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Electrical Energy Consumption in California: Data Collection and Analysis

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Authors

Berman, S.M.
Horovitz, M.W.
Blumstein, C.J.
et al.

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ELECTRICAL ENERGY CONSUMPTION IN CALIFORNIA:

DATA COLLECTION AND ANALYSIS*

A Report to the California Energy Resources Conservation
and Development Commission

S. M. Berman
M. W. Horovitz
C. J. Blumstein
V. A. Adams
K. B. Anderson
P. Caesar
R. D. Clear
D. B. Goldstein
B. A. Greene
D. M. Gustafson
E. P. Kahn
L. B. King
R. B. Weisenmiller

Energy and Environment Division
University of California
Lawrence Berkeley Laboratory
Berkeley, California 94720

UCID 3847

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Prepared by B. A. Greene
with assistance from P. Caesar and Y. Howell

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E. P. Kahn

and

V. A. Adams

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by

M. W. Horovitz

and

K. B. Anderson

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&M60B, 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.

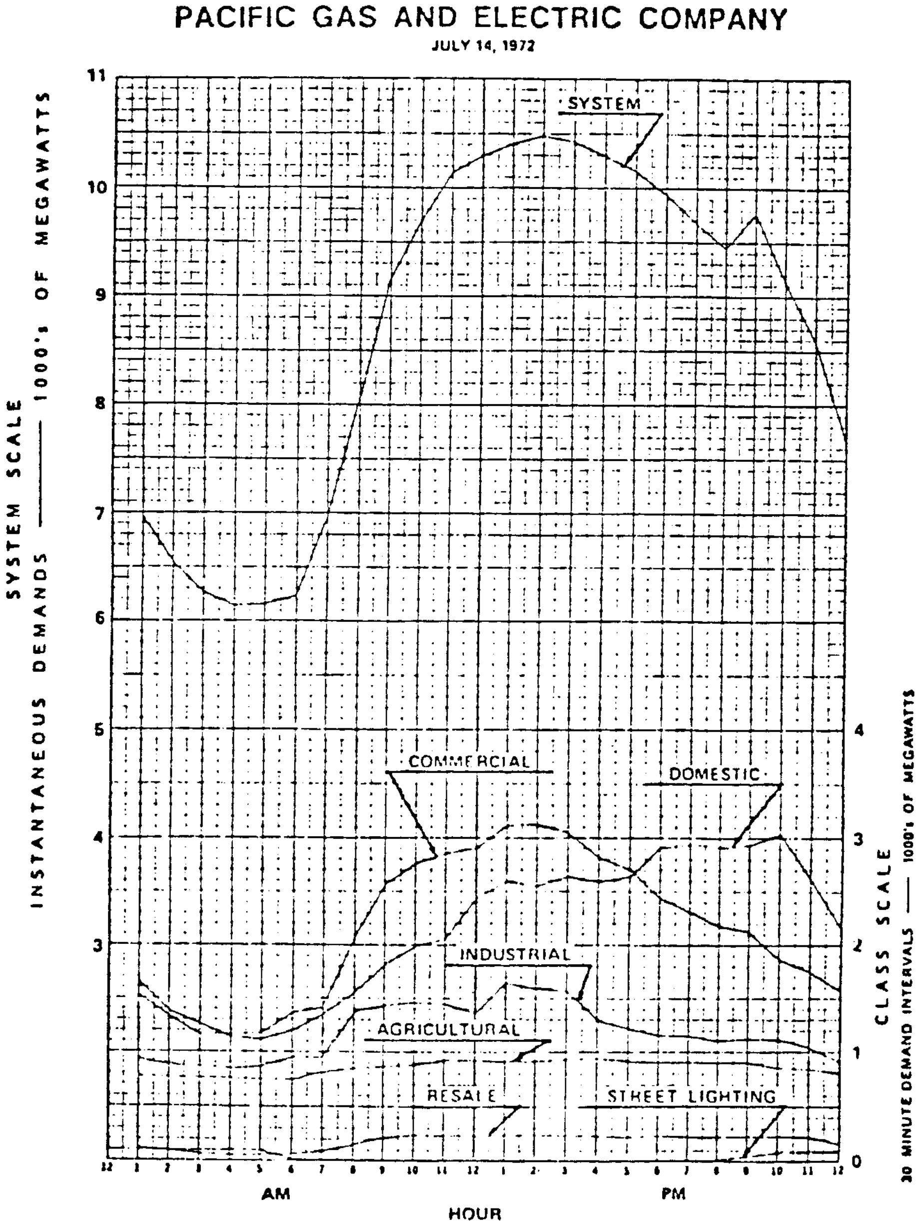

Figure 1. Load curves for the Pacific Gas and Electric Company on the peak day in 1972. The top curve is the "net system input" curve and reflects the amount of electricity generated to meet demand by PG&E and the Bureau of Reclamation. The six curves at the bottom reflect demand at the point of use 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.

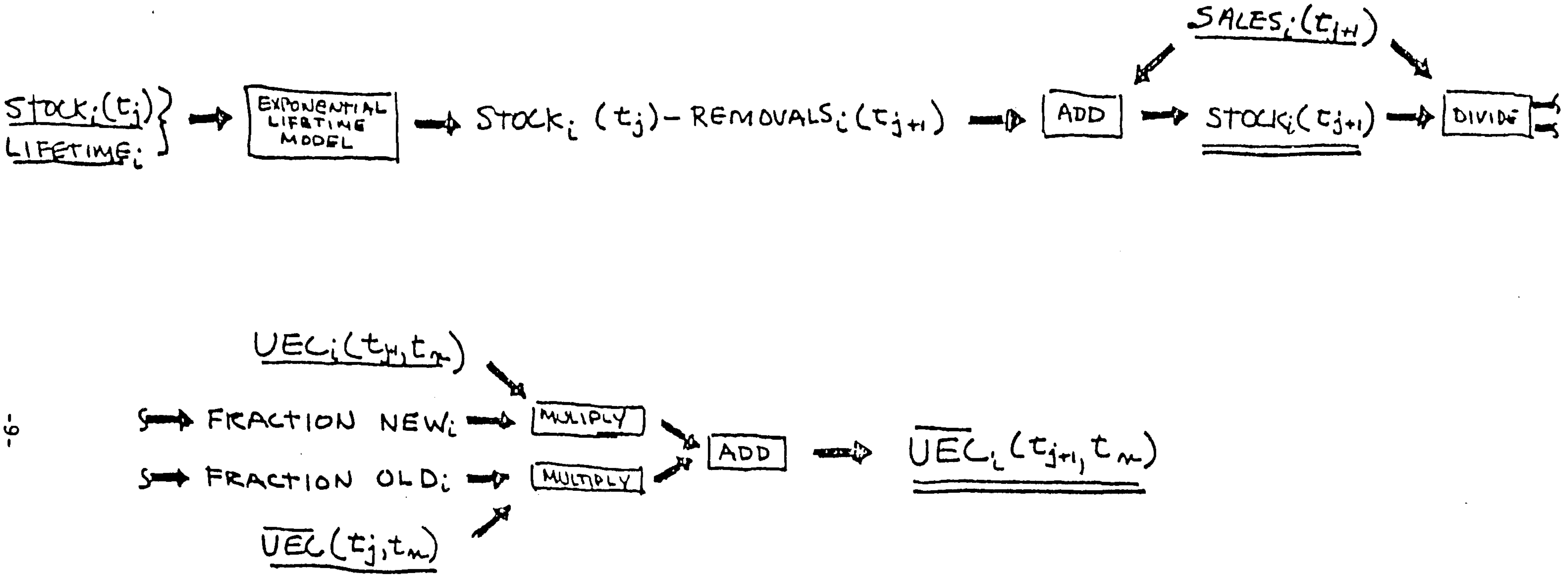

Figure 3. Computations for a one year step in an exponential lifetime stock-use model. Input is underlined once, output is underlined twice. STOCK and $\overline{\text{UEC}}$ for device i are updated from the year t_j to the year t_{j+1} (j+1 less than or equal to n).

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 ($\overline{\text{UEC}}$) 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 $\overline{\text{UEC}}$ 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 $\overline{\text{UEC}}$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

	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 Sale (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 $\overline{\text{UEC}}$ 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

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[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.

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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.
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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 consumption 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. <u>Energy Alternatives for California</u>[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.

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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).
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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 describing 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:

- Load research
- Saturation studies

- 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:

- o Non-residential buildings
- o Experiment design
- o 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 manufacturing, 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		
West in Central Cities			New		Removal		If exp. rates		
Year Built	1970	1960	Const.	Other	Demol.	Other	Rem.	Dem.	New Const.
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)

			Removal Rate	
Area	Single Family	Multi-Family	Mobile	Mobile' (with mobile demolition plus other rate of other units)
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 not 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 All Electric Homes 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 submetering 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

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[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

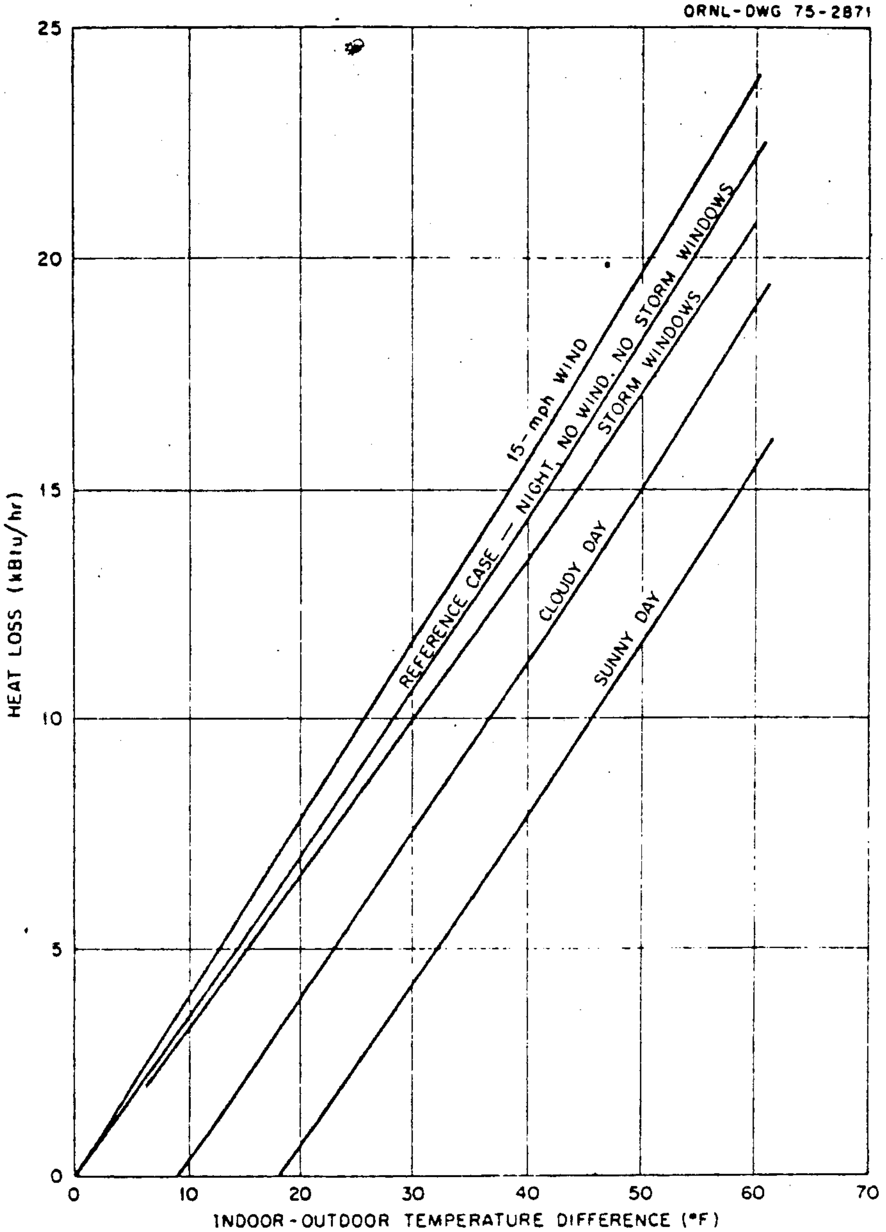

Figure A2.1 Steady--state heat loss from mobile homes (derived from experimentally based model) for a 600 sq ft (12 x 50') mobile home. Published in "Energy Conservation Studies" ORNL-NSF-EP-84, (December 31, 1974), p. 7.

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.

CSD 41 REV. 1-69
S.C.E. CO.

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

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(over)

Figure A2.3 (cont'd)

Gold Medallion Apartment Standards

(continued)

Exhibit "A"

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.

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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.

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(over)

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.

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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)

<u>Multi-Family Units</u>

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)

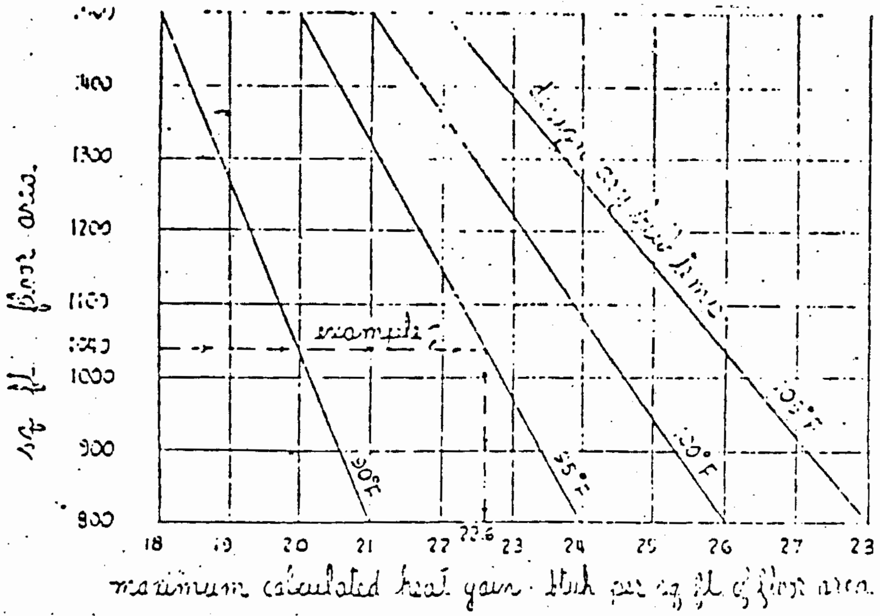

FIGURE 7b

Figure A2.6

Figure A2.7

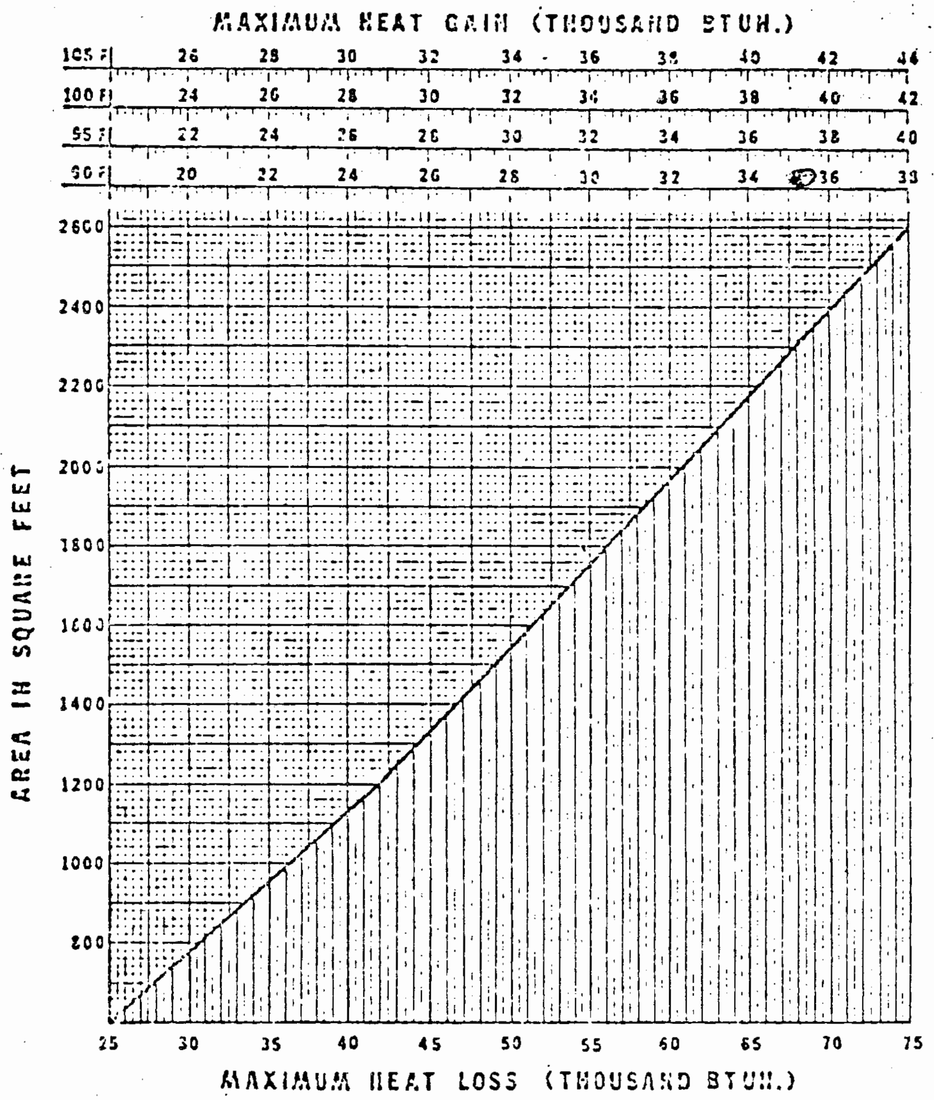
MAXIMUM HEAT GAIN (THOUSAND BTUH.)
105 F 26 28 30 32 34 36 38 40 42 44
100 F 24 26 28 30 32 34 36 38 40 42
95 F 22 24 26 28 30 32 34 36 38 40
90 F 20 22 24 26 28 30 32 34 36 38
AREA IN SQUARE FEET
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
25 30 35 40 45 50 55 60 65 70 75
MAXIMUM HEAT LOSS (THOUSAND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

