURATIONS
SM01 SACRAMENTO MUNICIPAL UTILITY DISTRICT 1975 APPLIANCE SATURATION SURVEY.
SM01 INCLUDES 70,72 DATA. NOT CROSS TABULATED, DOES INCLUDE DEMOGRAPHIC DATA,
SM01 AGE DATA AND CRUDE SALES DATA.
0001 1960 CENSUS OF HOUSING TABLE 13

002 1960 CENSUS TABLES 14 AND 28
000 CALIF MOBILE HOME REPORT ANNUAL SUMMARY 1975 SALES
066 LADWP STATISTICS ON ADDITIONS OF APPLIANCES-NUMBER OF ADDITIONS-LOAD
066 ADDED-GROSS ANNUAL REVENUE ADDED
02 ELECTRIC SPACE HEATING APRIL 1970 PACIFIC GAS AND ELECTRIC COMPANY
776 LADWP STATISTICAL REPORTS 1956-1965 AND 1966-1975
783 RATE 14 BILLING DATA
815 FPC PUBLICATION 'ALL ELECTRIC HOMES'
865 ENGINEERING SERVICES UNIT POWER SERVICES DIVISION 8-27-75
875 OFFICIAL STATEMENT RELATING TO $50,000,000 SMUD ELECTRIC REVENUE
875 REVENUE BONDS,SERIES F, OCT. 18, 1973
876 SMUD ANNUAL REPORT 1974
903 RESIDENTIAL ELECTRIC SPACE HEATING LOAD RESEARCH PROJECT MARCH 1967 PGI
918 LADWP EMPIRICALLY DERIVED-NOT CENSUS COUNT
944 USE DATA FROM EEI
951 SMUD 1975 APPLIANCE SATURATION SURVEY (AS OF JANUARY 1975)
984 PGE PUBLICATION 'RESIDENTIAL DWELLINGS WITH COMPLETE ELECTRIC SPACE
984 HEATING≠
2000 SDG+E SUBMISSION, ELECTRICALLY-HEATED DWELLING UNITS ADDED IN 1974
2001 PGE RESIDENTIAL ELECTRIC SPACE HEATING-LOAD RESEARCH PROJECT 1967
2751 1970 CENSUS
3000 SCE DOCUMENT? RESI ELEC ENERGY USE FOR SELECTED CUSTOMER CATEGORIES
4000 SYSTEM FORECASTS 1975-94, ELEC SYSTEM PLANNING, MARCH, 1975
5000 SCE DOCUMENT-FPC ALL ELECTRIC HOMES REPORT
3000 NORTHERN CA. REAL ESTATE REPORT VOL.27/NUMBER 1 PGE.43 FROM REAL ESTATE
3000 RESEARCH COUNCIL OF NORTHERN CALIFORNIA.
3500 RESIDENTIAL RESEARCH COMMITTEE OF SOUTHERN CALIFORNIA, 'RESIDENTIAL
3500 RESEARCH REPORT NO. 2, SECOND QUARTER 1975.' PGE.48-50.
3000 1970 US CENSUS DETAILED HOUSING CHARACTERISTICS TABLE 63
500 1960 CENSUS TABLE 29-OCCUPANCY CHARACTERISTICS,HEATING EQUIPMENT,AND
600 TYPE OF FUEL, FOR COUNTIES OUTSIDE SMSA'S 1960-P6-168

S O U R C E F O O T N O T E S

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AHO1  1  ADDITIONS COME FROM AHO1 +2 PER CENT TO ACCOUNT FOR THE APPROXIMATELY
AHO1  1    PER CENT OF TOTAL SALES WHOSE LOCATION OF SALE IS NOT KNOWN. AHAM'
AHO1  1  DATA APPEARS HIGHLY ACCURATE AS A RECORD OF DOMESTIC MANUFACTURERS
AHO1  1  SALES. EXCEPT WHERE NOTED IMPORTS ARE ASSUMED TO BE NEGLIGIBLE (LESS
AHO1  1  THAN 0.5 PER CENT ).
CEN1  1  CENSUS DATA FOR LA CITY. 1960 CENSUS MORE CAREFUL THAN 1970 CENSUS IN
CEN1  1  DISTINGUISHING OWNED VS. SHARED LAUNDRY FACILITIES.
DG63  1  THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES.  FIGURES
DG63  1  FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG63  1  126508/199572 (CALIF. NON-RESID. CONSTRUCTION DIVIDED BY REGIONAL
DG63  1  NON-RESIDENTIAL CONSTRUCTION.)
DG64  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG64  1  MULTIPLYING BY 130992/204758 (CALIF. NONRES. CONSTR. DIVIDED BY
DG64  1  REGION VIII NONRES. CONSTR.)
