

SBW Consulting, Inc.
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Final Report

**AN EVALUATION OF STRATEGIES FOR
THE COLLECTION OF APPLIANCE EFFICIENCY
DATA AND AN UPDATE OF THE ENERGY
EFFICIENCY RATING MATRIX**

Submitted to

**BASE EFFICIENCY STUDIES SUBCOMMITTEE
CALIFORNIA DSM MEASUREMENT ADVISORY COMMITTEE**

Submitted by

**SBW CONSULTING, INC.
2820 Northup Way, Suite 230
Bellevue, WA 98004**

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I. Introduction

A recent study conducted for the Base Efficiency Studies Subcommittee of the California DSM Measurement Advisory Committee (CADMAC) provided an energy efficiency rating matrix for energy efficiency measures subject to California and federal minimum appliance efficiency standards. A major finding of the study was that little data is available on the current efficiency ratings of appliances purchased in California. The data are particularly lacking for appliances purchased within the service areas of each CADMAC utility. The CADMAC utilities require data on the average efficiency rating of recently purchased appliances so that these ratings can be compared to the ratings of appliances subject to rebates or incentives from utility DSM programs. The purpose of the study described in this report is to investigate various strategies for improving the data available on the efficiency rating of recently purchased appliances.

A. Study Objectives

This study had the following objectives.

1. Examine several options for obtaining data on the energy efficiency rating of appliances purchased in California and within the service areas of the CADMAC utilities. The data required are those needed to conduct impact evaluations of DSM programs that provide financial incentives for the purchase of appliances that exceed current federal and state standards.
2. Identify the best strategy available for the on-going collection of the required energy efficiency data.
3. Determine whether the data collection strategy is applicable to regions outside of California.
4. Review the present status of federal legislation pertaining to appliance efficiency standards and incorporate any new findings into the energy efficiency rating matrices previously developed for CADMAC.
5. Identify appliances, currently included in DSM programs operated by the CADMAC utilities that do not fall under the purview of present federal or California appliance efficiency standards.

B. Scope of This Study

To define the scope of this study we began with the appliances included in the efficiency rating matrix previously developed for CADMAC. Listed below are all of the appliances that appear in that matrix.

Boilers
Central Air-Conditioning
Central Furnaces

Clothes Dryers
Clothes Washers
Dishwashers
Electric Heaters
Electric Water Heaters
Freezers
Gas Household Cooking
Gas Space Heaters
Gas Swimming Pool Heaters
Gas Water Heaters
Lamp Ballasts
Motors
Oil Water Heaters
Refrigerator-Freezers
Refrigerators
Room Air Conditioners
Showerheads
Sink Faucets
Tub Spout Diverters

Certain appliances from this list were eliminated from further consideration because data on the purchases of such appliances would not be useful to the evaluation of DSM program impacts for the CADMAC utilities. Oil Water Heaters were eliminated because changes in their efficiency would not affect the calculation of gas or electric energy savings. Gas Household Cooking and Gas Swimming Pool Heaters were eliminated because the only efficiency rating method available for these appliances indicates whether they use an intermittent ignition. All such appliances sold in California must have an intermittent ignition. Because this efficiency rating simply indicates the presence of intermittent ignition, and all units are now required to comply, it cannot be used to distinguish levels of appliance efficiency in a DSM program evaluation.

Of the appliances listed only a small number are solely regulated by California standards and are not yet included in the federal regulations. The appliances regulated only by California are:

Gas Household Cooking
Showerheads
Sink Faucets
Tub Spout Diverters

Recent federal legislation limits the ability of states to impose appliance efficiency requirements that exceed the federal standard. States can petition to obtain approval for more stringent regulations, but this is not likely to occur.

One special case in the list of appliances is Motors. Motors are only regulated by federal standards and these standards only apply to motors in federally owned facilities. However, motors play a major role in the CADMAC utilities' DSM programs, therefore it seems appropriate to retain them in the list of appliances for which data on current purchases is important.

C. Data Collection Requirements

Data collection requirements were defined by considering what data is needed by the CADMAC utilities to conduct DSM program evaluations. Other CADMAC committee work has recently defined the method that will be used to evaluate savings. The method to be used specifies that energy savings from an efficient appliance are to be calculated by comparing the energy efficiency that would have been selected in the absence of the program to the energy efficiency of the product selected under the DSM program. If the appliance manufacturers perfectly conformed to the applicable federal and California requirements and did not exceed those requirements, the current standards would define the efficiency level that would have existed in the absence of the program. However, some products do exceed the standards. Some of the difference may even be attributable to "free-drivership" of the DSM program, i.e., manufacturers tend to produce efficient units in excess of the specific number financed by the utility programs and would not have brought these excess units into the California market without the impetus of the program.

The need to determine what would have been purchased in the absence of the program is what drives the utility's requirements for appliance efficiency data. For any one of the CADMAC utilities, in the absence of free-driver effects, the appliance efficiency level that would have been purchased can be approximated by determining the sales weighted average efficiency rating, after removing the total number of units financed by the utility's DSM program. If appliance buying habits vary among the CADMAC utilities, we might expect this sales weighted average to vary. Unfortunately, we were not able to find any previous research that indicates whether buying habits are substantially different across utilities. In the absence of research on this topic the prudent, but expensive, approach will be to assume that utility specific sales weighted efficiency ratings are required.

Another possible part of the data requirements are the characteristics of the buyers and the facilities where the appliances are being installed. In general the calculation of energy savings requires both a change in efficiency, attributable to the program, and measures of how the appliance will be utilized, e.g., hours of operation. Ideally, information on appliances purchases would be tied to relevant characteristics of the purchasers or more specifically the end-users. Consumer surveys are the only data collection method that provides this connection. All other methods rely on the existence of separate consumer research efforts that usually do not determine the efficiency level of appliances held by the surveyed consumers. If the CADMAC utilities rely on separate consumer survey research, they will have to assume that consumer characteristics do not vary across groups of consumers that buy appliances with different efficiency ratings. This assumption may or may not be correct.