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' x 30' x .36 + 112' x 50' x (.1 + .15) = 4899 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' x 30' x .366 + 112' x 50' x (.08 + .08) = 4162 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' x 30' x .264 + 112' x 50' x (.06 + .08) = 3967 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

	Saturation (Percent)				
Service Area	PG&E	SMUD	SCE	LADWP	SDG&E
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)	Saturation (Percent) PG&E[1] (1974 & 1975)	SMUD[2] (1971-1975)	SCE[3] (1973 & 1974)	LADWP[4] (1970-1975)	SDG&E[5] (1974)
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]

	Saturation (Percent)		
Year Built	Resistance	Supplementary	
		Built-in	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

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[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

(kwhr/yr)

Insulation	Travis	Oakland	Burbank	Los Angeles (Airport)
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	8,820	3,760	3,330	3,610	5,330
	(182,000)	(23,400)	(312,000)	(130,100)	(97,800)	(745,000)
Single Family	12,250	12,000	6,500	6,500	6,500	9,040
	(102,000)	(6,500)	(86,100)	(25,400)	(24,600)	(244,600)
Multi-Family	6,500[1]	7,500	2,550	2,550	2,550	3,320
	(72,700)	(16,500)	(216,000)	(104,400)	(71,700)	(481,300)
Mobile	12,250[2]	12,000	6,500	6,500	6,500	8,800
	(7,200)	(380)	(9,560)	(300)	(1,520)	(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

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[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 A~~3~~4.1. 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

	(Percent)				
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)
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

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

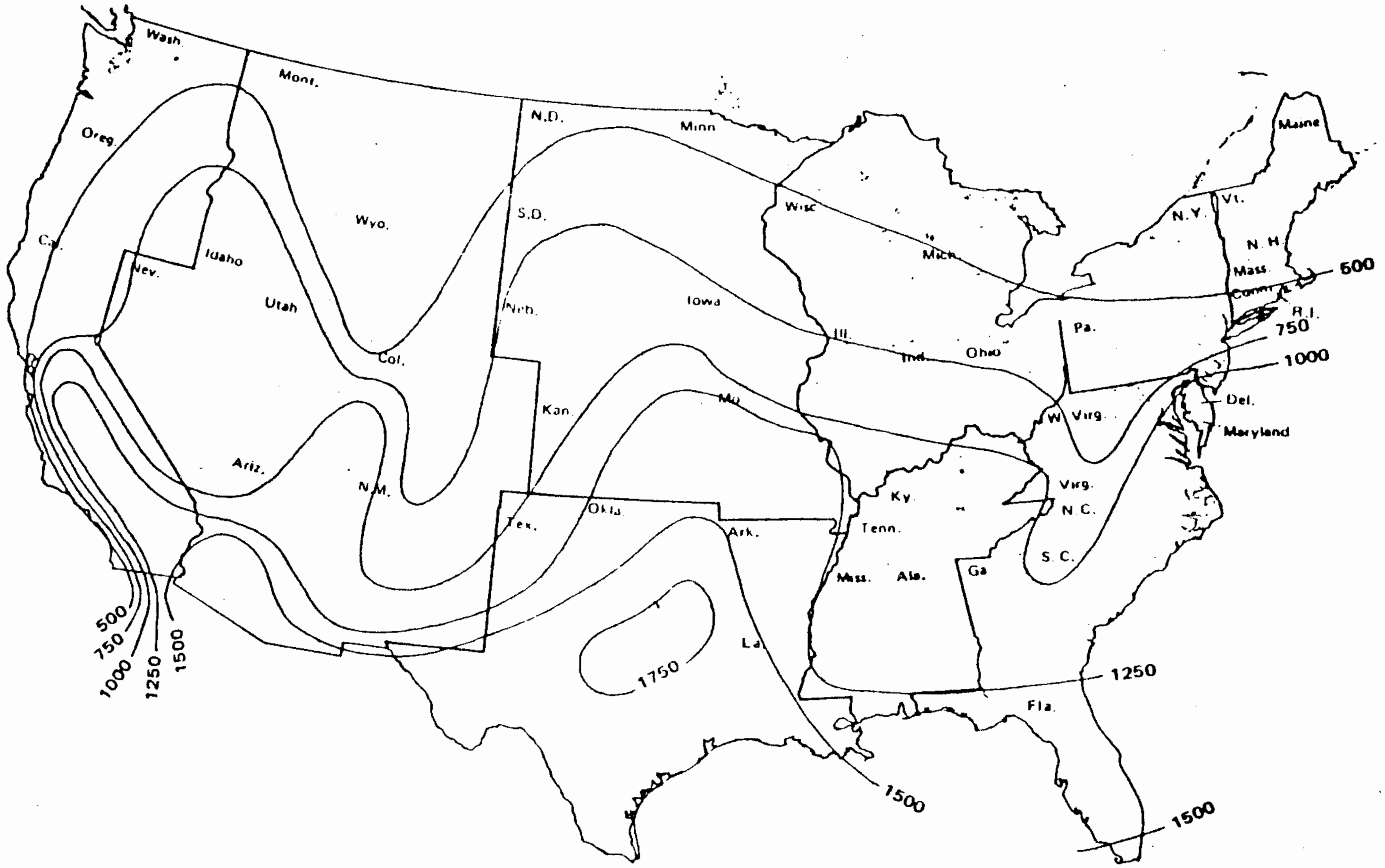


Figure A4.1 This figure is a rather coarse indication of the isocline lines for cooling hours, which has been reproduced from S. H. Dole, "Energy Use and Conservation in the Residential Sector: A Regional Analysis", R-1641-NSF (1976), p.

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

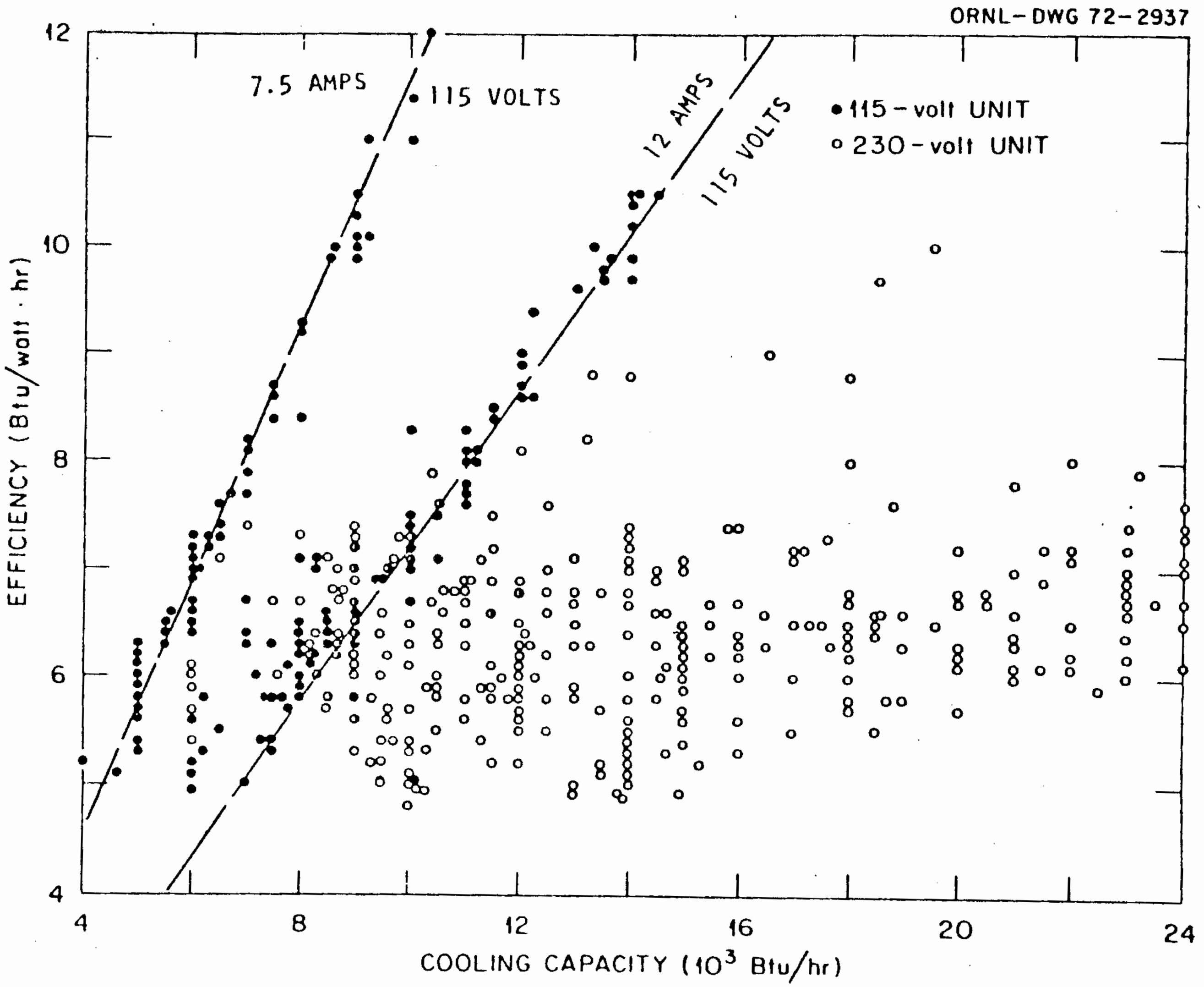


Figure A4.2 This scatter plot of EER versis size for room air conditioners has been reproduced from J. C. Moyers, "The Room Air Conditioner as a Consumer of Electricity", ORNL-NSF-EP-59 (1973), p. 6. The efficiency axis is the EER, while the other axis is the size.

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.

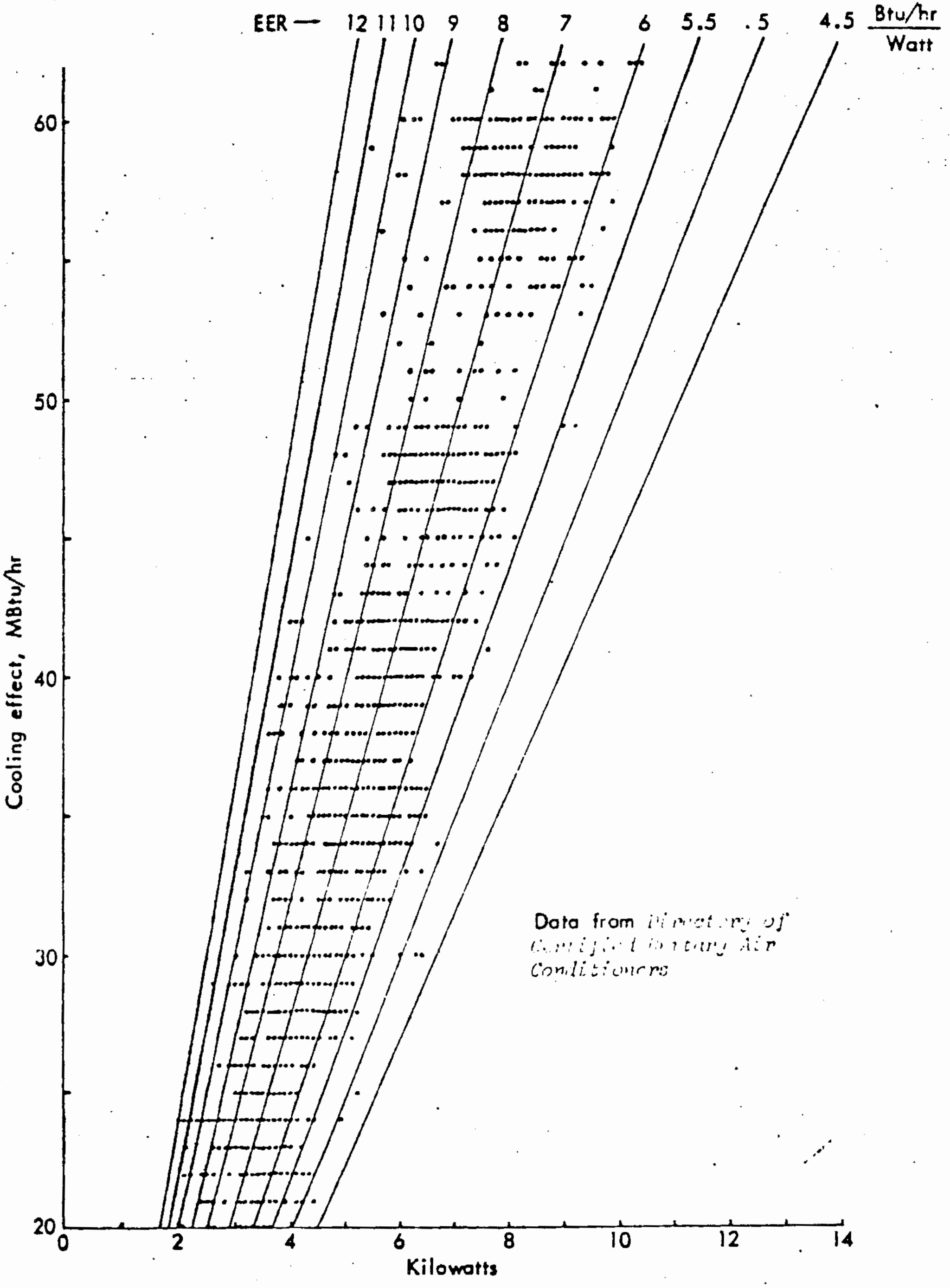
These cooling loads become less accurate as the insulation levels are increased. The cooling requirements are seen to stay relatively constant as insulation is increased beyond the current state levels (see Table A4.5). This is because, while increased insulation lowers the sensible cooling load, it 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



Data from *Directory of Certified Unitary Air Conditioners*

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 <u>All Electric Homes</u>[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

		(kwhr/yr)		
Insulation	Travis	Oakland	Burbank	Los Angeles (Airport)
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 uninsulated 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	1,105	1,131	1,119	1,186	1,126
	(5,760)	(6,990)	(39,700)	(9,500)	(5,300)	(67,200)
Single Family	1,340	1,460	1,820	1,820	1,820	1,730
	(2,780)	(2,710)	(14,600)	(3,390)	(2,200)	(25,700)
Multi-Family	804	880	730	730	730	751
	(2,240)	(3,620)	(19,900)	(6,060)	(2,620)	(34,400)
Mobile	804	880	730	730	730	752
	(738)	(658)	(5,210)	(47)	(455)	(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).