DG65  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG65  1  MULTIPLYING BY 144969/220516 (CALIF. NONRES. CONSTR. DIVIDED BY
DG65  1  REGION VIII NONRES. CONSTR.)
DG66  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG66  1  MULTIPLYING BY 143413/230247 (CALIF. NONRES. CONSTR. DIVIDED BY
DG66  1  REGION VIII NONRES. CONSTR.)
DG67  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG67  1  MULTIPLYING BY 127217/209080 (CALIF. NONRES. CONSTR. DIVIDED BY
DG67  1  REGION VIII NONRES. CONSTR.)
DG68  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG68  1  MULTIPLYING BY 137658/219195 (CALIF. NONRES. CONSTR. DIVIDED BY
DG68  1  REGION VIII NONRES. CONSTR.)
DG69  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG69  1  MULTIPLYING BY 170222/258381 (CALIF. NONRES. CONSTR. DIVIDED BY
DG69  1  REGION VIII NONRES. CONSTR.)
DG70  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG70  1  MULTIPLYING BY 131093/212661 (CALIF. NONRES. CONSTR. DIVIDED BY
DG70  1  REGION VIII NONRES. CONSTR.)
DG71  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG71  1  MULTIPLYING BY 129730/214400 (CALIF. NONRES. CONSTR. DIVIDED BY
DG71  1  REGION VIII NONRES. CONSTR.)
DG72  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG72  1  MULTIPLYING BY 135445/237865 (CALIF. NONRES. CONSTR. DIVIDED BY
DG72  1  REGION VIII NONRES. CONSTR.)
DG73  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG73  1  MULTIPLYING BY 156946/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG73  1  REGION VIII NONRES. CONSTR.)
DG74  1  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG74  1  MULTIPLYING BY        /        (CALIF. NONRES. CONSTR. DIVIDED BY
DG74  1  REGION VIII NONRES. CONSTR.)
LAT1  1  THE LOS ANGELES TIMES CONTINUING HOME AUDIT SURVEYS 6000 HOUSEHOLDS
LAT1  1  ANNUALLY IN THE LOS ANGELES MARKET AREA.
PG01  1  CENSUS DATA TABULATED BY P,G+E FOR ITS SERVICE AREA. NOTE THAT THE
PG01  1  GAS SERVICE AREA IS DIFFERENT THAN THE ELECTRIC SERVICE AREA.
PG01  1  SATURATIONS ARE CALCULATED FROM OCCUPIED DWELLING UNITS NOT METERS,
PG01  1  AND THEREFORE INCLUDE RESIDENTS IN MASTER-METERED DWELLINGS.
SC01  1  1973 MAIL SURVEY. SAMPLE SIZE IS 23549. SATURATION RESULTS FROM
SC01  1  EARLIER SURVEYS ARE ALSO TABULATED. 69,70 AND 73 CROSS TABULATED
SC01  1  AGAINSTSF,MF. THE SURVEY REPORT STATES THAT UNREADABLE ANSWERS WERE
SC01  1  TALLIED AS ZEROES. THIS WOULD BIAS ALL RESULTS LOW. SCE IS REVIEWING
SC01  1  THE SURVEY AS A CHECK. THE SURVEY APPEARS TO INCLUDE TOO HIGH A
SC01  1  PROPORTION OF SINGLE FAMILY UNITS. UNLESS NOTED THIS IS UNCORRECTED
SC01  1  FOR. SCE RESPONSE TO OUR QUERIES IS SUPPOSED TO ARRIVE 5/3-5/8/76.
SC02  1  PRELIMINARY DATA SHEET FOR 1975 SURVEY. THE DATA WERE NOT
SC02  1  DISAGGREGATED INTO SINGLE FAMILY OR MULTI FAMILY  AND THERE IS NO
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SC02  1  BACK-UP INFORMATION.
SM01  1  MAIL SURVEY SIZES AND SIGMAS ARE - 75;2140,(2.1 PER CENT),72;2105
SM01  1  (2.1 PER CENT), AND 70;2048(2.2 PER CENT). SURVEY NOT CROSS TABULATED
SM01  1  AGAINST TYPE OF DWELLING UNIT NOR CHECKED FOR REPRESENTATIVENESS OF
  T1  1  SF AND MF POPULATIONS. 72 SURVEY RAW DATA IN HAND. ENTRIES NOT
SM01  1  CORRECTED FOR SF VS. MF SPLIT AS OF 4/26/76 . OUR DATA IS MISSING 200
SM01  1  REPLIES OUT OF 2100.