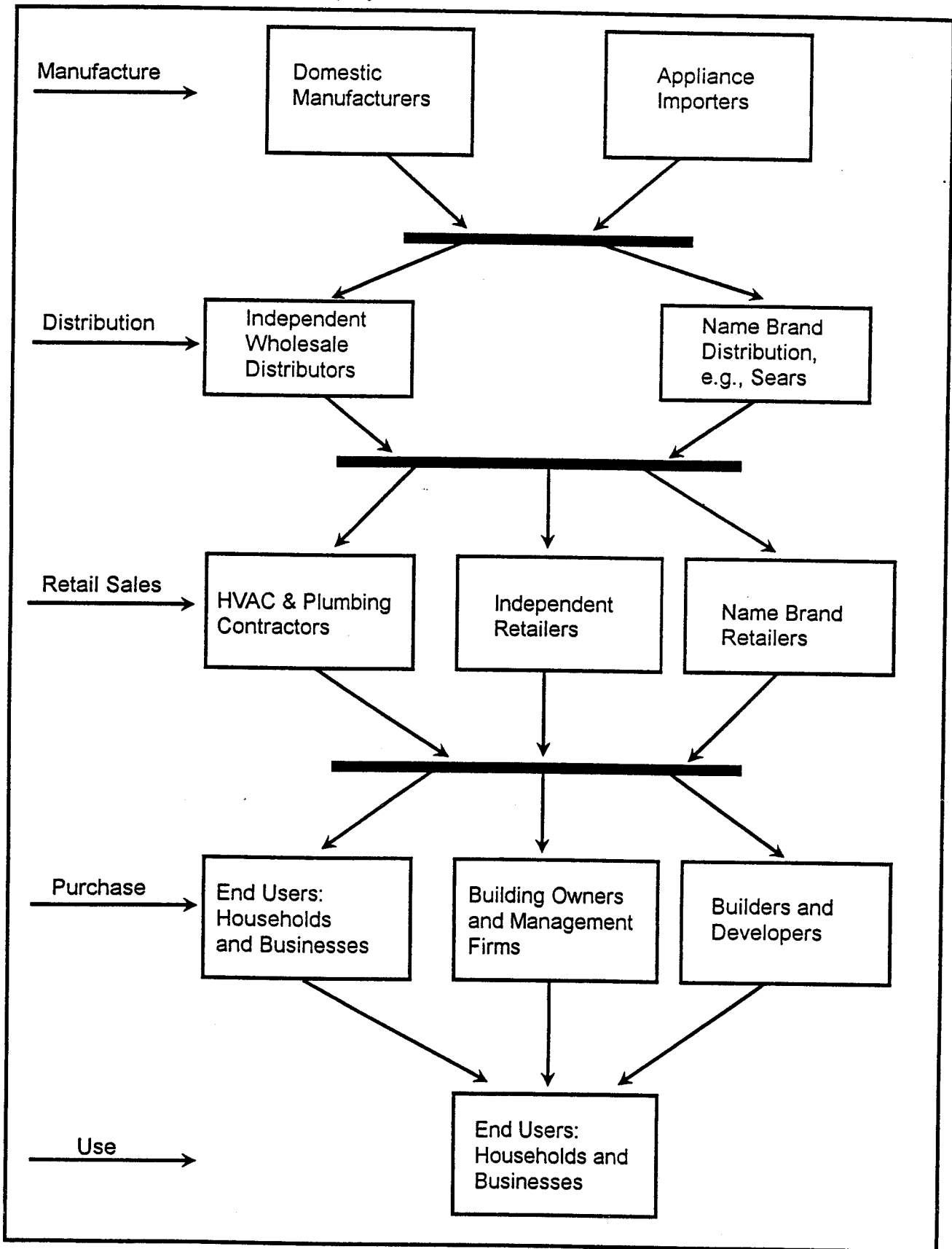
For the purposes of this study, we have assumed that the ideal data product would provide information on the sales weighted average efficiency rating of each appliance and the average characteristics of the consumers who purchased those appliances. However, suspecting that this ideal data product will be very expensive and difficult to create we have considered a range of data collection strategies. Most of these strategies do not provide any direct connection between consumer characteristics and appliance efficiency levels. Further, many of these strategies only provide statewide appliance efficiency information.

D. Possible Sources of Appliance Efficiency Data

Figure 1 depicts the appliance delivery system and shows the numerous paths that an appliance may follow from its initial shipment by a domestic manufacturer or importer to its use in a household or business. As shown in the figure there are five different types of activities in this system: Manufacture, Distribution, Retail Sales, Purchase and Use. Each level of activity provides an opportunity for collecting data on the appliances flowing through the system. However, through a review of the relevant literature and discussions with trade associations it has become clear that there is no single point in this system where all of the required data can be collected for all of the appliances of concern to the CADMAC utilities.

In the next section of this report we will summarize the findings of previous research efforts that collected data from various points in the appliance delivery system. Some of these efforts are on-going activities such as those conducted by various trade associations. Other have been one-time attempts to collect data from one or more specific types of entities that participate in the appliance delivery system.

Figure 1: Appliance Delivery System



II. Review of Possible Sources of Appliance Efficiency Data

Our search for sources of appliance efficiency data involved a literature review and telephone interviews with three types of organizations that collect appliance data on a on-going basis. Given the resources available for this study, our investigations were not exhaustive. However, with a few exceptions, we feel that we have been able to determine the important characteristics of the previous and on-going efforts to collect data on the appliances of interest to the CADMAC utilities. The exceptions are those appliances covered by California regulations that are essentially plumbing parts, e.g., showerheads. Although there have been a number of DSM program evaluations involving these appliances, we have not located any trade association or previous research that provides information on the total shipments or sales of these appliances in California. Further work will be needed to reach firm conclusions about how to collect data on these appliances.

Although we reviewed a number of relevant articles and papers, our conclusions are based primarily on the findings presented in the following reports.

1. **Reference #1 - California Market Trends for More Efficient Appliances: An Analysis of California and National Shipment Data in the Early 1980's**, California Energy Commission, July 1987. This study drew on data collected by three national trade associations and data reported directly by 175 manufacturers doing business in California. These manufacturers were directed to report the required shipments data by the CEC. **Scope:** Statewide data for Refrigerators, Freezers, Central Gas Furnaces, Wall Furnaces, Heat Pumps, Central Air Conditioners, Room Air Conditioners, Electric Water Heaters, and Gas Water Heaters.
2. **Reference #2 - Development of an Appliance Sales Data Collection System, prepared by ERC International for the California Energy Commission, May 1988.** This study involved a pilot test of a appliance sales data collection system. Although wholesale distributors were the initial target source for the data, the authors redesigned the pilot after conducting an extensive focus group discussion with wholesalers. The pilot data collection was conducted with a sample of manufacturers. **Scope:** Statewide data for Room Air Conditioners, Central Air Conditioners, Heat Pumps, Gas Furnaces, Electric Water Heaters, Gas Water Heaters, Refrigerators and Freezers.
3. **Reference #3 - Requirements for a Sales Tracking System: A Scoping Study**, prepared by HBRIS, Inc., for the Wisconsin Center for Demand-Side Research, 1993. This study reviewed 16 other studies conducted by utilities to gather data on appliance sales. These studies included 1 survey of manufacturers, 2 distributor surveys, 12 surveys of retailers, and 1 consumer survey. In addition, a number of market research organizations were interviewed that track sales data for a wide variety of consumer products. The information collected was used to design a sales tracking system for the state of Wisconsin. **Scope:** Central Air Conditioners, Forced-Air Heating Systems, Refrigerators, Water Heaters, and Room Air Conditioners.

Reference numbers have been assigned to each of these reports so that they can be succinctly cited throughout the balance of this report.

In addition to the literature cited above, we base our conclusions on telephone contacts with three types of organizations that are involved in the on-going collection of appliance data.