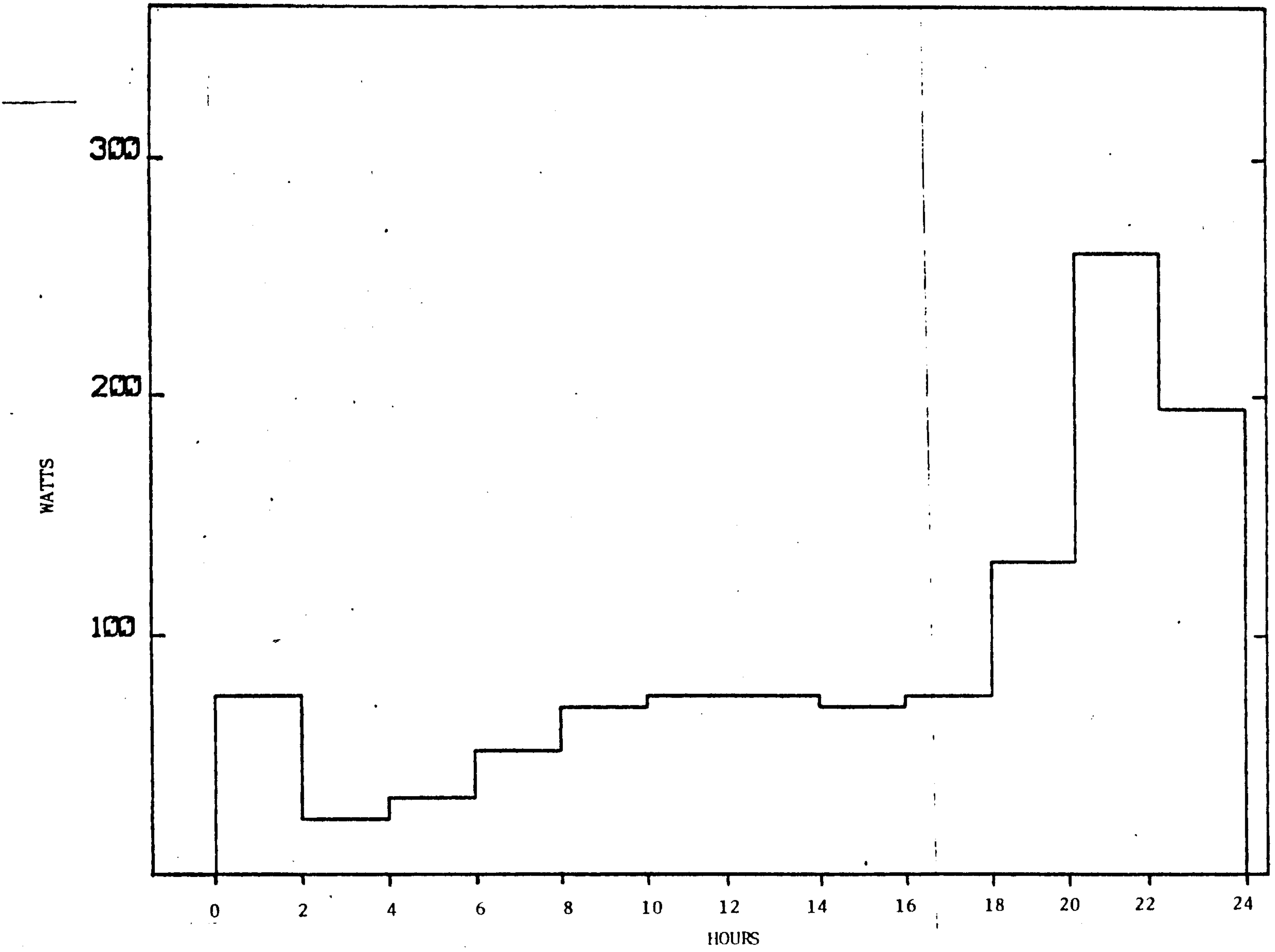
Lighting load curves[4] were measured in the 1950's. Figures A5.1 and A5.2 show the summer and winter load curves scaled to 1130 kwhr/yr. The winter curve is higher overall, as the lighting energy consumption on the average winter day is 1.24 times larger than the lighting energy consumption for the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

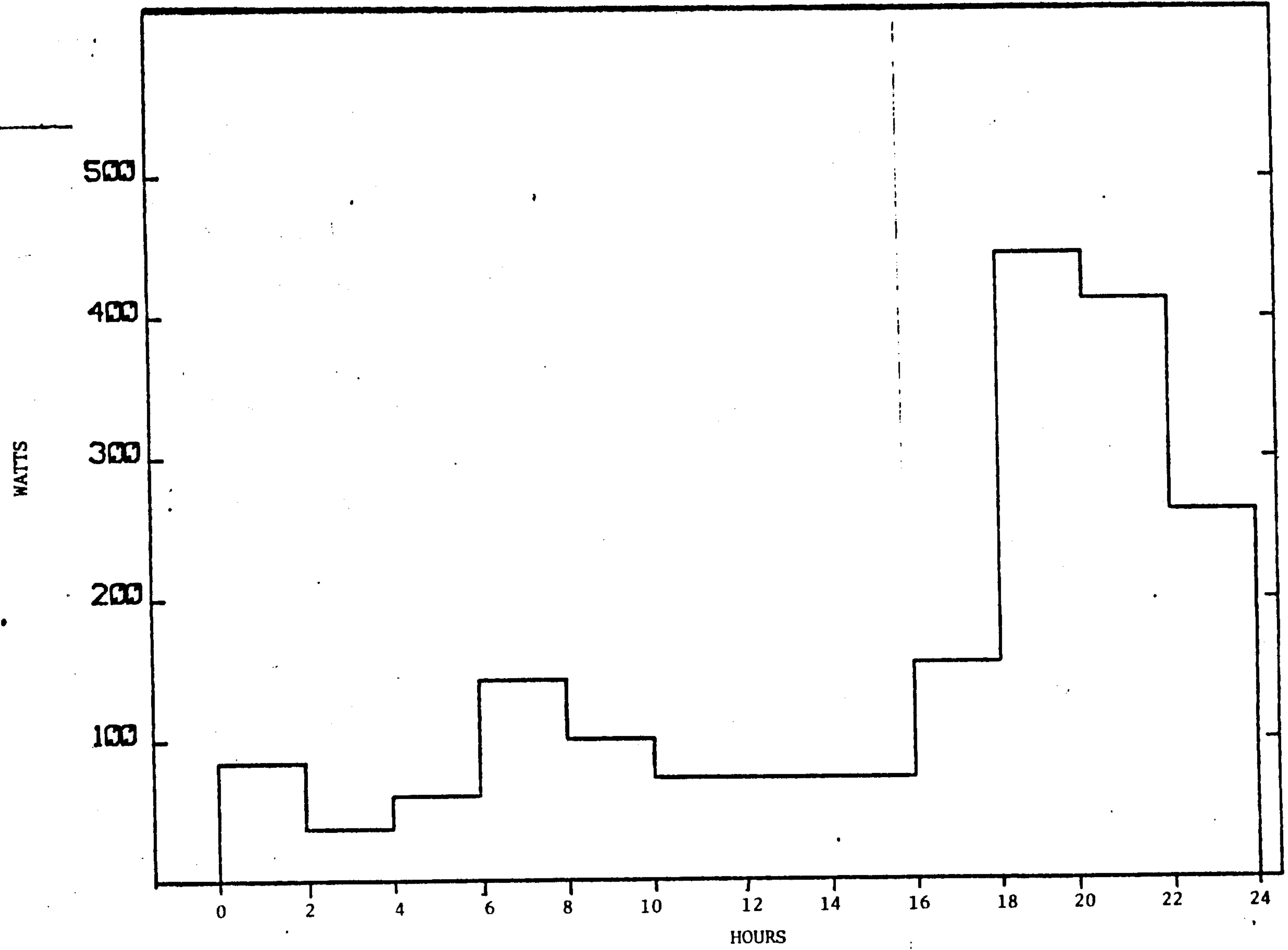
Lighting is a major fraction of electrical energy use in houses. Much better data could be gathered by keeping a yearly record of retail sales of light bulbs in California by type of bulb. By limiting the data collection to those types of bulbs which are sold to the residential market, and by lumping 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



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

Year	PG&E 1970	SMUD 1975	SCE 1975	LADWP 1970	SDG&E 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 <u>contingent</u> 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 SIA 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

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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 ft^3	7 [illegible]	12 - 22.9 ft^3	16 - 22.9 ft^3

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	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	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	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	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	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	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	130	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]

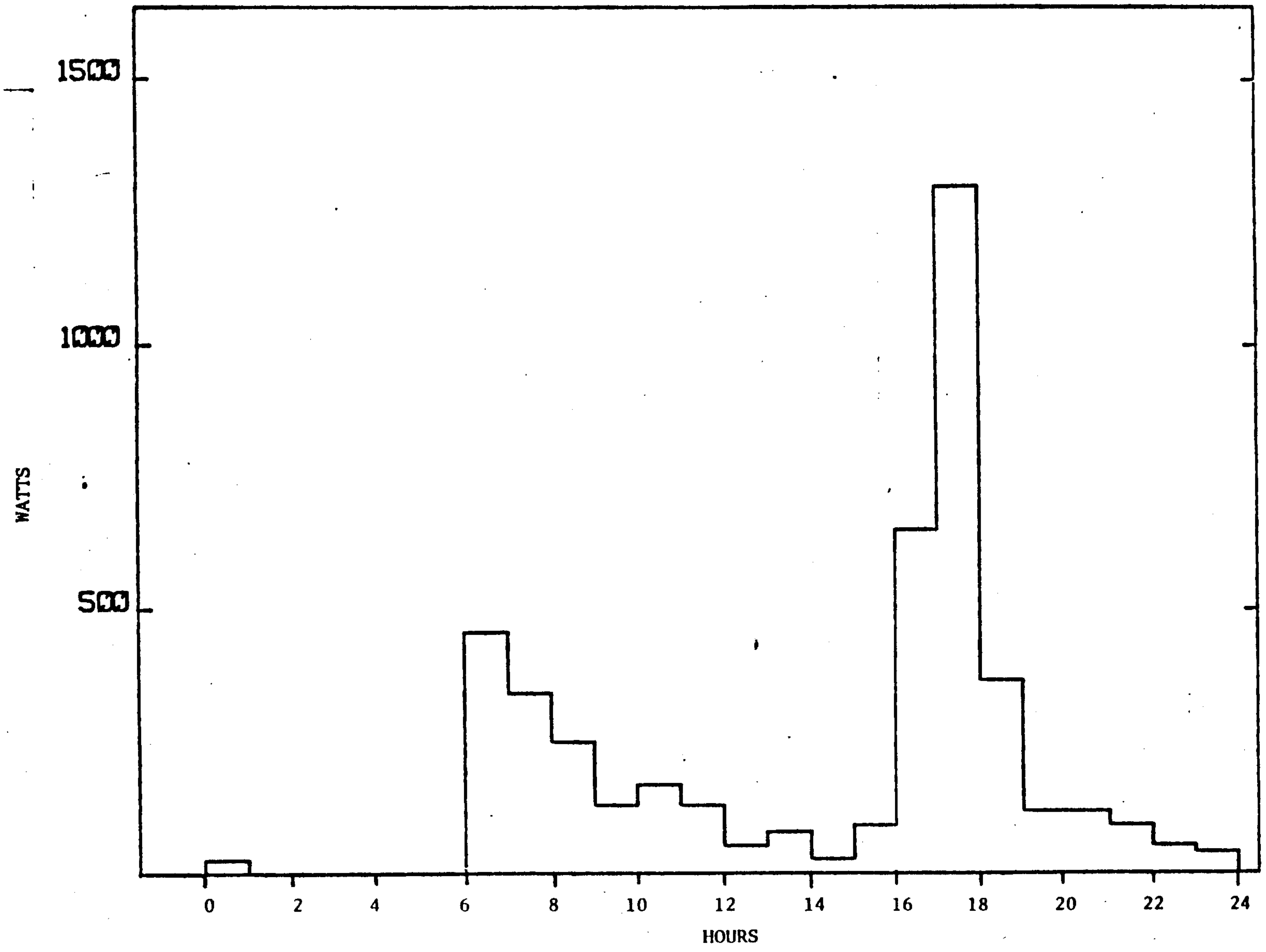
At the time of the original EEI estimate of range use, there were few small cooking appliances. To the extent that the recent load surveys measure the influence of these small cooking appliances it would appear reasonable to assume that the energy actually used for the range has declined. Properly speaking 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



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 ($\sim$500 at SDG&E's system peak), while the second assumption yields 1500 watts ($\sim$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, <u>i.e.</u> 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] (∿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 All

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

Year	PG&E 1970	SMUD 1975	SCE 1975	LADWP 1970	SDG&E 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,

$$\overline{x}_o = [\sum_t^{\infty} x_o(t) \ \Delta t]/x_o(0). \qquad (1)$$

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,

$$\sum_{t}^{\infty} x_o(t) = \sum_{t}^{\infty} [N_o(t) + \sum_{j=1}^{t} U_{o,j}(t)]. \tag{2}$$

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,

$$\overline{N}_o = [\sum_{t}^{\infty} N_o(t)]/N_o(0), \text{ and} \tag{3}$$

$$\overline{U}_o = [\sum_{t}^{\infty} \sum_{j=1}^{t} U_{o,j}(t)]/\sum_{j=1}^{\infty} U_{o,j}(j). \tag{4}$$

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:

$$\overline{x}_o = \overline{N}_o + \overline{U}_o[\sum_{j=1}^{\infty} U_{o,j}(j)]/N_o(0). \tag{5}$$

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,

$$\overline{x} = [\sum_{i}^{m} \sum_{t}^{\infty} x_i(t)]/\sum_{i}^{m} x_i(i),$$

$$x_i(t) \equiv 0 \text{ for } t < i, \tag{6}$$

$$\overline{N} = [\sum_{i}^{m} \sum_{t}^{\infty} N_i(t)]/\sum_{i}^{m} N_i(i),$$

$$N_i(t) \equiv 0 \text{ for } t < i, \text{ and} \tag{7}$$

$$\overline{U} = [\sum_{i}^{m} \sum_{t}^{\infty} \sum_{j=1}^{t} U_{i,j}(t)]/\sum_{i}^{m} \sum_{j=1} U_{i,j}(j),$$

$$U_{i,j}(t) \equiv 0 \text{ for } j \leq i. \tag{8}$$

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,

$$\overline{U} = [\sum_{t}^{\infty} \sum_{j=1}^{t} U_j(t)]/ \sum_{j=1} U_j(j) \tag{10}$$

It follows that

$$\sum_{i}^{m} \sum_{t}^{\infty} x_i(t) = \sum_{i}^{m} \sum_{t}^{\infty} N_i(t) + \sum_{t}^{\infty} \sum_{j}^{t} U_j(t), \text{ and} \tag{11}$$

$$\overline{x} = \overline{N} + \overline{U} [\sum_{j=1}^{\infty} U_j(j)]/\sum_{i}^{m} N_i(i). \tag{12}$$

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]		Weighting factor[2] for used lifetimes	Service lifetime
	New	Used		
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