)001  1  SATURATION DERIVED FROM STOCK SIZE
L000  1  SALES FOR EACH COUNTY ALLOCATED BETWEEN DOUBLE + SINGLE UNITS ACCORDIN
L000  1  TO THAT YEAR'S SALES DATA
L815  1  ALL USES
L815  2  HEATING ONLY
L815  3  ALL UNITS
L815  4  HEATING ONLY
L815  5  COOLING ONLY
2000  A  MOBILE HOMES
2000  F  MULTI-FAMILY UNITS
2000  S  NEW INDIVIDUAL (SINGLE-FAMILY) HOMES
2000  T  ALL HOMES
2751  1  SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK
2751  2  STOCK DERIVED BY ADDING VALUE FOR ≠ONE≠ TO PRODUCT OF ≠TWO OR MORE≠
2751  2  TIMES 2.2.
3000  1   THESE ARE FHA INSURANCE APPLICATIONS (MULTI+SINGLE) FOR NEW HOUSING F
3000  1   ALAMEDA,CONTRA COSTA,DEL NORTE, HUMBOLDT, LAKE,MARIN,MENDOCINO,MONTER
3000  1   ,NAPA, SAN BENITO, SAN FRANCISCO,SAN MATEO, SANTA CLARA, SANTA CRUZ,
3000  1   SOLANO, AND SONOMA COUNTIES  ( SAN FRANCISCO OFFICE).
3000  2   THESE ARE FHA INSURANCE APPLICATIONS (MULTI+SINGLE) FOR NEW HOUSING F
3000  2   FRESNO, KINGS, MADERA, MARIPOSA,MERCED, STANISLAUS, AND TULARE COUNTI
3000  2   ( FRESNO OFFICE ).
3000  3   THESE ARE FHA INSURANCE APPLICATIONS (MULTI+SINGLE) FOR ALPINE, AMADC
  00  3   BUTTE, CALAVERAS, COLUSA, GLENN, LASSEN, MODOC, PLUMAS, SACRAMENTO, S
3000  3   JOAQUIN, SHASTA, SIERRA, SISKIYOU, SUTTER,TEHAMA, TRINITY, TUOLUMME,
3000  3   YOLO, YUBA, AND THE WESTERN HALF OF EL DORADO, NEVADA, AND PLACER
3000  3   COUNTIES (SACRAMENTO OFFICES).
3500  4   FIGURE IS FOR 1-4 UNITS IN DWELLING. FOR LOS ANGELES, VENTURA, SANTA
3500  4   BARBARA, KERN, INYO, MONO, AND SAN LUIS OBISPO COUNTIES (LA OFFICE) A
3500  4   ORANGE, RIVERSIDE, AND SAN BARNARDINO COUNTIES (SANTA ANA OFFICE).
3500  5   FIGURE IS FOR 4+ UNITS (OR'PROJECTS') WHICH INCLUDES MUST CONDOMINIUM
3500  5   FOR LOS ANGELES, VENTURA, SANTA BARBARA, KERN, INYO, MONO, AND SAN LU
3500  5   OBISPO COUNTIES (LA OFFICE) AND FOR ORANGE, RIVERSIDE, AND SAN BARNAR
3500  5   DINO COUNTIES (SANTA ANA OFFICE).
3500  6   THESE ARE TRACT UNITS.'ALMOST ALL TRACT UNITS APPLICATIONS ARE FOR PR
3500  6   POSED CONSTRUCTION.' SINGLE UNITS ARE ALSO LISTED, BUT ALMOST ALL OF
3500  6   THESE ARE FOR EXISTING CONSTRUCTION. THESE DATA ARE FOR INYO, KERN, L
3500  6   ANGELES, ORANGE, SAN BERNARDINO, SAN LUIS OBISPO, SANTA BARBARA, AND
3500  6   VENTURA COUNTIES IN CALIFORNIA, AND CLARK AND LINCOLN COUNTIES IN
3500  6   NEVADA.
3000  1  OCCUPIED HOUSING ONLY
3000  2  ALL YEAR-ROUND HOUSING - NOT JUST OCCUPIED
3000  3  SATURATION RATE DERIVED FROM STOCK SIZE
3600  1  DERIVED FROM OCCUPIED UNITS DATA
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F O O T N O T E S

*98MOBHOD6969B1 A) DEALER UNKNOWN - NORTHERN CALIFORNIA
*98MOBHOD6969B1 A) DEALER UNKNOWN - SOUTHERN CALIFORNIA
*98MOBHOD6969B2 B) SEE FOOTNOTE 1 FOR SOURCE 1000
*98MOBHOD6969B2 B) SEE FOOTNOTE 1 FOR SOURCE 1000
*98MOBHOS6969B1 A) DEALER UNKNOWN - NORTHERN CALIFORNIA
*98MOBHOS6969B2 B) SEE FOOTNOTE 1 FOR SOURCE 1000