1. **Trade Associations.** The trade associations contacted include the Association of Home Appliance Manufacturers (AHAM), the Air Conditioning and Refrigeration Institute (ARI), the Gas Appliance Manufacturers Association (GAMA), and the National Electrical Manufacturers Association (NEMA), and the Certified Ballast Manufacturers Association (CBMA). For each of these associations we identified the staff that are involved in the collection of data from manufacturers and obtained a description of the data collected and the method by which these data could be made available to the CADMAC utilities.
2. **Trade and Consumer Publications.** A number of periodicals provide information on major appliances that they collect from manufacturers or their subscribers. Two such publications were contacted: the monthly trade magazine called Appliance and Consumers Reports. The staff of Appliance conduct an annual survey of manufacturers that requests data on shipments for various appliances. Unfortunately, no data is collected on shipments by efficiency category and the data are strictly estimates of national shipment volume. Consumers Reports provides detailed data collected from subscribers that participate in its reader's survey. Only a small number of major appliances are included in the survey and it is not clear at this time whether Consumers Union (publisher of Consumers Reports) would release the primary data for California respondents. However, the greatest problem with the Reader's Survey is that the respondents are most likely a highly atypical group of appliance purchasers.
3. **Private Sales Tracking Firms.** A number of market research firms provide national, regional and local market sales data for a wide variety of clients. These data may be gathered either by processing Uniform Product Code (UPC) data, otherwise known as scan data, from retailers, or by performing inventory audits. Sales tracking systems have been established that rely of data from special groups of retailers, random samples representative of particular markets, or from all major retailers. A list of firms that offer private tracking system services was provided in **Reference #3**. Two of these firms, Information Resources, Inc. (IRI) and Audits and Surveys, were contacted to determine whether they currently offer sales tracking for major appliances. Staff contacted at IRI said that they did not collect major appliance data and did not express any interest in providing such data in the future. Staff from Audits and Surveys reported that they currently have custom tracking projects operating for small appliances but none for major appliances. However, they felt that they could operate such a project and successfully collect data from an appropriate sample of retailers.

They are prepared to develop a cost estimate for such a project if the CADMAC utilities are interested in pursuing this strategy.

A. Data From Trade Associations

Data on appliance shipments is routinely collected by a number of trade associations, usually in the form of annual reporting from member firms. The fraction of the total shipments covered varies, but in many cases the trade associations contacted claimed that the member reports covered more than 90 percent of domestic production and imports. The data available from each of the trade associations is described below.

1. **Association of Home Appliance Manufacturers (AHAM).** Two data products are available from AHAM. Both are based on reporting by AHAM's member firms. The first product provides total shipments by county for the following appliances:

- Refrigerators
- Freezers
- Room Air-Conditioners
- Clothes Washers
- Dish Washers
- Electric Ranges
- Gas Ranges
- Compactors
- Clothes Dryers

The second data product provides national shipments, by energy efficiency category, for the following appliances:

- Refrigerators
- Freezers
- Room Air-Conditioners
- Clothes Washers
- Dish Washers

AHAM staff claim that the data provided in both data products represents a large fraction of all shipments, i.e., greater than 80%, except for Room Air-Conditioners, where one major manufacturer is not a member.

If CADMAC utilities are willing to assume that the proportion of appliances in each efficiency category is the same for the nation as for each of their service territories, the two data products can be combined to estimate the number of units shipped, by efficiency category, for each utility's service area.

2. **Air Conditioning and Refrigeration Institute (ARI).** Two data products are available from the Unitary Products Group of ARI. The first provides total shipments for a series of trading areas (approximately 24 trading areas

in California) for Central Air-Conditioning and Heat Pumps. The second product provides total shipments to California, by efficiency category (five categories of SEER). The membership has specifically authorized ARI to make these two data products available to utilities. ARI staff estimate that the shipments reported by their members represent 95 percent of total shipments to California.

3. **Gas Appliance Manufacturers Association (GAMA).** Three data products are available from GAMA. The first provides national total shipments for the following appliances:

- Residential and Commercial Water Heaters
- Residential Heating Systems
 - Central Furnaces
 - Boilers
 - Wall Furnaces
 - Room Heaters
 - Floor Furnaces
 - Gas Unit Heaters
 - Duct Furnaces

The second product reports shipments of Gas Furnaces (residential heating systems other than boilers) by trading area (regions smaller than states). The third product provides shipments of Gas Furnaces by state, efficiency level and configuration. GAMA also collects data on shipments of boilers by efficiency level, but the members have not authorized distribution of this data to any non-members. GAMA does not report shipments of gas water heaters, because manufacturers have refused to provide data for this appliance.

4. **National Electrical Manufacturers Association (NEMA).** NEMA collects data from its members on the shipments of motors, by size category. Shipments data are compiled for 127 trading areas, and NEMA staff estimate that their members account for more than 50 percent of all motor shipments. However, the data are only available to NEMA members.
5. **Certified Ballast Manufacturers Association (CBMA).** CBMA contracts with the US Bureau of the Census to collect data on national ballast shipments. These data are reported in the Current Industrial Report MQ 36C. According to CBMA staff, most of these ballasts are shipped to Original Equipment Manufacturers (OEMs) who then include them as part of combined lamp and ballast products. The lamp and fixture manufacturers would have to be surveyed in order to determine the final destination of the ballasts.

Trade associations are collecting useful information on the shipments of appliances by category of efficiency level. The major weakness of this data source is the lack of coverage of certain appliances, the geographic aggregation of the data (in some cases data is summarized for the nation or for California and are not available for individual utility service areas), the

uncertainties imposed by assuming that shipments are the same as sales (ignoring transshipments through California), and the lack of connection between shipments and the characteristics of the end users of the appliances. The major strength is that the data are routinely collected and available for a very modest cost.

B. Surveys of Manufacturers

A limited number of surveys of manufacturers have been performed by organizations other than trade associations. Three were identified in the literature search.

1. **Reference #1** (See beginning of Section II for the full citation) describes a study performed by the CEC in 1986. This study was based in part on shipment reports prepared by 175 manufacturers. These manufacturer were ordered by the CEC to provide the required data. Even though this data collection effort was successful, the author of the report does not believe that the CEC would ever again order the manufacturers to comply with this type of data request. Some of the data used in this study came from trade associations, and is routinely gathered and available.
2. **Reference #2** describes a study performed for the CEC in 1987 in which a sample of manufacturers were asked to voluntarily provide data on California shipments of appliances grouped by efficiency categories. Even after repeated telephone contacts data was only supplied by 21 out of 57 firms. Data confidentiality and the burden of assembling the data were cited by many firms as the reasons for delayed submittals or the failure to submit the requested data.
3. **Reference #3** cites a study preformed by Northern States Power in which lighting manufacturers were contacted and asked to supply data on shipments. 6 of 12 firms contacted provided the requested data.