TABLE OF CONTENTS

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

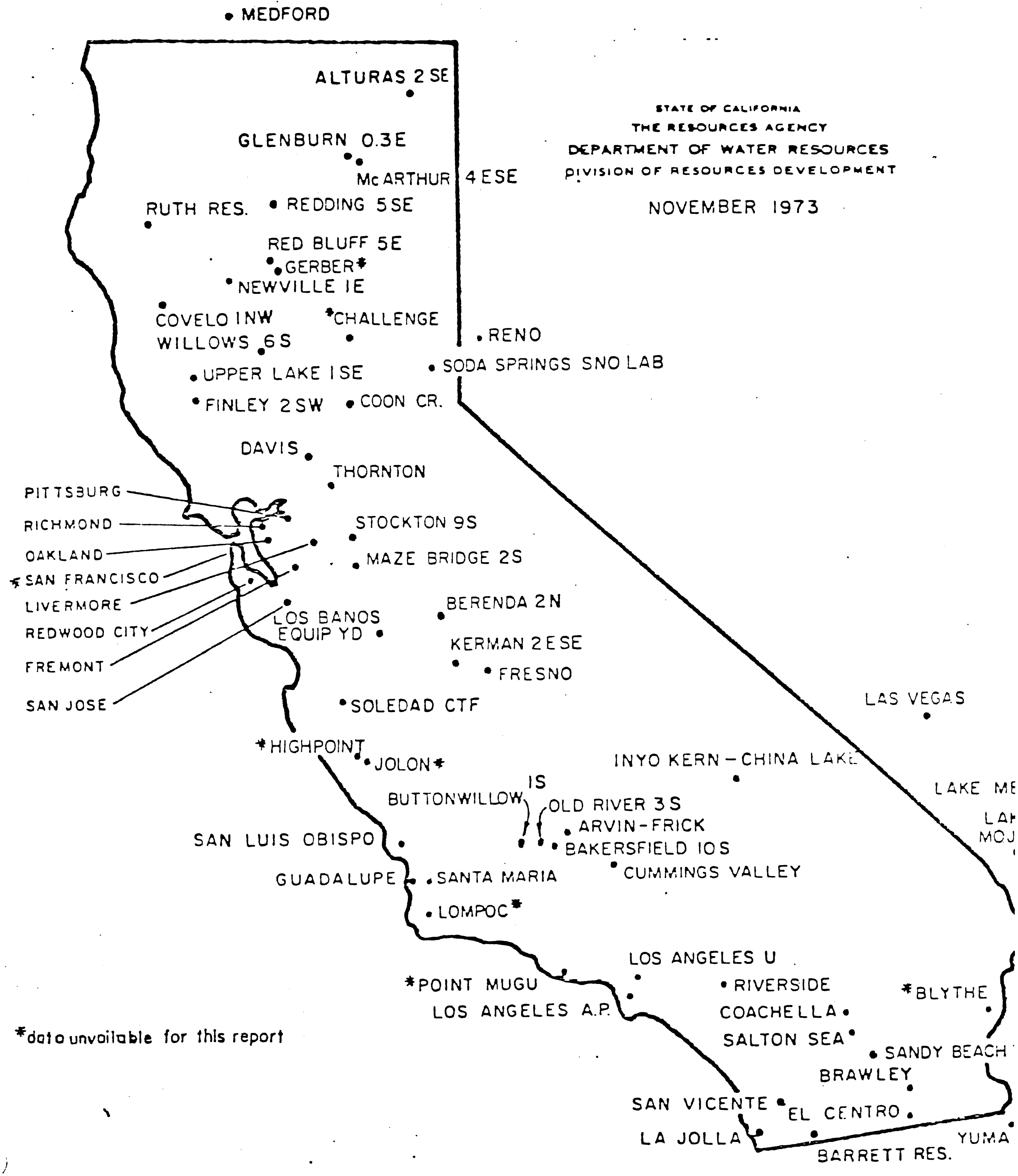
Available information on measurements of solar radiation in California (insolation data) has been compiled by the Department of Water Resources Division of Resources Developement (Solar Radiation Measurements in California, January 1974). Data is available for 55 stations, and varies in both quality 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



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF RESOURCES DEVELOPMENT

NOVEMBER 1973

*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 $\left(\frac{\text{cost of system installed}}{\text{square foot of collector}}\right)$ 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).

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*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		A		Various	96	$3,100	$2,600	$ 500	$32.29	$27.08	
Various					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 unnyvale ill 1973	CB	A	R	Gas	7000	$18,000	$18,000		$ 2.57		
HMND Winters ummer 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 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) 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 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	$ 550	$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 3/4' 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 x 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 x 10^6

Estimated from number of beds as follows (CA Stat. Abstract 1975):

General Hospitals	94,025 x 10^3 ft^2/bd	= 94.0 x 10^6
Psych. Hospitals	12,832 x 600 ft^2/bd	= 7.7 x 10^6
Nursing Homes, Community and Residential Care	168,726 x 500 ft^2/bd	= 84.4 x 10^6
Day Care	140,708 x 35 ft^2/bd	= 1.1 x 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	60,637,000	David Long Chief, Real Estate Division Corps of Engineers So. Pacific Division 630 Sansome Street San Francisco, CA 94111
Air Force	145,613,000	
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

$$\text{Total County} = 2.8\ (15 \times 10^6) + 4.0(5 \times 10^6)$$
$$= 62 \times 10^6\ \text{ft}^2$$

City Government estimated as 1 ft^2/person.

Hotels

Rand (1970) estimate 200×10^6

Construction (1971-74)

74	5.0	=	9.8	$\left(\frac{6.6}{12.9}\right)$
73	9.0	=	16.9	$\left(\frac{7.8}{14.7}\right)$
72	7.6	=	14.0	$\left(\frac{7.5}{13.8}\right)$
71	5.4	=	8.9	$\left(\frac{6.9}{11.4}\right)$
	227×10^6			

Construction
$$\text{estimate} = (\text{total Hotel \& Motel-Region VIII}) \frac{\text{CA Bldg. value in year i}}{\text{Total Bldg. value in year i}}$$
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

	Relative Intensity[a]		Energy Use	
Class of Building	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	Current	III-5	13.1	3.0	11.6	54.0	81.7	27.8-30.5
Bldg.	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 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    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 CC.
  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
```

SOURCES

```
AHO1     THIS IS A DUMMY SOURCE REFERENCE AHO1
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
```

SOURCE FOOTNOTES

```
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
1   RANGE 7171                        176.0AH01
1   RANGE 7272                        193.0AH01
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
103RANGE06060G0036B1119209600
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

TYPE	REGION	DEVICE				SECTOR	TIME PERIOD				FUEL TYPE	SATURATION RATE ≤ 100.0%				[illegible]	FOOTNOTE	STOCK SIZE x 10^4				HARDNESS	SOURCE				FOOTNOTE	ADDITIONS PER YR. x 10^3				HARDNESS	SOURCE				FOOTNOTE	REMOVALS PER YR. x 10^3				HARDNESS	SOURCE				FOOTNOTE	AVG. COST PER UNIT x $10				HARDNESS	SOURCE				FOOTNOTE	UTILIZATION				HARDNESS	SOURCE				FOOTNOTE	ENERGY CONSUMPTION kW/yr				HARDNESS	SOURCE				FOOTNOTE
							FR		TO																																																				UNITS																	
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	25	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

CARD TYPE	ELEC. REGION	DEVICE	SECTOR	TIME PERIOD			ENERGY CONSUMPTION ADDITIONS kWh/yr	HARDNESS	SOURCE	FOOTNOTE	ENERGY CONSUMPTION, REMOVALS kWh/yr	HARNESS	SOURCE	FOOTNOTE	
				FR	TO										
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
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BUILDING INFORMATION - CARD 1

TYPE	GEOG. 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 10^3	HARDNESS	SOURCE	FOOTNOTE	AVG. COST PER UNIT x$1000	HARDNESS	SOURCE	FOOTNOTE	SQUARE FEET x 10^5	HARDNESS	SOURCE	FOOTNOTE	ENERGY CONSUMPTION kWh/ft² yr	HARDNESS	SOURCE	FOOT-NOTE
3	4	5 6 7 8 9	10 11	12 13	14 15 16 17 18 19 20	21 22 23 24	25	25 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

00-540551

BUILDING INFORMATION - CARD 2

TYPE	GEOG. REGION	BUILDING TYPE					TIME PERIOD FR		TO									FRACTION INSULATED (e.g. 100.0)				HARDNESS	SOURCE				FOOTNOTE	AVERAGE RENT x $10				HARDNESS	SOURCE				FOOTNOTE	CONSTRUCTION PRICE INDEX (e.g. 100.0)				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

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	NOON	1	2	3	4	5	6	7	8	9	10	11	MID NITE	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

7600-34035(REV.8-68)

FOOTNOTES

CARD TYPE	GEOG REGION		DEVICE/SECTOR						TIME PERIOD				FOOTNOTE NO.	LINE NO.		FOOTNOTE INFORMATION																																																												
									FR		TO																																																																				
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
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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
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SOURCE FOOTNOTES

	SOURCE I.D.				FOOTNOTE NO.	LINE NO.																																																																									
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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/SECTOR 136ALL3   6060          4.53
ERROR IN CARD TYPE OR DEVICE/SECTOR 134ALL4   6060          3.41
ERROR IN CARD TYPE OR DEVICE/SECTOR 167ALL4   6060          6.62
ERROR IN CARD TYPE OR DEVICE/SECTOR 133ALL4   6060          2.38
ERROR IN CARD TYPE OR DEVICE/SECTOR 136ALL4   6060          4.24
ERROR IN CARD TYPE OR DEVICE/SECTOR 134ALL5   6060          3.11
ERROR IN CARD TYPE OR DEVICE/SECTOR 167ALL5   6060          6.45
ERROR IN CARD TYPE OR DEVICE/SECTOR 133ALL5   6060          2.32
ERROR IN CARD TYPE OR DEVICE/SECTOR 136ALL5   6060          4.13
ERROR IN CARD TYPE OR DEVICE/SECTOR 134ALL6   6060          1.40
ERROR IN CARD TYPE OR DEVICE/SECTOR 167ALL6   6060          3.32
ERROR IN CARD TYPE OR DEVICE/SECTOR 133ALL6   6060          1.26
ERROR IN CARD TYPE OR DEVICE/SECTOR 136ALL6   6060          2.06
ERROR IN CARD TYPE OR DEVICE/SECTOR 134ALL7   6060          3.63
ERROR IN CARD TYPE OR DEVICE/SECTOR 167ALL7   6060          4.91
ERROR IN CARD TYPE OR DEVICE/SECTOR 133ALL7   6060          1.84
ERROR IN CARD TYPE OR DEVICE/SECTOR 136ALL7   6060          3.07
ERROR IN CARD TYPE OR DEVICE/SECTOR 137ALL2   6060          3.81
ERROR IN CARD TYPE OR DEVICE/SECTOR 137ALL3   6060          6.54
ERROR IN CARD TYPE OR DEVICE/SECTOR 137ALL4   6060          7.00
ERROR IN CARD TYPE OR DEVICE/SECTOR 137ALL5   6060          6.99
ERROR IN CARD TYPE OR DEVICE/SECTOR 137ALL6   6060          3.47
ERROR IN CARD TYPE OR DEVICE/SECTOR 137ALL7   6060          6.10
ERROR IN CARD TYPE OR DEVICE/SECTOR 139ALL2   6060          .270
ERROR IN CARD TYPE OR DEVICE/SECTOR 163ALL2   6060          .246
ERROR IN CARD TYPE OR DEVICE/SECTOR 164ALL2   6060          .359
ERROR IN CARD TYPE OR DEVICE/SECTOR 165ALL2   6060          12.1
ERROR IN CARD TYPE OR DEVICE/SECTOR 139ALL3   6060          .835
ERROR IN CARD TYPE OR DEVICE/SECTOR 163ALL3   6060          .718
ERROR IN CARD TYPE OR DEVICE/SECTOR 164ALL3   6060          1.08
ERROR IN CARD TYPE OR DEVICE/SECTOR 165ALL3   6060          36.4
ERROR IN CARD TYPE OR DEVICE/SECTOR 139ALL4   6060          1.35
ERROR IN CARD TYPE OR DEVICE/SECTOR 163ALL4   6060          .925
ERROR IN CARD TYPE OR DEVICE/SECTOR 164ALL4   6060          1.47
ERROR IN CARD TYPE OR DEVICE/SECTOR 165ALL4   6060          43.5
ERROR IN CARD TYPE OR DEVICE/SECTOR 139ALL5   6060          1.97
ERROR IN CARD TYPE OR DEVICE/SECTOR 163ALL5   6060          1.26
ERROR IN CARD TYPE OR DEVICE/SECTOR 164ALL5   6060          1.54
ERROR IN CARD TYPE OR DEVICE/SECTOR 165ALL5   6060          46.4
ERROR IN CARD TYPE OR DEVICE/SECTOR 139ALL6   6060          1.18
ERROR IN CARD TYPE OR DEVICE/SECTOR 163ALL6   6060          .681
ERROR IN CARD TYPE OR DEVICE/SECTOR 143ALL2   6060          2.61
ERROR IN CARD TYPE OR DEVICE/SECTOR 142ALL2   6060          .976
ERROR IN CARD TYPE OR DEVICE/SECTOR 143ALL3   6060          4.96
ERROR IN CARD TYPE OR DEVICE/SECTOR 142ALL3   6060          .969
ERROR IN CARD TYPE OR DEVICE/SECTOR 143ALL4   6060          4.18
ERROR IN CARD TYPE OR DEVICE/SECTOR 142ALL4   6060          .780
ERROR IN CARD TYPE OR DEVICE/SECTOR 143ALL5   6060          2.94
ERROR IN CARD TYPE OR DEVICE/SECTOR 142ALL5   6060          .772
ERROR IN CARD TYPE OR DEVICE/SECTOR 143ALL6   6060          1.75
ERROR IN CARD TYPE OR DEVICE/SECTOR 142ALL6   6060          .700
ERROR IN CARD TYPE OR DEVICE/SECTOR 143ALL7   6060          3.52
ERROR IN CARD TYPE OR DEVICE/SECTOR 142ALL7   6060          1.53
ERROR IN CARD TYPE OR DEVICE/SECTOR 163       6060          4.63
ERROR IN CARD TYPE OR DEVICE/SECTOR 164       6060          6.98
ERROR IN CARD TYPE OR DEVICE/SECTOR 165       6060          228.
ERROR IN CARD TYPE OR DEVICE/SECTOR 163       6060          3.95
ERROR IN CARD TYPE OR DEVICE/SECTOR 164       6060          5.86
ERROR IN CARD TYPE OR DEVICE/SECTOR 165       6060          146.
ERROR IN CARD TYPE OR DEVICE/SECTOR 163       6060          .235
ERROR IN CARD TYPE OR DEVICE/SECTOR 164       6060          .295
ERROR IN CARD TYPE OR DEVICE/SECTOR 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)
   3301 means 33 (3.30×10^1)
   3655 means 365000 (3.65×10^5)

Percentages are coded in a fixed format. 1000 means 100.0%; 06677 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
01 - Alameda
02 - Alpine
03 - Amador
04 - Butte
05 - Calaveras
06 - Colusa
07 - Contra Costa
08 - Del Norte
09 - Fresno
11 - Glenn
12 - Humboldt
13 - Imperial
14 - Inyo
15 - Kern
16 - Kings
17 - Lake
18 - Lassen
19 - Los Angeles
20 - Madera
21 - Marin
22 - Mariposa
23 - Mendocino
24 - Merced
25 - Modoc
26 - Mono
27 - Monterey
28 - Napa
29 - Nevada
30 - Orange
31 - Placer
32 - Plumas
33 - Riverside
34 - Sacramento
35 - San Benito
36 - San Bernardino
37 - San Diego
38 - San Francisco
39 - San Joaquin
40 - San Luis Obispo
41 - San Mateo
42 - Santa Barbara
43 - Santa Clara
44 - Santa Cruz
45 - Shasta
46 - Sierra
47 - Siskiyou
48 - Solano
49 - Sonoma
50 - Stanislaus
51 - Sutter
52 - Tehama
53 - Trinity
54 - Tulare
55 - Tuolumne
56 - Ventura
57 - Yolo
58 - Yuba
59 - Los Angeles SCE
60 - San Francisco SMSA
61 - San Francisco SCA
62 - Los Angeles SCA
63 - Bakersfield U.A.
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,TAPE
             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
```