Our conclusion from the review of relevant literature and from conversation with trade association staff is that special surveys of manufacturers, i.e., those conducted solely for utility research purpose, are likely to be hampered by high levels of non-response. One or two manufacturers can have a dominant market position for a specific appliance and if they do not participate data for that appliance is severely compromised. Some regular reporting of the required data is occurring through trade associations, although not all large manufacturers are participating, and special surveys are not likely to yield more than what can be purchased from these associations, unless the state makes such reporting a condition of doing business in California. However, because there are a small number of manufacturers for each appliance, special surveys of manufacturers are the best low cost strategy for collecting data for certain appliances, especially if the data can be aggregated for the state of California.

C. Surveys of Distributors and Retailers

In addition to surveys of manufactures, we also found reference to a number of previous studies that attempted or conducted surveys of distributors and retailers. Examples of the studies reviewed include:

1. **Reference #1** (See beginning of Section II for the full citation) describes a study performed by the CEC in 1986, which initially intended to survey a sample of distributors. A focus group including representatives of major distributors and manufacturers was held to review the data collection plans. So many negative comments were made concerning the planned survey that the survey of distributors was abandoned and replaced with a survey of manufacturers.
2. **Reference #3** cites a study attempted by the Bonneville Power Administration (BPA). BPA contacted a group of refrigerator distributors in an attempt to collect information on sales within BPA's service area. All of the distributors contacted declined to participate. Some explained that the data was not available as they did not know where the final sales were taking place.
3. **Reference #3** cites a study conducted by Wisconsin Electric. The study was designed to collect sales data for fluorescent lamps and ballasts. The utility reported obtaining data on a large fraction of total sales although non-participation of some distributors was cited as a potential problem.
4. **Reference #3** cites 12 studies that have been conducted by utilities, involving samples of retailers. The appliances covered by these studies include:

- Refrigerators
- Freezers
- Electric Water Heaters
- Room Air-Conditioners
- Central Air-Conditioners
- Electric Space Heaters
- Forced Air Furnaces
- Gas Water Heaters

In a numbers of cases the studies involved samples of retailers who were registered dealers in a utility's DSM program. This seems to be a major factor in obtaining responses to data requests. In general the response to data requests ranged from adequate to poor and varied considerably across appliance. The response rate and data quality was dependent on the care exercised in designing the data collection procedures and the amount of time spent on site with the retailers.

Another option for obtaining retail sales data is to use one of the national market research firms that maintain on-going sales tracking programs. These firms use a combination of scan data (data on sales transaction from automated point-of-sale systems that is tied to Uniform Product Codes) and traditional inventory audits to determine the volume of sales for specific products. Such sales tracking systems have existed for a number of years covering products such as pharmaceuticals and household consumables. These firms seem to specialize in certain product areas. Two firms were contacted that appeared to be working in areas closely related

to major appliances. Neither firm was currently conducting any sales tracking for major appliances, although one was tracking small household appliances. One firm did express interest in the possibility of setting up a major appliance tracking system and is willing to prepare a bid for such a system if the CADMAC utilities are interested in pursuing this option. They felt they could get retailers to participate, although the specific problems associated with dealing with HVAC contractors and dealers selling water heaters, which are not like typical storefront retail operations, was not fully explored.

In general we have found that surveys of distributors and retailers are problematic and expensive. The major weakness of surveys of distributors and retailers is high rates of non-participation. This can be particularly damaging if large name brand firms or certain classes of dealers, such as those that sell hot water heaters, refuse to participate. Another weakness is inconsistent and unreliable record keeping by retailers that compromises the quality of the data reported. The major strength of these surveys is that they can provide sales data for specific geographic areas and that it is possible to obtain data for any type of appliance. The best hope probably lies in utilizing market research firms that through their other long term sales tracking operations have strong connections to many large retailers. Unfortunately, many appliances are sold and installed by small local firms, i.e. HVAC contractors and water heater dealers, and these market research firms will have no particular advantage in dealing with these entities.

D. Surveys of Consumers

The final source of data on appliance sales are the appliance consumers. As shown in Figure 1, these may be purchasers of the appliance but not the end user, as in the case of building owners or developers. Alternatively, they may be both the purchaser and the end user, as is the case for homeowners or company's that purchase appliances for their own use. **Reference #3** (See beginning of Section II for the full citation) describes one consumer survey. This study, conducted for Pacific Gas and Electric, gathered data on Refrigerator purchases. It is the only consumer survey found in our literature review specifically designed to obtain data on appliances purchased in a specific year. This survey deals with only one appliance purchased by residential end users. Many residential and non-residential appliance saturation or customer characteristics surveys have been conducted by utilities, but they are not designed to obtain the specific make and model of appliances purchased in a particular year. In fact special techniques are required in order to obtain the make and model data that are needed to match an efficiency level with a specific appliance.

In a few cases, California utilities have conducted on-site verification surveys for a portion of the respondents to their appliance saturation or customer characteristics surveys. During these on-site surveys, data have been collected on the make and model of certain appliances. Although these data are useful for a number of purposes, limitations of the sample designs, i.e., they are not samples of recent purchasers for a specific appliance, do not allow these data to be used to estimate appliance purchases for a specific year.

There are two generic designs that could be used to conduct consumer surveys of appliance purchases. The first design is a cross-sectional survey, well represented by the design used in the PG&E Refrigerator study cited in **Reference #3**. In this study a specific technique was developed for conducting a telephone survey and getting the respondents to examine their refrigerator and accurately report its make and model number. The purchasers of the

appliances are located by making a large number of screening calls to telephone numbers generated by random-digit dialing. In the case of the PG&E survey 7,022 calls were made to locate 306 households that purchased appliances in 1991. Accurate make and model information was obtained from 150 of these households. The major strength of this approach is that it is bias-resistant, i.e., the respondents have little motivation to mislead the surveyors about their purchases, although bias may be introduced because those who put in the extra effort to find energy efficient models may be more likely to respond to the survey.

The other design that could be used is a panel survey. In this design, a sample of consumers is recruited to participate in the panel for a number of years. They are asked to report the make and model of each major appliance that they purchase. Generally, an incentive would be offered to participate in a such a panel design. The sample size of the panel could be roughly the same size as the cross-sectional survey sample, but it could provide information on a number of appliances. This panel design is similar to the Nielsen panel used to evaluate television viewer ship. The most critical element of the panel design is the structure of the incentive. A safe method for paying the incentive is to ask each household to respond once each year, even if they have not purchased any appliances and to pay the incentive for each year's response. This would be prohibitively expensive. Another method is to ask for reports from the panel at the time of appliance purchases, but to require some proof of purchase in order to obtain the incentive. This design is potentially cost-effective, but we have not found any reference to such a design in the literature and thus we do not know how well it would work.

In general, consumer surveys have a number of advantages. They are the only source of appliance data that can be directly linked to consumer characteristics, e.g., operating hours. They also can provide data for specific service areas and a wide variety of appliances. They may be the only way to gather reliable data for certain appliances, such as Gas Water Heaters, that have proved to be resistant to all other forms of data collection. Unfortunately, there is very little information available about how well such surveys will work in practice. Further, they are expensive, especially when compared to the cost of data from trade associations.

III. Findings and Recommendation for Future Data Collection

Our findings and recommendations concerning future appliance data collection efforts are presented in this section. First we will describe what appears to be the best source of data for each appliance. Next, we will describe an overall strategy for data collection. Finally, we will discuss the applicability of the overall strategy to data collection in areas outside of the California that may be used in control group studies.

A. Best Data Source for Each Appliance

Shown in Figure 2 are the appliances considered in this study and the best sources of information on appliance shipments and purchases by energy efficiency level. Two types of sources are cited. The first is for gathering information for the entire state of California. The second is for gathering information for individual utility service areas. Within each of these types we show the source that would provide the best quality data and the source that would

provide the least cost data. The following codes are used in the table to indicate the types of data sources.

<u>Source</u>	<u>Code</u>
Trade Associations	
ARI	ARI
AHAM	AHAM
GAMA	GAMA
Survey of Manufacturers	SOM
Survey of Distributors	SOD
Survey of Retailers	SOR
Survey of Consumers	SOC

Figure 2: Best Sources of Appliance Shipment and Purchase Data

Appliance	Sources of Data for			
	California		Specific Utilites	
	Best Quality	Least Cost	Best Quality	Least Cost
Boilers	SOM	SOM	SOR	SOR
Central Air-Conditioning	ARI	ARI	ARI	ARI
Central Furnaces	GAMA	GAMA	SOR	SOR
Clothes Dryers	SOM	SOM	SOC	SOR
Clothes Washers	AHAM	AHAM	SOC	SOR
Dishwashers	AHAM	AHAM	SOC	SOR
Electric Heaters	SOM	SOM	SOR	SOR
Electric Water Heaters	SOM	SOM	SOR	SOR
Freezers	AHAM	AHAM	SOC	SOR
Gas Space Heaters	GAMA	GAMA	SOR	SOR
Gas Water Heaters	SOC	SOC	SOC	SOC
Lamp Ballasts	SOM	SOM	SOR	SOR
Motors	SOM	SOM	SOR	SOR
Refrigerator-Freezers	AHAM	AHAM	SOC	SOR
Refrigerators	AHAM	AHAM	SOC	SOR
Room Air Conditioners	AHAM	AHAM	SOC	SOR
Showerheads	SOM	SOM	SOR	SOR
Sink Faucets	SOM	SOM	SOR	SOR
Tub Spout Diverters	SOM	SOM	SOR	SOR

It is important to note that the assignment of sources shown in Figure 2 is largely based on the judgment of the author of this report. In some cases the assignments are based on firm evidence, particularly those where well established, routinely collected data is available from trade associations. In other cases the assignment is dictated by repeated failures of other sources, e.g., gas water heaters for which manufacturers and retailers have consistently refused to provide data in previous studies. The assignment for some cells in the table are highly speculative. In particular those for which no prior studies have been conducted, such as Tub Spout Diverters.

A number of general patterns are evident in Figure 2. First, when reliable trade association data is available and covers a large fraction of all shipments it is both the best and least cost source. Second, when trade association data is not available and the appliance is either complex or inaccessible to end users, the best solution for statewide data is to survey manufacturers and the best solution for utility specific data is to survey retailers. If the appliance is simple and readily accessible to consumers than the best quality, utility specific data, will come from surveys of consumers, and the least expensive utility specific data will come from surveys of retailers.

Some applications of appliance shipment data require shipments by efficiency level and capacity category, e.g., ranges of BTU per Hour for gas furnaces. Surveys of retailers or consumers require the identification of appliance make and model. The make and model can be used to identify both capacity category and efficiency level. Data from surveys of manufacturers and from trade associations may or may not provide the information needed to partition shipments by capacity categories. The recommended sources of data for each type of appliance shown in Figure 2 still apply even if the objective is to gather data by efficiency level and capacity category.

B. Strategy for Future Data Collection

As is obvious from the discussion of Figure 2 the appropriate strategy for future data collection depends to a considerable degree on whether or not the CADMAC utilities require service-area specific appliance sales data. In addition, whether any strategy is practical will be determined by the funding that is available for data collection. If the budget available is small, i.e., less than \$100,000 per year, the only practical strategy is to abandon the requirement for service-area specific data, fully utilize the available trade association data, and collect information for selected appliances from surveys of major manufacturers. Under these conditions some appliances should be dropped from consideration due to the repeated failures in prior data collection efforts, e.g., Gas Water Heaters.

If larger budgets are available, i.e. substantially greater than \$100,000, other data collection strategies could be considered. The available data from trade associations would be purchased including the data available for total appliances shipped by trading area. These data would form important control totals to be used in judging the overall accuracy of data collected from other sources. The remainder of the strategy would be composed of a number of manufacturer, retailer, and consumer surveys as recommended in Figure 2. The exact mix of surveys would be determined by the budget available for data collection. The budget would determine whether the lowest cost or the best quality source, as shown in Figure 2, is selected.

C. Applicability to Regions Outside of California

None of the data collection methods are peculiar to California. This is especially true now that the federal government has restricted the development of state-specific efficiency standards. If the CADMAC utilities need to examine appliance efficiency data for regions outside of California, such as regions where utilities are not operating appliance efficiency programs, these data can be collected from the sources cited in Figure 2. The specific sources chosen will depend on the budget available for data collection. If the data collection is based on trade association data, the additional cost of adding other regions will be small. If the data collection requires new surveys of manufacturers, retailers or consumers the additional cost of adding other regions will be large.

IV. Update of Appliance Efficiency Matrix

This section presents the results of our review of the recent changes in federal legislation pertaining to appliance efficiency standards, and our review of measures included in the CADMAC utilities' DSM programs that are not subject to federal or California appliance efficiency standards.

A. Recent Changes in Federal Legislation

The Federal government has issued no new rules pertaining to appliance efficiency since the Code of Federal Regulations revision of January 1, 1993. Therefore the Appliance Standards tables have not been modified. The Department of Energy is presently conducting work to determine if the standard levels for regulated appliances should be revised, but to date has made no formal recommendations to Congress on this subject.

A Notice of Proposed Rulemaking (NPR) was issued by the Department of Energy, Office of Energy Efficiency and Renewable Energy and published in the March 4, 1994 Federal Register. The notice proposes new energy descriptors for direct heating equipment, mobile home furnaces, and pool heaters. The notice also proposes to amend energy conservation standards and effective dates for room air conditioners, water heaters, furnaces, direct heating equipment, pool heaters, and fluorescent lamp ballasts. The notice provides new standards for color television sets with screen size of 13.0 to 33 inches. Appendix B is a copy of the relevant pages of the NPR indicating the proposed standards. These proposed standards would take effect three years following publication of a final rule.

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers is in the process of updating Standard 90-1989: Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings. This standard specifies mandatory energy efficiency levels for new federal buildings that are voluntary for non-federal buildings. The standards do not supersede the National Appliance Energy Conservation Act provisions as amended, but do provide consensus standards for other measures.