```
            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
  7       1 CDSRTND(I) = 0
 10         CALL SORT0
 11      50 READ(4,100) CARD
        100 FORMAT(8A10)
 17         IF (CARD.EQ.5H/END/) GO TO 290
 21         DO 101 I = 1,12
 26     101 RVALUE = -0
 30         DO 102 I = 9,83
 36     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, 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     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
```

```
      SUBROUTINE BRKCARD
C
C     ROUTINE TO BREAK NON-BLANK CARD INFO. ,PUTS IT INTO VARIOUS AR
C     FOR CARD TYPES 1 AND 2
C      CRDINFO
C        THIS AREA IS NOT CLEARED BY THIS ROUTINE - CLEARING MUST
C        BE DONE EXTERNALLY.  THIS ALLOWS ACCUMULATION OF INFO
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 BROKEN 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 FOUND.
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 FOUND IN TH
C        VARIOUS DATA COLUMNS.  ARRAY ELEMENT 1 CONTAINS THE INFO FR
C        THE FIRST INFORMATION COLUMN ON CARD TYPE 1, ARRAY ELEMENT
C        2 CONTAINS THE INFO FROM THE 2ND SET OF INFO ON CARD TYPE 1,
C        ETC.
C          RVALUE - THE REAL VALUE OF THE DATA, WITH PROPER EXPONENTS
C          MANTISA - THE MANTISA FOUND OR DERIVED FROM THE VARIOUS CO
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          FOOTNT - THE FOOTNOTE CODE FOUND IN THE COLUMNS.
C          J - THE COLUMN NUMBER
C          TIMEFR - THE STARTING YEAR OF THE PERIOD 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 FOR PRINTING HEADINGS.
C          LINENO - 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
```

```
BRKCARD
                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 NCCLS/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
  150 IF (CRDTYPE.EQ.3) GO TO 105
      DEVBLDG = 2
      CALL TRNSCT
      GO TO 200
C
C               CARD TYPE 2
C
  160 CRDTYPE = 2
      GO TO 115
C
C               CARD TYPE 3
C
  170 CRDTYPE = 3
      GO TO 115
C
C               DEVICE AND SECTOR CARDS
C
  200 IF (CRDTYPE.NE.1) GO TO 210
      IF (DEVBLDG.NE.1) GO TO 210
      IF (SATRATE.EQ.0) GO TO 210
C      LOAD SATURATION RATE INFO FOR DEVICE CARDS, TYPE 1
      MANTISA(1) = SATRATE
      EXPNT(1) = 0
      RVALUE(1) = FLOAT(SATRATE)/10.
      HARDNS(1) = 0
      DECODE(10,205,CARD(3)) SATSRC
  205 FORMAT(5X,A4,X)
      SOURCE(1) = SATSRC
      FOOTNT(1) = SATFTNT
      FUELTYP = ITEMP
C      LOAD THE NUMBER OF DATA COLUMNS INTO K
  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.
      DO 300 I=1,K
      DECODE (4,212,CARD(I+2)) NUM4
  212 FORMAT(A4)
C      IF THE NUMBER FIELD IS BLANK, CHECK THE NEXT COLUMN.
      IF (NUM4.EQ.4H    ) GO TO 300
C      LOAD THE DEFAULT EXPONENT
      IEXP = IEXPS(I,CRDTYPE, DEVBLDG)
C      LOAD THE COLUMN NUMBER.
      J = I + 6*CRDTYPE - 6
      IF (DEVBLDG.EQ.1) J = J + 1
C      CHECK FOR NON-STANDARD FORMATS.
      IF (IEXP.LT.0) GO TO 230
      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.
      IF(SOURCE(J).EQ.4H0001.AND.FOOTNT(J).EQ.1H*)FOOTNT(J)=1H1
      IF(SOURCE(J).NE.4H    ) GO TO 902
      SOURCE(J)=4H0002
```

```
BRKCARD
   302          HARDNS(J)=0
   303      902 CONTINUE
   303          IF(DEVBLOG.EQ.2) GO TO 901
   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(
               -, 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, 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     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
CRDINFC- 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     DEVBLCG    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, 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)
                 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      DEVBLDG    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 TJ 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),HARCNS(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   , HARCNS( I),SOURCE
              -     FOCTNT(I)
           410 FORMAT(I10,X,I1,X,A4,X,A1,X)
  332      412 CONTINUE
  332          IF (FCOTNT(I).EQ.1H ) GO TO 415
        C
        C           THE FOLLOWING CODE STORES FOOTNOTE INFC FOR
        C           LATER RETRIEVAL AND PRINTING OF FC(TNOTES
        C
        C           CHECK WHETHER FOOTNOTE IS SOURCE FTNT OR DETAIL FTNT
  335          IF (FCOTNT(I).NE.1H*) GO TO 740
        C
        C           ITS A DETAIL FCOTNOTE - STORE INFO IN CC2-13, LETTER
        C           CORRESPONDING TO COLUMN NO, AND LINE NO CN 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 FCOTNOTE NC
        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 FCOTNCTES
 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 (CCLNO.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)
```

```
             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
```

```
          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    866       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    HARONS    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    000660
              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
```

```
SORTEON
                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 044000
```

```
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
```

```
      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 UN,10HITS       ,
          310HCENTRAL WA,10HRM AIR FUR,10HNACE      ,
          410HELEC.HEAT+,10HELEC.AIR C,10HONDITION,G,
          610HHEAT PUMP ,10H          ,10H          ,
          710HKWH SALES ,10HPER CUSTOM,10HER        ,
          810HKWH SALES ,10HFOR TOTAL ,10HRESIDENTL.,
          910HFLOOR,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, 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 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 UA  ,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          ,10HPOMONA-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 ,10HFORNIA      ,
                      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     00003
          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 ,
     36HMOBHOD,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 ,10HHOUSING 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
         00013E/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

CONTENTS

```
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              4630 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
```

```
                    ALL HOUSING

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 130992/204758 (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 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 170222/258361 (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 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 156048/263911 (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 170222/258381 (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 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 156546/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731  REGION VIII NONRES. CONSTR.)
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```
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         1560000 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          533000 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          145000 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               290 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              590 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 144969/228516 (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 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 170222/253381 (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 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 156346/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731  REGION VIII NONRES. CONSTR.)
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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             2400 0 8500
  19          74-74 STOCK              902 0 8500
```

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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              431 0 8000
  17          61-61 STOCK              738 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             4230 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             3910 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            11600 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
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 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
```

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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  126508/199572 (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 127217/209088 (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 131093/212681 (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 129731/214400 (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 135445/237835 (CALIF. NONRES. CONSTR. DIVIDED BY
DG721  REGION VIII NONRES. CONSTR.)
DG731  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG731  MULTI-LYING BY 156546/253511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731  REGION VIII NONRES. CONSTR.)
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```
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  28500000 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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  - - - - -   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 127217/209086 (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 170222/255361 (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 129730/214430 (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 156546/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731  REGION VIII NONRES. CONSTR.)
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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	5890000	1	DG72	1
13	73-73	CONST.SQFT	7490000	1	DG73	1

- - - - - SOURCE FOOTNOTES - - - - -

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 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 129730/214433 (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 156546/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731 REGION VIII NONRES. CONSTR.)

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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              2670 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               150 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.
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  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                  680 0 0002
FRESNO UA
  55          60-60 STOCK                  590 0 0002
LA - LONG BEACH SMSA
  56          60-60 STOCK                33590 0 0002
SACRAMENTO UA
  57          60-60 STOCK                 2940 0 0002
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```
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
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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        16 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         5 0 1000 1
CONTRA COSTA CO.
  26        69-69 CONSTRUCTN       116 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       186 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        16 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        35 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
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  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         138 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          32 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         265 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           6 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          46 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.
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 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       93 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      161 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
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 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      30 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    1360 0 1000 1
 179          71-71 CONSTRUCTN    2060 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      30 0 1000 1
PLUMAS CO.
 191          70-70 CONSTRUCTN       1 0 1000 1
 192          71-71 CONSTRUCTN       0 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.
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 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       1350 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        255 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        365 0  1000 1
 242          75-75 CONSTRUCTN        338 0  1000 1
SAN MATEO CO.
 243          69-69 CONSTRUCTN         26 0  1000 1
 244          70-70 CONSTRUCTN         25 0  1000 1
 245          71-71 CONSTRUCTN         40 0  1000 1
 246          72-72 CONSTRUCTN        161 0  1000 1
 247          73-73 CONSTRUCTN        141 0  1000 1
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  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         286  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         686  0  1000  1
  262            74-74  CONSTRUCTN         763  0  1000  1
  263            75-75  CONSTRUCTN         736  0  1000  1
 SANTA  CRUZ  CO.
  264            69-69  CONSTRUCTN         157  0  1000  1
  265            70-70  CONSTRUCTN         286  0  1000  1
  266            71-71  CONSTRUCTN         277  0  1000  1
  267            72-72  CONSTRUCTN         253  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         156  0  1000  1
  272            70-70  CONSTRUCTN         133  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         451  0  1000  1
  297            75-75  CONSTRUCTN         339  0  1000  1
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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         166 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         276 0 1000 1
TUOLUMNE CO.
 330          69-69 CONSTRUCTN          25 0 1000 1
 331          70-70 CONSTRUCTN          50 0 1000 1
 332          71-71 CONSTRUCTN          36 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         333 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
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 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


    - - - - -   SOURCE   FOOTNOTES   - - - - -
10001  SALES FOR EACH COUNTY ALLOCATED BETWEEN DOUBLE + SINGLE UNITS ACCORDING
10001  TO THAT YEAR'S SALES DATA
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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
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   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         43 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        136 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         26 0 1000 1
 LAKE CO.
   90          69-69 CONSTRUCTN         54 0 1000 1
   91          70-70 CONSTRUCTN         63 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         93 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
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  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        33 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       137 0 1000 1
 137          73-73 CONSTRUCTN        96 0 1000 1
 138          74-74 CONSTRUCTN        39 0 1000 1
 139          75-75 CONSTRUCTN        16 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
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MOBILE HOME SINGLE WIDTH

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 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         83 0 1000 1
 178            74-74 CONSTRUCTN         91 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        228 0 1000 1
 187            71-71 CONSTRUCTN        835 0 1000 1
 188            72-72 CONSTRUCTN        900 0 1000 1
 189            73-73 CONSTRUCTN        518 0 1000 1
 190            74-74 CONSTRUCTN        516 0 1000 1
 191            75-75 CONSTRUCTN        354 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
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 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        856 0 1000 1
 208           70-70 CONSTRUCTN        776 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         37 0 1000 1
 221           70-70 CONSTRUCTN         54 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         30 0 1000 1
 228           70-70 CONSTRUCTN         25 0 1000 1
 229           72-72 CONSTRUCTN        127 0 1000 1
 230           73-73 CONSTRUCTN        136 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        146 0 1000 1
 238           74-74 CONSTRUCTN        130 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
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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         53 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        154 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         54 0 1000 1
SONOMA CO.
 270           69-69 CONSTRUCTN        356 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        249 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         96 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.
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                         MOBILE HOME SINGLE WIDTH

 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           34 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          255 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           53 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
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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         38 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         52 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        341 0 CT70
  31          71-71 CONSTRUCTN        402 0 CT71
  32          72-72 CONSTRUCTN        432 0 CT72
  33          73-73 CONSTRUCTN        933 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         53 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          8 0 CT71
  46          72-72 CONSTRUCTN          4 0 CT72
CONTRA COSTA CO.
  47          67-67 CONSTRUCTN       1640 0 CT69
  48          68-68 CONSTRUCTN       1250 0 CT69
  49          69-69 CONSTRUCTN       3490 0 CT69
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   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         50  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        256  0  CT73
   88          74-74  CONSTRUCTN        203  0  CT74
 IMPERIAL CO.
   89          67-67  CONSTRUCTN        159  0  CT69
   90          68-68  CONSTRUCTN         53  0  CT69
   91          69-69  CONSTRUCTN         44  0  CT69
   92          70-70  CONSTRUCTN         78  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        116  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
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 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          705 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           98 0 CT73
 116          74-74 CONSTRUCTN           36 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            6 0 CT73
 124          74-74 CONSTRUCTN            6 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          300 0 CT69
 144          68-68 CONSTRUCTN          497 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
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MULTI-UNIT RESIDENTIAL BLDGS.

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 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         64 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        169 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         40 0 CT72
 171          73-73 CONSTRUCTN         58 0 CT73
MONO CO.
 172          67-67 CONSTRUCTN         77 0 CT69
 173          68-68 CONSTRUCTN        135 0 CT69
 174          69-69 CONSTRUCTN        269 0 CT69
 175          70-70 CONSTRUCTN        321 0 CT70
 176          71-71 CONSTRUCTN        502 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        340 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       1650 0 CT71
 185          72-72 CONSTRUCTN       2240 0 CT72
 186          73-73 CONSTRUCTN       1480 0 CT73
 187          74-74 CONSTRUCTN        355 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        609 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         40 0 CT71
 198          72-72 CONSTRUCTN        130 0 CT72
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MULTI-UNIT RESIDENTIAL BLDGS.

```
 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       16100 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          89 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         231 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           0 0 CT70
 220            71-71 CONSTRUCTN          10 0 CT71
 221            72-72 CONSTRUCTN          16 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        5220 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           0 0 CT71
 245            72-72 CONSTRUCTN          73 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
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 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        868 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       1650 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        178 0 CT69
 281          68-68 CONSTRUCTN         90 0 CT69
 282          69-69 CONSTRUCTN        257 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       4000 0 CT71
 293          72-72 CONSTRUCTN       5430 0 CT72
 294          73-73 CONSTRUCTN       4850 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       1550 0 CT72
 299          70-70 CONSTRUCTN       1350 0 CT72
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 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         284 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           0 0 CT71
 337           72-72 CONSTRUCTN          50 0 CT72
 338           73-73 CONSTRUCTN          96 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        1090 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
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                          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        138 0 CT69
 365        69-69 CONSTRUCTN        128 0 CT69
 366        70-70 CONSTRUCTN        157 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         76 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        597 0 CT69
 396        68-68 CONSTRUCTN        716 0 CT69
 397        69-69 CONSTRUCTN       1800 0 CT72
 398        70-70 CONSTRUCTN       2710 0 CT70
 399        71-71 CONSTRUCTN       4880 0 CT71
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 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        1368  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
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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   - - - - -
DG631  THIS INFORMATION WAS DERIVED FROM DATA ON 11 WESTERN STATES.  FIGURES
DG631  FOR CALIFORNIA WERE DERIVED BY MULTIPYING WESTERN REGIONAL DATA BY
DG631  126808/199572 (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 170222/298381 (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 131093/212661 (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 150546/263511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731  REGION VIII NONRES. CONSTR.)
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 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   9360000 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 DG65
   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   1760000 0 DG63
   35          64-64 CONST.SQFT   2010000 0 DG64
   36          65-65 CONST.SQFT   2150000 0 DG65
   37          66-66 CONST.SQFT   1350000 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   2920000 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   2085000 0 DG66
   49          67-67 CONST.SQFT   1390000 0 DG67
   50          68-68 CONST.SQFT   1300000 0 DG68
   51          69-69 CONST.SQFT   1810000 0 DG69
   52          70-70 CONST.SQFT   1030000 0 DG70
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   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   48400000 0 DG65
   59          66-66 CONST.SQFT   52000000 0 DG66
   60          67-67 CONST.SQFT   44000000 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     556000 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     333000 0 DG63
   83          64-64 CONST.SQFT     567000 0 DG64
   84          65-65 CONST.SQFT     613000 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.
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 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   4630000 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   7620000 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   5330000 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
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 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     1640000 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     3640000 0 DG66
 178          67-67 CONST.SQFT     5300000 0 DG67
 179          68-68 CONST.SQFT     3340000 0 DG68
 180          69-69 CONST.SQFT     4290000 0 DG69
 181          70-70 CONST.SQFT     2950000 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     2150000 0 DG68
 191          69-69 CONST.SQFT     1700000 0 DG69
 192          70-70 CONST.SQFT      315000 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     8660000 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     9260000 0 DG72
 205          73-73 CONST.SQFT    11300000 0 DG73
SANTA CRUZ CO.
 206          73-73 CONST.SQFT      406000 0 DG73
SHASTA CO.
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 207            68-68 CONST.SQFT  10200000 0 DG68
SOLANO CO.
 208            63-63 CONST.SQFT    836000 0 DG63
 209            64-64 CONST.SQFT    787000 0 DG64
 210            65-65 CONST.SQFT   1100000 0 DG65
 211            66-66 CONST.SQFT    576000 0 DG66
 212            67-67 CONST.SQFT    705000 0 DG67
 213            68-68 CONST.SQFT   1260000 0 DG68
 214            69-69 CONST.SQFT   1080000 0 DG69
 215            70-70 CONST.SQFT    609000 0 DG70
 216            71-71 CONST.SQFT   1380000 0 DG71
 217            72-72 CONST.SQFT    748000 0 DG72
 218            73-73 CONST.SQFT   1060000 0 DG73
SONOMA CO.
 219            63-63 CONST.SQFT   1330000 0 DG63
 220            64-64 CONST.SQFT   1520000 0 DG64
 221            65-65 CONST.SQFT   1430000 0 DG65
 222            66-66 CONST.SQFT   1130000 0 DG66
 223            67-67 CONST.SQFT   1050000 0 DG67
 224            68-68 CONST.SQFT   1050000 0 DG68
 225            69-69 CONST.SQFT   1250000 0 DG69
VENTURA CO.
 226            66-66 CONST.SQFT   2930000 0 DG66
 227            67-67 CONST.SQFT   1410000 0 DG67
 228            68-68 CONST.SQFT   2620000 0 DG68
 229            69-69 CONST.SQFT   4140000 0 DG69
 230            70-70 CONST.SQFT   2090000 0 DG70
 231            71-71 CONST.SQFT   2640000 0 DG71
 232            72-72 CONST.SQFT   2650000 0 DG72
 233            73-73 CONST.SQFT   2480000 0 DG73
YOLO CO.
 234            64-64 CONST.SQFT    879000 0 DG64
 235            65-65 CONST.SQFT   1170000 0 DG65
 236            66-66 CONST.SQFT    602000 0 DG66
 237            67-67 CONST.SQFT    867000 0 DG67
 238            68-68 CONST.SQFT    329000 0 DG68
 239            69-69 CONST.SQFT    632000 0 DG69
 240            70-70 CONST.SQFT    805000 0 DG70
 241            71-71 CONST.SQFT    512000 0 DG71
 242            72-72 CONST.SQFT    725000 0 DG72
 243            73-73 CONST.SQFT    468000 0 DG73
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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