B. DSM Program Measures Not Covered by Standards

There are many DSM measures offered by California utilities for which no mandatory standards presently exist to establish baseline efficiency levels. These measures are listed in Appendix A, according to affected end use, fuel, and category. For each measure we have indicated the utilities and customer sectors to which they apply.

Some of these measures are regulated by California Title-24 Energy Efficiency Standards for Residential and Non-Residential Buildings. Specific provisions are dependent upon the building type, climate conditions, and compliance path. This standard specifies levels of efficiency for space conditioning systems, water heating systems, pool and spa heating equipment, doors, windows, fenestration products, insulation, lighting controls, and lighting systems for residential and non-residential buildings. Utilities providing incentives for these measures can refer to the appropriate provisions of this regulation to determine required efficiency levels for new construction.

Many of these measures are not efficiency improvements to specific appliances, rather they are treatments that affect overall system efficiencies - such as energy management systems or adjustable speed drives. The baseline conditions for this type of measure is the performance of the system in the absence of the feature, which can often be determined using simulation models of the facilities under consideration. Such models are necessary because the performance of these features is dependent upon the particular climate, construction, and use characteristics of the building in question.

Appendix A

California Utility DSM Measures Not Subject to Mandatory Standards

This appendix contains a matrix listing the efficiency measures offered by PG&E, SCE, SDG&E, and SoCal Gas during 1993, that were not subject to either federal or California energy efficiency standards. The measures are sorted according to the affected end use, affected fuel, measure category, and measure name. For each measure the matrix indicates the utility and customer sectors that apply.

The first column of the matrix lists "affected end uses," and may contain any one of the following energy end use categories: 1) domestic hot water (DHW), 2) heating, ventilating, and air conditioning (HVAC), 3) lighting (LIGHTS), 4) electric motors (MOTORS), 5) other (OTHER), and 6) refrigeration (REF). The measure categories indicated in the fourth column include; 1) controls, 2) equipment, 3) insulation, 4) maintenance, and 5) shell. Shell measures include all items that affect the building envelope, such as windows, doors, wall and ceiling insulation. The customer sectors are: residential (R), commercial (C), industrial (I), and agricultural (A). These categories are compatible with those developed for the California Conservation Inventory, although some of the detailed energy end uses which appear in the inventory have been aggregated.

California Utility DSM Measures Not Subject to Mandatory Standards

Affected End Use	Affected Fuel	Measure Category	Measure Name	Utility/Consumer Sector																		
				PG&E			SCE			SDG&E			SoCal Gas									
				New	Retro	A	New	Retro	A	New	Retro	A	New	Retro	A							
HVAC		Shell	Wall insulation																			
HVAC		Shell	Window treatment																			
HVAC	X	Equipment	Economizer																			
HVAC	X	Insulation	Ceiling insulation																			
HVAC	X	Insulation	Duct insulation																			
HVAC	X	Insulation	Wall insulation																			
HVAC	X	Maintenance	Building envelope repair																			
HVAC	X	Maintenance	Filter																			
HVAC	X	Maintenance	Maintenance																			
HVAC	X	Shell	Outlet gaskets																			
HVAC	X	Shell	Weatherstripping																			
HVAC	X	Shell	Window glazing																			
LIGHTS		Controls	Daylighting																			
LIGHTS	X	Controls	Lighting control improvement																			
LIGHTS	X	Equipment	Fixture upgrade/replacement																			
LIGHTS	X	Equipment	Lamp efficiency improvement																			
LIGHTS	X	Maintenance	Lumen maintenance																			
MOTORS	X	Controls	Adjustable speed drive for compressor																			
MOTORS	X	Controls	CO monitors																			
MOTORS	X	Controls	Timeclock for motors																			
MOTORS	X	Controls	Variable speed drives																			
Other	X	Controls	EMS for process heat																			
Other	X	Controls	Timeclock with battery																			
Other	X	Equipment	Air amplifiers																			
Other	X	Equipment	Boarding machine																			
Other	X	Equipment	Coffee machine insulation																			
Other	X	Equipment	Injection molders																			
Other	X	Equipment	Jensen press																			
Other	X	Equipment	Low loss transformers																			
Other	X	Equipment	Low pressure sprinklers																			
Other	X	Equipment	Process heat																			
Other	X	Equipment	Pump efficiency upgrade																			
Other	X	Equipment	Surge valves																			
Other	X	Equipment	Well water measurement device																			
Other	X	Maintenance	Pump adjustment																			

California Utility DSM Measures Not Subject to Mandatory Standards

Affected End Use	Affected Fuel		Measure Category	Measure Name	Utility/Customer Sector																					
	Gas	Elec			PG&E		SCE		SDG&E		SoCal Gas															
					New	Retro	New	Retro	New	Retro	New	Retro														
DHW		x	Controls	EMS for water heating																						
DHW		x	Equipment	Fine bubble diffusers																						
DHW		x	Equipment	Water saving flapper																						
DHW		x	Insulation	Pipe insulation																						
DHW	x		Maintenance	Maintenance																						
HVAC		x	Controls	Bypass controls				x																		
HVAC		x	Controls	CO2 sensor				x																		
HVAC		x	Controls	Clock thermostat				x																		
HVAC		x	Controls	Cooling EMS																						
HVAC		x	Controls	DDC for cooling																						
HVAC		x	Controls	Heating EMS																						
HVAC		x	Equipment	Constant volume efficiency upgrade																						
HVAC		x	Equipment	Cooling tower efficiency upgrade																						
HVAC		x	Equipment	Dessicant dehumidifiers																						
HVAC		x	Equipment	Direct evaporative cooler																						
HVAC		x	Equipment	Economizer																						
HVAC		x	Equipment	Evaporative condenser																						
HVAC		x	Equipment	Evaporative cooler																						
HVAC		x	Equipment	Evaporative cooler covers																						
HVAC		x	Equipment	Exhaust dampers																						
HVAC		x	Equipment	VAV systems																						
HVAC		x	Equipment	Variable frequency drives																						
HVAC		x	Equipment	Whole house fan																						
HVAC		x	Insulation	Duct insulation																						
HVAC		x	Maintenance	HVAC filter replacement																						
HVAC		x	Maintenance	Register sealing																						
HVAC		x	Shell	Automatic door																						
HVAC		x	Shell	Ceiling insulation																						
HVAC		x	Shell	Double walled polyethylene																						
HVAC		x	Shell	Floor insulation																						
HVAC		x	Shell	Glazing																						
HVAC		x	Shell	Infiltration reduction																						
HVAC		x	Shell	Mini blinds																						
HVAC		x	Shell	Sun screens																						
HVAC		x	Shell	Thermal night curtain																						

California Utility DSM Measures Not Subject to Mandatory Standards

Affected End Use	Affected Fuel	Measure Category	Measure Name	Utility/Customer Sector																			
				PG&E			SCE			SDG&E			SoCal Gas										
				New	Retro	CI	New	Retro	CI	New	Retro	CI	New	Retro	CI								
Other	X	Controls	Timeclocks																				
Other	X	Equipment	Dual mode steamer		X																		
Other	X	Equipment	Fryer insulation		X																		
Other	X	Equipment	Heat recovery		X																		
Other	X	Equipment	Process cooking replacement																				
Other	X	Equipment	Replace gas engine																				
Other	X	Equipment	Thermal oxidizer																				
REF	X	Controls	Condensate evaporator controls																				
REF	X	Controls	EMS for refrigeration																				
REF	X	Controls	Walk-in occupancy sensor																				
REF	X	Equipment	Air cooled condenser																				
REF	X	Equipment	Antisweat controls																				
REF	X	Equipment	Auto closers																				
REF	X	Equipment	Case lighting																				
REF	X	Equipment	Display case covers																				
REF	X	Equipment	Door gaskets																				
REF	X	Equipment	Electric condensate evaporator																				
REF	X	Equipment	Evaporator efficiency upgrade																				
REF	X	Equipment	Evaporative condenser																				
REF	X	Equipment	Evaporative condensers																				
REF	X	Equipment	Floating head pressure																				
REF	X	Equipment	Glass or acrylic doors																				
REF	X	Equipment	Heat exchanger																				
REF	X	Equipment	Heatless doors																				
REF	X	Equipment	High capacity condensers																				
REF	X	Equipment	Hot gas defrost																				
REF	X	Equipment	Low temp doors																				
REF	X	Equipment	Medium temp doors																				
REF	X	Equipment	Multiplex compressor																				
REF	X	Equipment	New case with doors																				
REF	X	Equipment	Strip curtains for walk-in																				
REF	X	Equipment	Subcoolers																				
REF	X	Insulation	Suction line insulation																				
REF	X	Maintenance	Maintenance																				

Appendix B

US DOE Notice of Proposed Rulemaking - Energy Conservation Program for Consumer Products

This appendix contains a reproduction of pages from Vol. 59, No.43 of the Federal Register which present the relevant portion of the US DOE Notice of Proposed Rulemaking for Energy Conservation Program for Consumer Products. The notice proposes new energy descriptors for direct heating equipment, mobile home furnaces, and pool heaters. The notice also proposes to amend energy conservation standards and effective dates for room air conditioners, water heaters, furnaces, direct heating equipment, pool heaters, and fluorescent lamp ballasts. The notice provides new standards for color television sets with screen size of 13.0 to 33 inches. The proposed standards, described in this notice, would take effect three years following publication of a final rule.

disputed issues of material fact relating to the proposed rule. This opportunity will be afforded after any rebuttal statements, to the extent that the presiding official determines that such questioning is likely to result in a more timely and effective resolution of such issues. If the time provided is insufficient, DOE will consider affording an additional opportunity for questioning at a mutually convenient time. Persons interested in making use of this opportunity must submit their request to the presiding official no later than shortly after the completion of any rebuttal statements and be prepared to state specific justification including why the issue is one of disputed fact and how the proposed questions would expedite their resolution.

Any further procedural rules regarding proper conduct of the hearing will be announced by the presiding official.

A transcript of the hearing will be made, and the entire record of this rulemaking, including the transcript, will be retained by DOE and made available for inspection at the DOE Freedom of Information Reading Room as provided at the beginning of this notice. Any person may purchase a copy of the transcript from the transcribing reporter.

d Issues Requested for Comment

As discussed above in today's notice, DOE has identified a number of issues where comments are requested. These issues include, but are not limited to, the following:

- The baseline units and the base cases;
- Consideration of incremental impacts of various standard levels;
- Market share elasticities;
- Usage elasticities, i.e., rebound effect;
- Appropriate discount rates, including those for residential and

commercial consumer analyses (life-cycle cost and Lawrence Berkeley Laboratory-Residential Energy Model) and the use of a social discount rate (Lawrence Berkeley Laboratory-Residential Energy Model);

- Energy price forecasts;
- The characterization of prototypical firms for the manufacturer impact analysis (Lawrence Berkeley Laboratory-Manufacturer Impact Model);
- Efficiency forecasts for these products;
- Any lessening of product utility resulting from the addition of the design options identified;
- The effects on forecasts due to the use of national average energy prices and usage rates;
- The effects of standards on manufacturers' incentives to develop innovative products and product features;
- Any uncertainties in modeling, especially with regard to product usage, e.g., changes in usage rates as shown by survey data or changes in usage of features;
- Location of water heaters with respect to conditioned space;
- Lifetimes of appliances;
- Maintenance costs and failure rates of appliances and components;
- The possible expansion of DOE's economic analysis to include the variable effects of standards on identifiable sub-groups of consumers, and/or the incremental effects of standards relative to lower or higher standard levels; and
- Possible modifications or alternatives to LBL's Manufacturer Impact Model.

Many of these issues are not unique to this proposed rule and some, such as discount rates and modifications of the Lawrence Berkeley Laboratory Manufacturer Impact Model, have been raised in previous DOE public notice under the appliance conservation

standards program or by public comments on these notices. Those issues and the possible expansion of DOE's economic analysis in several areas were raised in DOE's Advance Notice of Proposed Rulemaking Regarding Energy Conservation Standards for Three Types of Consumer Products, published on September 8, 1993 (58 FR 47326). DOE hopes that its conclusions in these areas for this rulemaking will serve as the basis for the development and promulgation of future appliance conservation standards, unless comments in future rulemakings make a persuasive case to the contrary.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Energy conservation, Household appliances.

Issued in Washington, DC, December 15, 1993.

Christine S. Ervin,
Assistant Secretary, Energy Efficiency and Renewable Energy.

For the reasons set forth in the preamble part 430 of chapter II of title 10, Code of Federal Regulations, is proposed to be amended as set forth below.

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

1. The authority citation for part 430 continues to read as follows:

Authority: 42 U.S.C. 6291-6309.

2. Section 430.32 is amended by revising paragraphs (b), (d), (e), and (i) through (m) to read as follows:

§ 430.32 Energy conservation standards and effective dates.

(b) Room air conditioners.