     - - - - -   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  126803/199572 (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. CONST-.)
DG681  DERIVFD 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 131093/212601 (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 120733/214400 (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 156546/283511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731  REGION VIII NONRES. CONSTR.)
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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

     - - - - -   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 127217/209083 (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 135546/263511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731  REGION VIII NONRES. CONSTR.)
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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


    - - - - -   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 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 170222/258361 (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.)
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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
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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 149609/220516 (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 170222/253381 (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 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.)
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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        367 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        308 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
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  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       1590 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       1590 0 CT73
  85             74-74 CONSTRUCTN       2630 0 CT74
GLENN CO
  86             67-67 CONSTRUCTN         59 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
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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         60 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        369 0 CT74
LAKE CO.
 134          67-67 CONSTRUCTN        233 0 CT69
 135          68-68 CONSTRUCTN        195 0 CT69
 136          69-69 CONSTRUCTN        131 0 CT69
 137          70-70 STOCK            6433 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            4330 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
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 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         138 0 CT69
 159          68-68 CONSTRUCTN         138 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            43300 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          54 0 CT69
 176          69-69 CONSTRUCTN          41 0 CT69
 177          70-70 STOCK             1780 0 0002   CONSTRUCTN          79 0 CT70
 178          71-71 CONSTRUCTN          56 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         406 0 CT73
 189          74-74 CONSTRUCTN         264 0 CT74
MERCED CO.
 190          67-67 CONSTRUCTN         355 0 CT69
 191          68-68 CONSTRUCTN         351 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
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  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             830 0 0002    CONSTRUCTN           64 0 CT70
  210          71-71 CONSTRUCTN        157 0 CT71
  211          72-72 CONSTRUCTN        116 0 CT72
  212          73-73 CONSTRUCTN         34 0 CT73
  213          74-74 CONSTRUCTN         59 0 CT74
 MONTEREY CO.
  214          67-67 CONSTRUCTN        937 0 CT69
  215          68-68 CONSTRUCTN        699 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       1610 0 CT72
  220          73-73 CONSTRUCTN       1390 0 CT73
  221          74-74 CONSTRUCTN       1650 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        751 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       8680 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      15100 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        551 0 CT69
  249          70-70 STOCK           19600 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
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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	3220	0	CT74				
SACRAMENTO CO.									
270	67-67	CONSTRUCTN	2500	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	57	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	3650	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	10700	0	CT69				
297	70-70	STOCK	256000	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	7600	0	CT74				
SAN FRANCISCO CO.									
302	67-67	CONSTRUCTN	111	0	CT69				
303	68-68	CONSTRUCTN	116	0	CT69				

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 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         643 0 CT69
 335         68-68 CONSTRUCTN         825 0 CT69
 336         69-69 CONSTRUCTN         880 0 CT69
 337         70-70 STOCK            56800 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
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 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          48 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         123 0 CT72
 378          73-73 CONSTRUCTN         173 0 CT73
 379          74-74 CONSTRUCTN         169 0 CT74
SOLANO CO.
 380          67-67 CONSTRUCTN         933 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        2550 0 CT73
 395          74-74 CONSTRUCTN        2380 0 CT74
STANISLAUS CO.
 396          67-67 CONSTRUCTN        1040 0 CT69
 397          68-68 CONSTRUCTN         963 0 CT69
 398          69-69 CONSTRUCTN         593 0 CT69
 399          70-70 CONSTRUCTN        1210 0 CT70
 400          71-71 CONSTRUCTN        1090 0 CT72
 401          72-72 CONSTRUCTN        2010 0 CT72
 402          73-73 CONSTRUCTN        1860 0 CT73
 403          74-74 CONSTRUCTN        1920 0 CT74
SUTTER CO.
 404          67-67 CONSTRUCTN         170 0 CT69
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  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         75 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         46 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        846 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       2410 0 CT70
  448          71-71 CONSTRUCTN       3270 0 CT71
  449          72-72 CONSTRUCTN       4640 0 CT72
  450          73-73 CONSTRUCTN       2570 0 CT73
  451          74-74 CONSTRUCTN       1810 0 CT74
YOLO CO.
  452          67-67 CONSTRUCTN        342 0 CT69
  453          68-68 CONSTRUCTN        517 0 CT69
  454          69-69 CONSTRUCTN        501 0 CT69
  455          70-70 CONSTRUCTN        510 0 CT70
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 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        159 0 CT72
 466          73-73 CONSTRUCTN        214 0 CT73
 467          74-74 CONSTRUCTN        153 0 CT74
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CALIFORNIA
   1          60-60 STOCK          5460000 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             4430 0 9000 2
  14          70-70 STOCK             6650 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           173000 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             5780 0 9600
  26          70-70 STOCK            23300 0 9000 1
  27          70-70 STOCK            15000 0 9000 2
FRESNO CO.
  28          60-60 STOCK           119300 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            18500 0 9600
  38          70-70 STOCK            21000 0 9000 2
  39          70-70 STOCK            23200 0 9000 1
INYO CO.
  40          60-60 STOCK             4050 0 9600
  41          70-70 STOCK             6250 0 9000 1
  42          70-70 STOCK             5570 0 9000 2
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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        15600 0 9600
  68          70-70 STOCK        32500 0 9000 1
  69          70-70 STOCK        16600 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         2640 0 9000 2
MONO CO.
  76          60-60 STOCK          638 0 9600
  77          70-70 STOCK         1300 0 9000 2
  78          70-70 STOCK        76000 0 9000 1
MONTEREY CO.
  79          60-60 STOCK        52200 0 9600
  80          70-70 STOCK        26800 0 9000 1
  81          70-70 STOCK        71100 0 9000 2
NAPA CO.
  82          60-60 STOCK        18900 0 9600
  83          70-70 STOCK        11500 0 9000 1
  84          70-70 STOCK        25100 0 9000 2
NEVADA CO.
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  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            150000 0 9000 2
SACRAMENTO CO.
 100          60-60 STOCK            165000 0 0002
 101          70-70 STOCK            212000 0 9000 1
 102          70-70 STOCK            253000 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            250000 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            453000 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            295000 0 9000 2
SAN JOAQUIN CO.
 115          60-60 STOCK             86500 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             25500 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             33900 0 9000 2
 127          70-70 STOCK             33800 0 9000 1
SANTA CLARA CO.
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 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             705 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            2750 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.
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 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         276000 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         195000 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         225000 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
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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
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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

    - - - - -   S O U R C E   F O O T N O T E S   - - - - -
DG641  DERIVED FROM TOTALS FOR DODGE REGION VIII (11 WESTERN STATES) BY
DG641  MULTIPLYING BY 130992/234758 (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 127217/209030 (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 176222/258381 (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 131095/212631 (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 156546/263511 (CALIF. NONRES. CONSTR. DIVIDED BY
DG731  REGION VIII NONRES. CONSTR.)
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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          155000 0 5000
   6          74-74 STOCK          161000 0 5000
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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
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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
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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
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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
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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
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  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        34.6 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
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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       42.6 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        7.8 0 9000 1 STOCK          3940 0 9000
  40   0     70-70 SAT. RATE       36.1 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.
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   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          9.6 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         54.5 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         43.5 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 9000
 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         51.1 0 9000 5 STOCK             8490 0 9000
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  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         6.2 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        26.0 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         2.6 0 0001 1 STOCK          2730 1 0001
 SACRAMENTO CO.
 116    G     60-60 SAT. RATE         2.5 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         4.6 0 0001 1 STOCK          6910 1 0001
 121    G     60-60 SAT. RATE         3.6 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.
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 130    E     60-60 SAT. RATE          20.6 0 0001 1 STOCK          [illegible] 0 0001
 131    G     60-60 SAT. RATE          12.2 0 0001 1 STOCK          [illegible] 0 00
SANTA BARBARA CO.
 132    G     60-60 SAT. RATE          10.3 0 0001 1 STOCK          [illegible] 0 0001
 133    E     60-60 SAT. RATE           8.4 0 0001 1 STOCK          [illegible] 0 0001
SANTA CLARA CO.
 134    E     60-60 SAT. RATE          20.0 0 0001 1 STOCK          [illegible] 0 0001
 135    G     60-60 SAT. RATE           6.0 0 0001 1 STOCK          [illegible] 0 0001
SANTA CRUZ CO.
 136    G     60-60 SAT. RATE           4.0 0 2751 1 STOCK          [illegible] 2751
 137          60-60 SAT. RATE          12.0 0 2751 1 STOCK          [illegible] 2751
SHASTA CO.
 138          60-60 SAT. RATE          24.0 0 2751 1 STOCK          [illegible] 2751
 139    G     60-60 SAT. RATE           1.0 0 2751 1 STOCK          [illegible] 2751
SIERRA CO.
 140          60-60 SAT. RATE          25.0 0 2751 1 STOCK          [illegible] 2751
SISKIYOU CO.
 141          60-60 SAT. RATE          26.0 0 2751 1 STOCK          [illegible] 2751
SOLANO CO.
 142    G     60-60 SAT. RATE           4.8 0 0001 1 STOCK          [illegible] 0001
 143    E     60-60 SAT. RATE          19.3 0 0001 1 STOCK          [illegible] 0001
SONOMA CO.
 144    G     60-60 SAT. RATE           5.0 0 2751 1 STOCK          [illegible] 2751
 145          60-60 SAT. RATE          15.0 0 2751 1 STOCK          [illegible] 2751
STANISLAUS CO.
 146          60-60 SAT. RATE          17.0 0 2751 1 STOCK          [illegible] 2751
 147    G     60-60 SAT. RATE           2.0 0 2751 1 STOCK          [illegible] 2751
SUTTER CO.
 148    G     60-60 SAT. RATE           4.0 0 2751 1 STOCK          [illegible] 2751
 149          60-60 SAT. RATE          22.0 0 2751 1 STOCK          [illegible] 2751
TEHAMA CO.
 150          60-60 SAT. RATE          22.0 0 2751 1 STOCK          [illegible] 2751
 151    G     60-60 SAT. RATE           1.0 0 2751 1 STOCK          [illegible] 2751
TRINITY CO.
 152    G     60-60 SAT. RATE           2.0 0 2751 1 STOCK          [illegible] 2751
 153          60-60 SAT. RATE          23.0 0 2751 1 STOCK          [illegible] 2751
TULARE CO.
 154          60-60 SAT. RATE          12.0 0 2751 1 STOCK          [illegible] 2751
 155    G     60-60 SAT. RATE           3.0 0 2751 1 STOCK          [illegible] 2751
TUOLUMNE CO.
 156    G     60-60 SAT. RATE           4.0 0 2751 1 STOCK          [illegible] 2751
 157          60-60 SAT. RATE          19.0 0 2751 1 STOCK          [illegible] 2751
VENTURA CO.
 158    G     60-60 SAT. RATE           7.0 0 2751 1 STOCK          [illegible] 2751
 159          60-60 SAT. RATE           7.0 0 2751 1 STOCK          [illegible] 2751
YOLO CO.
 160          60-60 SAT. RATE          20.0 0 2751 1 STOCK          [illegible] 2751
 161    G     60-60 SAT. RATE           2.0 0 2751 1 STOCK          [illegible] 2751
YUBA CO.
 162    G     60-60 SAT. RATE           3.0 0 2751 1 STOCK          [illegible] 2751
SAN FRANCISCO SMSA
 163    E     60-60 SAT. RATE          12.6 0 0001 1 STOCK          [illegible] 0 0001
 164    G     60-60 SAT. RATE           6.6 0 0001 1 STOCK          [illegible] 0 000
BAKERSFIELD UA
 165    G     60-60 SAT. RATE           4.9 0 0001 1 STOCK          [illegible] 0 0001
 166    E     60-60 SAT. RATE          11.4 0 0001 1 STOCK          [illegible] 0 0001
FRESNO UA
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 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           2.6 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           4.8 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           6.5 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
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CALIFORNIA
   1          60-60 SAT. RATE        69.1 0 2751 1 STOCK        [illegible]00 1 27
   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 0 0001
   7   0      70-70 SAT. RATE        64.9 0 9000 1 STOCK        [illegible]0 0 9000
ALPINE CO.
   8          60-60 SAT. RATE       100.0 0 2751 1 STOCK        [illegible]09 1 2751
   9   0      70-70 SAT. RATE        83.6 0 9000 2 STOCK        [illegible]07 0 9000
AMADOR CO.
  10          60-60 SAT. RATE        89.0 0 2751 1 STOCK        [illegible]90 1 2751
  11   0      70-70 SAT. RATE        79.4 0 9000 3 STOCK        [illegible]50 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        78.0 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        76.3 0 9000 9 STOCK        [illegible] 0 9000
FRESNO CO.
  24          60-60 SAT. RATE        52.2 0 0001 1 STOCK        55700 0 0001
  25   0      70-70 SAT. RATE        77.3 0 9000 1 STOCK        47300 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        4600 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        22800 0 9000
IMPERIAL CO.
  30          60-60 SAT. RATE        78.0 0 2751 1 STOCK        [illegible] 1 2751
  31   0      70-70 SAT. RATE        50.0 0 9000 4 STOCK        [illegible] 0 9000
INYO CO.
  32          60-60 SAT. RATE        62.0 0 2751 1 STOCK        2220 1 2751
  33   0      70-70 SAT. RATE        59.0 0 9000 5 STOCK        3290 0 9000
KERN CO.
  34          60-60 SAT. RATE        55.2 0 0001 1 STOCK        47200 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
  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        4240 1 2751
  39   0      70-70 SAT. RATE        76.0 0 9000 8 STOCK        5740 0 9000
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CLOTHES WASHER