Product class	Energy efficiency ratio, effective as of	
	January 1, 1990	[3 years after publication of Final Rule]
1. Without reverse cycle and with louvered sides less than 8,000 Btu	8.0	11.1
2. Without reverse cycle and with louvered sides 6,000 to 7,999 Btu	8.5	10.3
3. Without reverse cycle and with louvered sides 8,000 to 13,999 Btu	9.0	11.0
4. Without reverse cycle and with louvered sides 14,000 to 19,999 Btu	8.8	11.1
5. Without reverse cycle and with louvered sides 20,000 and more Btu	8.2	9.6
6. Without reverse cycle and without louvered sides less than 6,000 Btu	8.0	10.7
7. Without reverse cycle and without louvered sides 6,000 to 7,999 Btu	8.5	9.9
8. Without reverse cycle and without louvered sides 8,000 to 13,999 Btu	8.5	10.7
9. Without reverse cycle and without louvered sides 14,000 to 19,999 Btu	8.5	10.8
10. Without reverse cycle and without louvered sides 20,000 and more Btu	8.2	9.3
11. With reverse cycle, and with louvered sides	8.5	10.8
12. With reverse cycle, without louvered sides	8.0	10.4

Strategies for Collection of Appliance Efficiency Data

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(d) *Water heaters.*

Product class	Energy factor, effective as of		
	January 1, 1990	April 15, 1991	[3 years after publication of Final Rule]
1. Gas	0.62—(.0019×Rated Storage Volume in gallons).	0.62—(.0019×Rated Storage Volume in gallons).	0.64—(.0017×Measured Storage Volume in gallons).
2. Gas Instantaneous	N/A	0.62—(.0019×Rated Storage Volume in gallons).	0.75.
3. Oil	0.59—(.0019×Rated Storage Volume in gallons).	0.59—(.0019×Rated Storage Volume in gallons).	0.73—(.0017×Measured Storage Volume in gallons).
4. Electric	0.95—(.00132×Rated Storage Volume in gallons).	0.93—(.00132×Rated Storage Volume in gallons).	1.96—(.00117×Measured Storage Volume in gallons).

Note: Rated Storage Volume equals the water storage capacity of a water heater, in gallons, as specified by the manufacturer. Measured Storage Volume equals the water storage capacity of a water heater, in gallons, as measured in paragraph 6.1.1 of the test procedure.

(e) *Furnaces.*

Product class	Annual fuel utilization efficiency, effective as of January 1, 1992	Annual efficiency, effective as of 3 years after publication of Final Rule
1. Furnaces (excluding classes noted below)	78
2. Gas-Fired mobile home furnaces	175	74.3
3. Oil-Fired mobil home furnaces	175	74.7
4. Small furnaces (other than furnaces designed solely for installation in mobile homes), input rate less than 45,000 Btu/hour	78
5. Boilers (excluding gas steam)	80
6. Gas steam boilers	75

¹ Effective as of September 1, 1990.

(i) *Direct heating equipment.*

Product class	Annual fuel utilization efficiency, effective as of January 1, 1990	Annual efficiency, effective as of 3 years after publication of Final Rule
1. Gas wall fan type up to 42,000 Btu/hour	73	72.2
2. Gas wall fan type over 42,000 Btu/hour	74	73.4
3. Gas wall gravity type up to 10,000 Btu/hour	59	67.7
4. Gas wall gravity type over 10,000 Btu/hour up to 12,000 Btu/hour	60	67.7
5. Gas wall gravity type over 12,000 Btu/hour up to 15,000 Btu/hour	61	67.9
6. Gas wall gravity type over 15,000 Btu/hour up to 19,000 Btu/hour	62	68.2
7. Gas wall gravity type over 19,000 Btu/hour up to 27,000 Btu/hour	63	73.6
8. Gas wall gravity type over 27,000 Btu/hour up to 46,000 Btu/hour	64	73.9
9. Gas wall gravity type over 46,000 Btu/hour	65	74.2
10. Gas floor type up to 37,000 Btu/hour	56	70.7
11. Gas floor type over 37,000 Btu/hour	57	70.0
12. Gas room type up to 18,000 Btu/hour	57	64.4
13. Gas room type over 18,000 Btu/hour up to 20,000 Btu/hour	58	69.9
14. Gas room type over 20,000 Btu/hour up to 27,000 Btu/hour	63	67.1
15. Gas room type over 27,000 Btu/hour up 46,000 Btu/hour	64	71.2
16. Gas room type over 46,000 Btu/hour	65	71.5

(j) *Kitchen ranges and ovens.*

Gas kitchen ranges and ovens with an electrical supply cord shall not be equipped with a constant burning pilot light. The standard is effective on

January 1, 1990. The annual energy use of a kitchen range and oven shall be the sum of the annual energy use of any of the following components incorporated into the kitchen range and oven, and

shall not exceed the allowable sum of energy usages for those components listed below.

Strategies for Collection of Appliance Efficiency Data

Kitchen range and oven component	Annual energy use, effective as of [3 years after publication of Final Rule]
1. Electric ovens, self-cleaning	267 kWh
2. Electric ovens, non-self-cleaning	218 kWh
3. Gas ovens, self-cleaning	1.64 MMBtu
4. Gas ovens, non-self-cleaning	1.14 MMBtu
5. Microwave ovens	233 kWh
6. Electric cooktop, coil element	260 kWh
7. Electric cooktop, smooth element	294 kWh
8. Gas cooktop	1.71 MMBtu

(k) Pool heaters.

Product class	Thermal efficiency (percent), effective as of January 1, 1990	Annual efficiency (percent), effective as of [3 years after publication of Final Rule]
Pool heaters	78	82.2

(l) Television sets.

Product class	Annual energy use—kWh/yr, effective as of [3 years after publication of Final Rule]
1. Color—Screen size of 13.0 to 33 inches	20.5 + 6.1D

Note: D equals the screen size, in inches, as specified by the manufacturer.

(m) Fluorescent lamp ballasts. (1) Except as provided in paragraphs (m)(2) and (m)(3) of this section, each fluorescent lamp ballast designed—

(i) To operate at nominal input voltages of 120 or 277 volts;
(ii) To operate with an input current frequency of 60 Hertz; and

(iii) For use in connection with F32, F40, F96, or F96HO lamps; shall have a power factor of 0.90 or greater and shall have a ballast efficacy factor not less than the following:

Product class	Ballast input voltage	Efficacy factor, effective as of	
		January 1, 1990	[3 years after publication of Final Rule]
1. One F40 lamp	120	1.805	1.250
	277	1.805	1.250
2. Two F40 lamps	120	1.060	1.128
	277	1.050	1.128
3. Two F96 lamps	120	0.570	0.72
	277	0.570	0.72
4. Two F96HO lamps	120	0.390	0.50
	277	0.390	0.50
5. Three F40 lamps	120	(2)	0.87
	277		0.87
6. Four F40 lamps	120	(2)	0.67
	277		0.67
7. One F32T8 lamp	120	(2)	3.17
	277		3.17
8. Two F32T8 lamps	120	(2)	1.58
	277		1.58
9. Three F32T8 lamps	120	(2)	1.06
	277		1.06
10. Four F32T8 lamps	120	(2)	0.76
	277		0.76

¹ Applies to T12 lamps only.
² Not applicable.

(2) The standards that are effective January 1, 1990, as described in paragraph (m)(1) of this section, do not apply to:

(i) A ballast which is designed for dimming or for use in ambient temperatures of 0°F or less, or

(ii) A ballast which has a power factor of less than 0.09 and is designed for use

only in residential building applications.

(3) The standards described in paragraph (m)(1) of this section, effective [3 years after publication of Final Rule], do not apply to:

(i) A ballast which is designed for use in ambient temperatures of 0°F or less, or

(ii) A ballast which has a power factor or less than 0.90 and is designed for use only in residential building applications.

[FR Doc. 94-4586 Filed 3-3-94; 8:45 am]

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