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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       52.0 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       81.0 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       50.8 0 0001 1 STOCK        37800 0 0001
SAN LUIS OBISPO CO.
  71           60-60 SAT. RATE       73.0 0 2751 1 STOCK        19100 1 2751
SAN MATEO CO.
  72           60-60 SAT. RATE       64.0 0 0001 1 STOCK        86500 0 0001
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SANTA BARBARA CO.
  73           60-60 SAT. RATE        47.2 0 0001 1 STOCK            24500 0 000
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        85.0 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        76.0 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      157000 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        59.3 0 0001 1 STOCK            25500 0 0001
FRESNO UA
  95           60-60 SAT. RATE        56.5 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
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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


    - - - - -   S O U R C E   F O O T N O T E S   - - - - -
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 MARKIT AREA.
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CALIFORNIA
    1          71-71 ADDITIONS     233000 1 AH01 1
    2          72-72 ADDITIONS     278000 1 AH01 1
    3          73-73 ADDITIONS     292000 1 AH01 1
    4          74-74 ADDITIONS     261000 1 AH01 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       18.8 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       16.3 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       26.4 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 AH01 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

    - - - - -   S O U R C E   F O O T N O T E S   - - - - -
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
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SDG+E SERVICE AREA
   1          74-74 STOCK           574000 0 2000
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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       26.2 0 9000 3 STOCK           1040 0 9000
 BUTTE CO.
  14  0       60-60 SAT. RATE        6.0 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       29.6 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        6.6 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
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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 9000
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         5.9 0 1492   STOCK            185000 0 1492
SAN BENITO CO.
  70  0      60-60 SAT. RATE         7.3 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         5.8 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
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  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  0       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  0       60-60 SAT. RATE           6.6 0 9600 1   STOCK            2020 0 9600
 SHASTA CO.
  83  0       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  0       60-60 SAT. RATE           6.7 0 9600 1   STOCK               5 0 9600
 SISKIYOU CO.
  86  0       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  0       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  0       60-60 SAT. RATE           5.0 0 9600 1   STOCK            2410 0 9600
 SUTTER CO.
  91  0       60-60 SAT. RATE           3.9 0 9600 1   STOCK             385 0 9600
 TEHAMA CO.
  92  0       60-60 SAT. RATE           3.6 0 9600 1   STOCK            1070 0 9600
 TRINITY CO.
  93  0       60-60 SAT. RATE          16.9 0 9600 1   STOCK             531 0 9600
 TULARE CO.
  94  0       60-60 SAT. RATE           3.8 0 9600 1   STOCK            1840 0 9600
 TUOLUMNE CO.
  95  0       60-60 SAT. RATE           2.1 0 9600 1   STOCK            1040 0 9600
 VENTURA CO.
  96  0       60-60 SAT. RATE           2.9 0 9600 1   STOCK            1610 0 9600
 YOLO CO.
  97  0       60-60 SAT. RATE           3.0 0 9600 1   STOCK             590 0 9600
 YUBA CO.
  98  0       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
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SAN DIEGO UA
 107     E     60-60 SAT. RATE         3.1 0 0001 1 STOCK                  7930 0 000
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
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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
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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 0 1951   STOCK             35900 1 1951
   2          72-72 SAT. RATE        13.7 0 1951   STOCK             29200 1 1951
   3          75-75 SAT. RATE        11.7 0 1951   STOCK             27500 1 1951
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CALIFORNIA
   1          60-60 SAT. RATE         19.2 0 2751 1 STOCK      [illegible]0 1 27
 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 STOCK      [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 STOCK      [illegible]7 0 9000
AMADOR CO.
   6          60-60 SAT. RATE         37.0 0 2751 1 STOCK      [illegible] 1 2751
   7  0       70-70 SAT. RATE         38.2 0 9000 3 STOCK      [illegible] 0 9000
BUTTE CO.
   8          60-60 SAT. RATE         36.0 0 2751 1 STOCK      [illegible] 1 2751
   9  0       70-70 SAT. RATE         35.7 0 9000 4 STOCK      [illegible] 0 9000
CALAVERAS CO.
  10          60-60 SAT. RATE         36.0 0 2751 1 STOCK      [illegible] 1 2751
  11  0       70-70 SAT. RATE         48.0 0 9000 5 STOCK      [illegible] 0 9000
COLUSA CO.
  12          60-60 SAT. RATE         45.0 0 2751 1 STOCK      [illegible] 1 2751
  13  0       70-70 SAT. RATE         45.0 0 9000 6 STOCK      [illegible] 0 9000
CONTRA COSTA CO.
  14    E     60-60 SAT. RATE         24.3 0 0001 1 STOCK      [illegible] 0 0001
  15  0       70-70 SAT. RATE         29.9 0 9000 7 STOCK      [illegible] 0 9000
DEL NORTE CO.
  16          60-60 SAT. RATE         31.0 0 2751 1 STOCK      [illegible] 1 2751
  17  0       70-70 SAT. RATE         44.3 0 9000 8 STOCK      [illegible] 0 9000
EL DORADO CO.
  18          60-60 SAT. RATE         37.0 0 2751 1 STOCK      [illegible] 1 27
  19  0       70-70 SAT. RATE         34.8 0 9000 9 STOCK      [illegible] 0 9000
FRESNO CO.
  20    E     60-60 SAT. RATE         23.5 0 0001 1 STOCK      [illegible] 0 0001
  21  0       70-70 SAT. RATE         31.2 0 9000 1 STOCK      [illegible] 0 9000
GLENN CO
  22          60-60 SAT. RATE         49.0 0 2751 1 STOCK      [illegible] 1 2751
  23  0       70-70 SAT. RATE         56.8 0 9000 2 STOCK      [illegible] 0 9000
HUMBOLDT CO.
  24          60-60 SAT. RATE         38.0 0 2751 1 STOCK      [illegible] 1 2751
  25  0       70-70 SAT. RATE         40.6 0 9000 3 STOCK      [illegible] 0 9000
IMPERIAL CO.
  26          60-60 SAT. RATE         25.0 0 2751 1 STOCK      [illegible] 1 2751
  27  0       70-70 SAT. RATE         24.7 0 9000 4 STOCK      [illegible] 0 9000
INYO CO.
  28          60-60 SAT. RATE         30.0 0 2751 1 STOCK      [illegible] 1 2751
  29  0       70-70 SAT. RATE         30.6 0 9000 5 STOCK      [illegible] 0 9000
KERN CO.
  30    E     60-60 SAT. RATE         22.1 0 0001 1 STOCK      [illegible] 0 0001
  31  0       70-70 SAT. RATE         23.9 0 9000 6 STOCK      [illegible] 0 9000
KINGS CO.
  32          60-60 SAT. RATE         36.0 0 2751 1 STOCK      [illegible] 1 2751
  33  0       70-70 SAT. RATE         34.0 0 9000 7 STOCK      [illegible] 0 9000
LAKE CO.
  34          60-60 SAT. RATE         42.0 0 2751 1 STOCK      [illegible] 1 2751
  35  0       70-70 SAT. RATE         43.2 0 9000 8 STOCK      [illegible] 0 900
LASSEN CO.
  36          60-60 SAT. RATE         41.0 0 2751 1 STOCK      [illegible] 1 2751
  37  0       70-70 SAT. RATE         56.2 0 9000 9 STOCK      [illegible] 0 9000
LOS ANGELES CO.
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  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        20.4 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          9940 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        15.8 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        20.6 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
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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        44.0 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        14.6 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        11.5 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        16.9 0 0001 1 STOCK          42600 0 0001
SAN JOSE UA
  94     E    60-60 SAT. RATE        18.5 0 0001 1 STOCK          32500 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           6500 0 0001
POMONA-ONTARIO UA
  97          60-60 SAT. RATE       117.3 0 2751 1 STOCK        5090000 1 27
  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
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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 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
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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         2.5 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        91.5 0 9600 1 STOCK            16200 0 9600
 24   0 G     70-70 SAT. RATE        89.7 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        86.4 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        76.3 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            116 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        51.9 0 0001 1 STOCK         250000 0 0001
 SAN FRANCISCO CO.
  63     G    60-60 SAT. RATE        95.2 0 0001 1 STOCK         263000 0 0001
 SAN JOAQUIN CO.
  64     G    60-60 SAT. RATE        54.3 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            63 0 9
SIERRA CO.
  71  0 G     60-60 SAT. RATE          6.4 0 9600 1 STOCK             5 0 9600
SISKIYOU CO.
  72  0 G     60-60 SAT. RATE          5.2 0 9600 1 STOCK            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             3 0 9600
TULARE CO.
  79  0 G     60-60 SAT. RATE         76.9 0 9600 1 STOCK   [illegible] 0 9600
TUOLUMNE CO.
  80  0 G     60-60 SAT. RATE          2.9 0 9600 1 STOCK   [illegible] 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         73.6 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 BRNACINO-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] 0 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         66.1 0 2751 1 STOCK   [illegible] 0 2751
SF-OAK URBANIZD AREA
  99    G     60-60 SAT. RATE         93.3 0 0001 1 STOCK   [illegible] 0 0001
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   - - - - -   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
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
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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

    - - - - -   S O U R C E   F O O T N O T E S   - - - - -
2000T  ALL HOMES
2000S  NEW INDIVIDUAL (SINGLE-FAMILY) HOMES
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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.          5640 0  3000
   15          72-72 E.C.ADDNS.          5730 0  3000
   16          73-73 E.C.ADDNS.          5690 0  3000
   17          74-74 E.C.ADDNS.          5540 0  3000
   18          75-75 E.C.ADDNS.          5600 0  3000
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SDG+E SERVICE AREA
   1            74-74 STOCK             533000 0 2000
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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      19.8 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       6.8 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       6.8 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       3.8 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.
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  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


     - - - - -   S O U R C E   F O O T N O T E S   - - - - -
27511  SATURATION RATE DERIVED FROM OCCUPIED UNITS STOCK
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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        33.6 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        49.3 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         6.5 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        55.8 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         1.3 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         7.6 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        46.1 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
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   46  0 G    60-60 SAT. RATE       34.3 0 9600 1 STOCK     [illegible] 9600
   47  0 G    70-70 SAT. RATE       36.0 0 9000 2 STOCK     [illegible] 90
   48  0      70-70 SAT. RATE       48.6 0 9000 2 STOCK     [illegible] 9000
 HUMBOLDT CO.
   49  0      60-60 SAT. RATE       38.1 0 9600 1 STOCK     [illegible] 9600
   50  0 G    60-60 SAT. RATE       34.9 0 9600 1 STOCK     [illegible] 9600
   51  0      70-70 SAT. RATE       52.3 0 9000 3 STOCK     [illegible] 9000
   52  0 G    70-70 SAT. RATE       37.9 0 9000 3 STOCK     [illegible] 9000
 IMPERIAL CO.
   53  0 G    60-60 SAT. RATE       49.3 0 9600 1 STOCK     [illegible] 9600
   54  0      60-60 SAT. RATE       34.2 0 9600 1 STOCK     [illegible] 9600
   55  0 G    70-70 SAT. RATE       49.9 0 9000 4 STOCK     [illegible] 9000
   56  0      70-70 SAT. RATE       38.0 0 9000 4 STOCK     [illegible] 9000
 INYO CO.
   57  0 G    60-60 SAT. RATE        3.7 0 9600 1 STOCK     [illegible] 9600
   58  0      60-60 SAT. RATE       37.8 0 9600 1 STOCK     [illegible] 9600
   59  0      70-70 SAT. RATE       41.9 0 9000 5 STOCK     [illegible] 9000
   60  0 G    70-70 SAT. RATE        1.7 0 9000 5 STOCK     [illegible] 9000
 KERN CO.
   61    E    60-60 SAT. RATE       13.9 0 0001 1 STOCK     [illegible] 0001
   62    G    60-60 SAT. RATE       77.1 0 0001 1 STOCK     [illegible] 0001
   63  0      70-70 SAT. RATE       26.0 0 9000 6 STOCK     [illegible] 9000
   64  0 G    70-70 SAT. RATE       67.4 0 9000 6 STOCK     [illegible] 9000
 KINGS CO.
   65  0      60-60 SAT. RATE       23.6 0 9600 1 STOCK     [illegible] 9600
   66  0 G    60-60 SAT. RATE       59.4 0 9600 1 STOCK     [illegible] 9600
   67  0 G    70-70 SAT. RATE       61.7 0 9000 7 STOCK     [illegible] 9000
   68  0      70-70 SAT. RATE       30.6 0 9000 7 STOCK     [illegible] 90
 LAKE CO.
   69  0      60-60 SAT. RATE       54.2 0 9600 1 STOCK     [illegible] 9600
   70  0 G    60-60 SAT. RATE         .7 0 9600 1 STOCK     [illegible] 9600
   71  0      70-70 SAT. RATE       63.9 0 9000 8 STOCK     [illegible] 9000
   72  0 G    70-70 SAT. RATE        2.6 0 9000 8 STOCK     [illegible] 9000
 LASSEN CO.
   73  0 G    60-60 SAT. RATE        2.2 0 9600 1 STOCK          10 0 9600
   74  0      60-60 SAT. RATE       49.6 0 9600 1 STOCK     [illegible] 9600
   75  0      70-70 SAT. RATE       54.6 0 9000 9 STOCK     [illegible] 9000
   76  0 G    70-70 SAT. RATE        6.9 0 9000 9 STOCK     [illegible] 9000
 LOS ANGELES CO.
   77    G    60-60 SAT. RATE       87.7 0 0001 1 STOCK     [illegible] 0001
   78    E    60-60 SAT. RATE        9.0 0 0001 1 STOCK     [illegible] 0001
   79  0      70-70 SAT. RATE       16.0 0 9000 1 STOCK     [illegible] 9000
   80  0 G    70-70 SAT. RATE       32.7 0 9000 1 STOCK     2010000 0 9000
 MADERA CO.
   81  0      60-60 SAT. RATE       27.4 0 9600 1 STOCK     [illegible] 9600
   82  0 G    60-60 SAT. RATE       43.5 0 9600 1 STOCK     [illegible] 9600
   83  0 G    70-70 SAT. RATE       40.0 0 9000 2 STOCK     [illegible] 9000
   84  0      70-70 SAT. RATE       41.7 0 9000 2 STOCK     [illegible] 9000
 MARIN CO.
   85    E    60-60 SAT. RATE       38.9 0 0001 1 STOCK     [illegible] 0001
   86    G    60-60 SAT. RATE       55.2 0 0001 1 STOCK       24400 0 0001
   87  0      70-70 SAT. RATE       60.2 0 9000 3 STOCK     [illegible] 9000
   88  0 G    70-70 SAT. RATE       37.4 0 9000 3 STOCK     [illegible] 900
 MARIPOSA C
   89  0      60-60 SAT. RATE       54.1 0 9600 1 STOCK     [illegible] 9600
   90  0 G    60-60 SAT. RATE        2.9 0 9600 1 STOCK     [illegible] 9600
   91  0 G    70-70 SAT. RATE        5.1 0 9000 4 STOCK     [illegible] 9000
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  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          38.5 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          63.4 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.
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 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 00
 151     E     60-60 SAT. RATE          25.7 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          53.9 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          51.0 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.
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 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         38.0 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         37.7 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
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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
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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       58.9 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       80.8 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       16.8 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       54.8 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       56.2 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      125.9 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      118.3 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
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LASSEN CO.
  40           60-60 SAT. RATE        77.7 0 2751 1 STOCK      [illegible] 1 275
  41  0        70-70 SAT. RATE       106.6 0 9000 R STOCK      [illegible] 2 900
LOS ANGELES CO.
  42     E     60-60 SAT. RATE        76.8 0 0001 1 STOCK      [illegible] 0 0001
  43     E     60-60 SAT. RATE        29.5 0 0001 1 STOCK      [illegible] 0 0001
  44  0        70-70 SAT. RATE       133.9 0 9000 S STOCK      [illegible] 2 9000
MADERA CO.
  45           60-60 SAT. RATE        90.4 0 2751 1 STOCK      [illegible] 1 2751
  46  0        70-70 SAT. RATE       115.8 0 9000 T STOCK      [illegible] 2 9000
MARIN CO.
  47     E     60-60 SAT. RATE        26.9 0 0001 1 STOCK      [illegible] 0 0001
  48     E     60-60 SAT. RATE        76.5 0 0001 1 STOCK      [illegible] 0 0001
  49  0        70-70 SAT. RATE       136.2 0 9000 U STOCK      [illegible] 2 9000
MARIPOSA C
  50           60-60 SAT. RATE        74.0 0 2751 1 STOCK      [illegible] 1 2751
  51  0        70-70 SAT. RATE       101.5 0 9000 V STOCK      [illegible] 2 9000
MENDOCINO CO.
  52           60-60 SAT. RATE        76.2 0 2751 1 STOCK      [illegible] 1 2751
  53  0        70-70 SAT. RATE       104.1 0 9000 W STOCK      [illegible] 2 9000
MERCED CO.
  54           60-60 SAT. RATE        93.5 0 2751 1 STOCK      [illegible] 1 2751
  55  0        70-70 SAT. RATE       117.9 0 9000 X STOCK      [illegible] 2 9000
MODOC CO.
  56           60-60 SAT. RATE        75.1 0 2751 1 STOCK      [illegible] 1 2751
  57  0        70-70 SAT. RATE       101.7 0 9000 Y STOCK      [illegible] 2 9000
MONO CO.
  58           60-60 SAT. RATE        60.2 0 2751 1 STOCK      [illegible] 1 275
MONTEREY CO.
  59           60-60 SAT. RATE        96.4 0 2751 1 STOCK      [illegible] 1 2751
NAPA CO.
  60           60-60 SAT. RATE        97.4 0 2751 1 STOCK      [illegible] 1 2751
NEVADA CO.
  61           60-60 SAT. RATE        90.4 0 2751 1 STOCK      [illegible] 1 2751
ORANGE CO.
  62     E     60-60 SAT. RATE        79.6 0 0001 1 STOCK      [illegible] 1 0001
  63     E     60-60 SAT. RATE        32.6 0 0001 1 STOCK      [illegible] 1 0001
PLACER CO.
  64           60-60 SAT. RATE        94.4 0 2751 1 STOCK      [illegible] 1 2751
PLUMAS CO.
  65           60-60 SAT. RATE        78.9 0 2751 1 STOCK      [illegible] 1 2751
RIVERSIDE CO.
  66     E     60-60 SAT. RATE        19.9 0 0001 1 STOCK      [illegible] 1 0001
  67     E     60-60 SAT. RATE        77.2 0 0001 1 STOCK      [illegible] 1 0001
SACRAMENTO CO.
  68     E     60-60 SAT. RATE        25.4 0 0001 1 STOCK      [illegible] 1 0001
  69     E     60-60 SAT. RATE        78.6 0 0001 1 STOCK      [illegible] 1 0001
SAN BENITO CO.
  70           60-60 SAT. RATE        89.6 0 2751 1 STOCK      [illegible] 1 2751
SAN BERNARDINO CO.
  71     E     60-60 SAT. RATE        20.3 0 0001 1 STOCK      [illegible] 1 0001
  72     E     60-60 SAT. RATE        79.2 0 0001 1 STOCK      [illegible] 1 0001
SAN DIEGO CO.
  73     E     60-60 SAT. RATE        79.1 0 0001 1 STOCK      [illegible] 1 000
  74     E     60-60 SAT. RATE        25.8 0 0001 1 STOCK      [illegible] 1 0001
SAN FRANCISCO CO.
  75     E     60-60 SAT. RATE        67.4 0 0001 1 STOCK      [illegible] 1 0001
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  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          80.8 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         103.2 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          16.0 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
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 109     E     60-60 SAT. RATE          29.9 0 0001 1 STOCK             641000 0 0001
 110     E     60-60 SAT. RATE          77.0 0 0001 1 STOCK            1700000 0 0001
 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          24.6 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          21.0 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          25.4 0 0001 1 STOCK             207000 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
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
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MISSING FOOTNOTE - 9000W
MISSING FOOTNOTE - 9000X
MISSING FOOTNOTE - 9000Y

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SDG+E SERVICE AREA
   1     E     74-74 STOCK              9 0 2000   ADDITIONS       9200 0 2000
   2   2 E     74-74 STOCK          62500 0 2000   ADDITIONS       7390 0 2000
   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


    - - - - -   S O U R C E   F O O T N O T E S   - - - - -
2000T  ALL HOMES
2000F  MULTI-FAMILY UNITS
2000A  MOBILE HOMES
2000S  NEW INDIVIDUAL (SINGLE-FAMILY) HOMES
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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          61.8 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          92.6 0 9000 7 STOCK           160000 0 9000
  28   0        70-70 SAT. RATE           4.6 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           5.9 0 0001 1 STOCK             9560 0 0001
  39   0 G      70-70 SAT. RATE          50.9 0 9000 1 STOCK           103000 0 9000
  40   0        70-70 SAT. RATE           6.1 0 9000 1 STOCK            10200 0 9000
GLENN CO
  41   0 G      60-60 SAT. RATE          46.6 0 9600 1 STOCK             2160 0 9600
  42   0        60-60 SAT. RATE          45.5 0 9600 1 STOCK             2150 0 9600
  43   0        70-70 SAT. RATE          36.2 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.
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  45   0       60-60 SAT. RATE        28.4 0 9600 1 STOCK      [illegible] 9600
  46   0 G     60-60 SAT. RATE        48.3 0 9600 1 STOCK      [illegible] 9600
  47   0       70-70 SAT. RATE        26.6 0 9000 3 STOCK      [illegible] 9000
  48   0 G     70-70 SAT. RATE        64.1 0 9000 3 STOCK      [illegible] 9000
 IMPERIAL CO.
  49   0       60-60 SAT. RATE        25.6 0 9600 1 STOCK      [illegible] 9600
  50   0 G     60-60 SAT. RATE        53.7 0 9600 1 STOCK      [illegible] 9600
  51   0       70-70 SAT. RATE        30.7 0 9000 4 STOCK      [illegible] 9000
  52   0 G     70-70 SAT. RATE        58.9 0 9000 4 STOCK      [illegible] 9000
 INYO CO.
  53   0 G     60-60 SAT. RATE         2.3 0 9600 1 STOCK      [illegible] 9600
  54   0       60-60 SAT. RATE        45.7 0 9600 1 STOCK      [illegible] 9600
  55   0 G     70-70 SAT. RATE         2.9 0 9000 5 STOCK      [illegible] 9000
  56   0       70-70 SAT. RATE        36.2 0 9000 5 STOCK      [illegible] 9000
 KERN CO.
  57     E     60-60 SAT. RATE         5.1 0 0001 1 STOCK      [illegible] 0001
  58     G     60-60 SAT. RATE        83.7 0 0001 1 STOCK      [illegible] 0001
  59   0       70-70 SAT. RATE         5.4 0 9000 6 STOCK      [illegible] 9000
  60   0 G     70-70 SAT. RATE        88.0 0 9000 6 STOCK      [illegible] 9000
 KINGS CO.
  61   0       60-60 SAT. RATE        12.8 0 9600 1 STOCK      [illegible] 9600
  62   0 G     60-60 SAT. RATE        64.0 0 9600 1 STOCK      [illegible] 9600
  63   0 G     70-70 SAT. RATE        77.5 0 9000 7 STOCK      [illegible] 9000
  64   0       70-70 SAT. RATE        12.5 0 9000 7 STOCK      [illegible] 9000
 LAKE CO.
  65   0 G     60-60 SAT. RATE          .7 0 9600 1 STOCK      [illegible] 9600
  66   0       60-60 SAT. RATE        44.0 0 9600 1 STOCK      [illegible] 9600
  67   0       70-70 SAT. RATE        53.6 0 9000 8 STOCK      [illegible] 9000
  68   0 G     70-70 SAT. RATE         2.8 0 9000 8 STOCK      [illegible] 9000
 LASSEN CO.
  69   0       60-60 SAT. RATE        53.0 0 9600 1 STOCK      [illegible] 9600
  70   0 G     60-60 SAT. RATE         1.5 0 9600 1 STOCK      [illegible] 9600
  71   0 G     70-70 SAT. RATE         5.2 0 9000 9 STOCK      [illegible] 9000
  72   0       70-70 SAT. RATE        64.5 0 9000 9 STOCK      [illegible] 9000
 LOS ANGELES CO.
  73     E     60-60 SAT. RATE         2.8 0 0001 1 STOCK      [illegible] 0001
  74     G     60-60 SAT. RATE        94.4 0 0001 1 STOCK      [illegible] 0001
  75   0       70-70 SAT. RATE         5.9 0 9000 1 STOCK      [illegible] 9000
  76   0 G     70-70 SAT. RATE        92.4 0 9000 1 STOCK      [illegible] 9000
 MADERA CO.
  77   0       60-60 SAT. RATE        15.9 0 9600 1 STOCK      [illegible] 9600
  78   0 G     60-60 SAT. RATE        51.2 0 9600 1 STOCK      [illegible] 9600
  79   0       70-70 SAT. RATE        17.3 0 9000 2 STOCK      [illegible] 9000
  80   0 G     70-70 SAT. RATE        58.2 0 9000 2 STOCK      [illegible] 9000
 MARIN CO.
  81     G     60-60 SAT. RATE        87.6 0 0001 1 STOCK      [illegible] 0001
  82     E     60-60 SAT. RATE         5.5 0 0001 1 STOCK      [illegible] 0001
  83   0       70-70 SAT. RATE         7.8 0 9000 3 STOCK      [illegible] 9000
  84   0 G     70-70 SAT. RATE        85.0 0 9000 3 STOCK      [illegible] 9000
 MARIPOSA C
  85   0 G     60-60 SAT. RATE         2.2 0 9600 1 STOCK      [illegible] 9600
  86   0       60-60 SAT. RATE        44.6 0 9600 1 STOCK      [illegible] 9600
  87   0       70-70 SAT. RATE        54.1 0 9000 4 STOCK      [illegible] 9000
  88   0 G     70-70 SAT. RATE         3.1 0 9000 4 STOCK      [illegible] 9000
 MENDOCINO CO.
  89   0       60-60 SAT. RATE        50.8 0 9600 1 STOCK      [illegible] 9600
  90   0 G     60-60 SAT. RATE         7.2 0 9600 1 STOCK      [illegible] 9600
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   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           6.9 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
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SAN MATEO CO.
 131     E     60-60 SAT. RATE          3.0 0 0001 1 STOCK              4170 0 0001
 132     G     60-60 SAT. RATE         94.1 0 0001 1 STOCK            127000 0 0001
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   0       60-60 SAT. RATE         12.6 0 9600 1 STOCK              3860 0 9600
 138   0 G     60-60 SAT. RATE         75.3 0 9600 1 STOCK             23100 0 9600
SHASTA CO.
 139   0 G     60-60 SAT. RATE          2.3 0 9600 1 STOCK               417 0 9600
 140   0       60-60 SAT. RATE         77.8 0 9600 1 STOCK             14200 0 9600
SIERRA CO.
 141   0       60-60 SAT. RATE         57.3 0 9600 1 STOCK               438 0 9600
 142   0 G     60-60 SAT. RATE          2.4 0 9600 1 STOCK                 2 0 9600
SISKIYOU CO.
 143   0 G     60-60 SAT. RATE          3.7 0 9600 1 STOCK               403 0 9600
 144   0       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   0       60-60 SAT. RATE         14.4 0 9600 1 STOCK              6810 0 9600
 148   0 G     60-60 SAT. RATE         72.3 0 9600 1 STOCK             34100 0 9600
STANISLAUS CO.
 149   0       60-60 SAT. RATE         13.6 0 9600 1 STOCK              6630 0 9600
 150   0 G     60-60 SAT. RATE         75.3 0 9600 1 STOCK             36100 0 9600
SUTTER CO.
 151   0 G     60-60 SAT. RATE         69.1 0 9600 1 STOCK              6880 0 9600
 152   0       60-60 SAT. RATE         13.3 0 9600 1 STOCK              1330 0 9600
TEHAMA CO.
 153   0       60-60 SAT. RATE         54.5 0 9600 1 STOCK              4360 0 9600
 154   0 G     60-60 SAT. RATE         18.0 0 9600 1 STOCK              1440 0 9600
TRINITY CO.
 155   0 G     60-60 SAT. RATE          2.5 0 9600 1 STOCK                 8 0 9600
 156   0       60-60 SAT. RATE         54.5 0 9600 1 STOCK              1710 0 9600
TULARE CO.
 157   0       60-60 SAT. RATE         15.7 0 9600 1 STOCK              7640 0 9600
 158   0 G     60-60 SAT. RATE         64.0 0 9600 1 STOCK             31400 0 9600
TUOLUMNE CO.
 159   0       60-60 SAT. RATE         43.9 0 9600 1 STOCK              2210 0 9600
 160   0 G     60-60 SAT. RATE          2.0 0 9600 1 STOCK               103 0 9600
VENTURA CO.
 161   0 G     60-60 SAT. RATE         88.1 0 9600 1 STOCK             47100 0 9600
 162   0       60-60 SAT. RATE          7.3 0 9600 1 STOCK              4000 0 9600
YOLO CO.
 163   0       60-60 SAT. RATE         12.4 0 9600 1 STOCK              2430 0 9600
 164   0 G     60-60 SAT. RATE         75.8 0 9600 1 STOCK             15100 0 9600
YUBA CO.
 165   0       60-60 SAT. RATE         14.5 0 9600 1 STOCK              1430 0 9600
 166   0 G     60-60 SAT. RATE         76.7 0 9600 1 STOCK              6970 0 9600
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
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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
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SOURCES

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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 15
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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
 2      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.
9000   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
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SOURCE FOOTNOTES

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AH01   1   ADDITIONS COME FROM AH01 +2 PER CENT TO ACCOUNT FOR THE APPROXIMATELY
AH01   1     PER CENT OF TOTAL SALES WHOSE LOCATION OF SALE IS NOT KNOWN. AHAM
AH01   1   DATA APPEARS HIGHLY ACCURATE AS A RECORD OF DOMESTIC MANUFACTURERS
AH01   1   SALES. EXCEPT WHERE NOTED IMPORTS ARE ASSUMED TO BE NEGLIGIBLE (LESS
AH01   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   125508/199572 (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 144969/225516 (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 143413/233247 (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 127217/209680 (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 137656/219195 (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 131093/212601 (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 135445/237855 (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 156546/283511 (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 29549. 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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5C02   1   BACK-UP INFORMATION.
5M01   1   MAIL SURVEY SIZES AND SIGMAS ARE - 75;2140,(2.1 PER CENT),72;2105
5M01   1   (2.1 PER CENT), AND 70;2048(2.2 PER CENT). SURVEY NOT CROSS TABULATED
5M01   1   AGAINST TYPE OF DWELLING UNIT NOR CHECKED FOR REPRESENTATIVENESS OF
   1   1   SF AND MF POPULATIONS. 72 SURVEY RAW DATA IN HAND. ENTRIES NCT
 M01   1   CORRECTED FOR SF VS. MF SPLIT AS OF 4/26/76 . OUR DATA IS MISSING 200
5M01   1   REPLIES OUT OF 2100.
3001   1   SATURATION DERIVED FROM STOCK SIZE
1000   1   SALES FOR EACH COUNTY ALLOCATED BETWEEN DOUBLE + SINGLE UNITS ACCORDIN
1000   1   TO THAT YEAR'S SALES DATA
1815   1   ALL USES
1815   2   HEATING ONLY
1815   3   ALL UNITS
1815   4   HEATING ONLY
1815   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, AMADO
  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 FLACER
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 ANGLLES, 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    NEVEDA.
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
```

FOOTNOTES

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*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
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