

# California Residential Efficiency Market Share Tracking

## Appliances 2001

Prepared for:

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# 1

## Introduction

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This report examines the efficiency shares and average efficiencies of clothes washers, dishwashers, refrigerators, and room air conditioners purchased in California's residential sector. Included are a review of data sources used for analysis of appliance efficiencies, a description of model availability with respect to energy efficiency ratings, a summary of applicable energy efficiency standards, the estimated percentage of units sold that qualify for the ENERGY STAR<sup>®</sup> label, and results of an analysis of market shares by market channel (national chains and independently owned retailers).

The data used in this analysis cover the 1998 through 2001 period. Subsequent reports will be made available on a semi-annual basis, with the next report (Volume 1, 2002) covering up through the first half of 2002.

Data for this report were collected from a panel of independently owned retailers and combined with national chain sales data provided by D&R International. The results were used to estimate the market share of ENERGY STAR qualifying appliances sold in California. Support of California's statewide appliance program is the reason for basing this analysis on the share of ENERGY STAR qualifying units sold. California uses ENERGY STAR as the criterion as well as the marketing tool for this program.

This report is an integral part of the ongoing Residential Efficiency Market Share Tracking Study (RMST).<sup>1</sup> The RMST, now in its fourth year, produces four separate semi-annual reports: Residential New Construction,<sup>2</sup> Lighting,<sup>3</sup> Appliances, and HVAC<sup>4</sup>. The objective of each RMST report is to estimate the market share of highly energy efficient products, over time, within the California residential market. A four- to eight-page high-level summary accompanies each study.

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<sup>1</sup> RER, Inc. *California Residential Efficiency Market Share Tracking: First-Year Interim Report*. Prepared for Southern California Edison. October 2000.

<sup>2</sup> RER, Inc. *Residential New Construction Study*. Prepared for Pacific Gas & Electric Company. September 2001.

<sup>3</sup> RER, Inc. *Residential Market Share Tracking: Lamps*. Prepared for Southern California Edison. April 2002.

<sup>4</sup> RER, Inc. *Residential Market Share Tracking: HVAC*. Prepared for Southern California Edison. October 2002.

The remainder of this report presents a discussion of the data collection, including the identification of data sources, a description of the data analysis techniques and a summary of the geographical coverage of the collected data. Individual sections describing findings for clothes washers, dishwashers, refrigerators, and room air conditioners follow. The final section discusses the work effort for the fourth year of the project.

# 2

## Data Collection and Analysis

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### 2.1 Overview

Sales data were collected from two major sources: D&R International (who provides data from some national ENERGY STAR partners)<sup>5</sup> and independent retailers (including regional appliance chains). RER is responsible for the recruitment, collection, and maintenance of the independent retail sample.

This section summarizes the number of California retail outlets and describes the data collection and analysis for the national and independent appliance retailer sales data. Appendix A, containing detailed information on how the sales data analysis is conducted, is included at the end of the report.

### 2.2 California Retail Outlets

The analysis of appliance sales relies on collecting the data from a variety of appliance retailers. It is helpful to understand the number of appliance retail storefronts in California. Table 2-1 summarizes the quantity of appliance retailers as well as the total number of storefronts. These figures are separated in the table to distinguish between national chain stores and independent retailers in the California appliance market. Independent appliance retailers include single storefronts (mom-and-pop stores) as well as regional chains. As depicted in Table 2-1, all national chain storefronts are currently ENERGY STAR partners. Overall, national chains sell approximately half of the appliances in California. The remaining half of appliances sold statewide stem from independents and regional chains. This percentage varies by appliance.

Data are being collected from approximately 43% of the national appliance retailer storefronts by D&R International. Additionally, RER collects data from 30 independent storefronts (of the 412 total independent storefronts across the state) for tracking energy efficient appliance market share.

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<sup>5</sup> It is important to note that not all national ENERGY STAR partners share appliance sales data with D&R International.

**Table 2-1: California Appliance Retailer Entities and Storefronts – 2001**

	National Chains	Independent Regional Chains	Independent Individual Stores	All Retailers
Companies/Retail Entities	6	32	300	337
California Retail Storefronts	515 <sup>1</sup>	112	300	927
ENERGY STAR Partners <sup>2</sup>	6	3	0	9

1. Costco and Sam’s Club Membership Warehouses have been added to this figure as these storefronts have entered the home appliance market.
2. ENERGY STAR partners are all retail entities, because all their storefronts participate once the corporate home office has agreed to the program. Individual storefronts do not make the decision regarding participation.

### 2.3 National Appliance Retailer Sales Data

D&R International (D&R) provided RER with available sales data from national retail chains for each of the appliances covered by the RMST project. D&R collects sales data from national retailers under a contract to support and evaluate the EPA/DOE ENERGY STAR Appliance Program and to track the sales of ENERGY STAR labeled products on a national level. California sales data were made available to RER to support the California RMST project. The national chain ENERGY STAR partners in the 2001 data include two national retail entities. The data included the total number of all units sold by zip code and the total number of ENERGY STAR qualifying units sold by zip code. Due to confidentiality agreements with national partners, D&R was unable to provide more detailed information about specific efficiencies of the units sold. It is worth noting that there have been changes over the past four years in the number of participants providing sales data for D&R’s database.

### 2.4 Independent and Regional Chain Appliance Retailer Sales Data

This section discusses the collection of the independent and regional chain appliance retail sales data. In addition, a discussion is presented to help explain the differences between national chain and independent retailer market shares of ENERGY STAR qualifying units.

#### ***ENERGY STAR Sales by Independent Retailers***

In California, independent retailers have secured a substantial market share in the overall appliance market. This study continues to show that independent retailers generally sell a larger percentage of ENERGY STAR qualified appliances than national chain appliance retailers. The difference could be attributable to several factors, including lower employee turnover and therefore higher awareness, willingness to special order appliances, and overall different marketing strategies. Additionally, independent appliance retailers may cater to a different clientele that is more likely to purchase the higher end, and sometimes higher

efficiency, product. However, it is important to realize that national chains have improved their ENERGY STAR product lines. In turn, their market share of these items has increased in California. In the past, national chain stores appliance selection had been limited by corporate decisions. It is important to realize that, in general, independent appliance retailers offer more flexibility to consumers. Moreover, independent stores do not try to compete with the price points that national chain stores offer on some models. Instead, they tend to focus on service, knowledge, and helping to find the best fit for the needs of a customer. Many times customers of independent retailers are looking for planned appliance replacements. This stands in contrast to some customers who may seek out a national chain because they require an emergency appliance replacement purchase.

**Sample Frame and Sample Design**

RER used a sample frame of independent retailers. This sample was mainly drawn from a list provided by the Electric and Gas Industries Association (EGIA). Independent research by the project team also supplemented the EGIA information.<sup>6</sup> Table 2-2 illustrates the breakdown of storefronts by utility area.

**Table 2-2: Independent Appliance Retailer Sample Frame**

	Utility Service Area				All
	PG&E	SCE	SDG&E	Other*	
<b>All Areas</b>					
Storefronts	208	98	34	72	412
Percent of Total	50%	25%	8%	17%	100%
<b>PG&amp;E, SCE, and SDG&amp;E Only</b>					
Storefronts	208	98	34		340
Percent of Total	61%	29%	10%		100%

\*“Other” includes municipal utilities such as LADWP, SMUD, LMUD, and many others.

The project team plans to continue to improve the accuracy of the sample. Table 2-3 provides the sampling targets for each utility service area.

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<sup>6</sup> The sample obtained from the EGIA under-represents the SDG&E service area, according to EGIA staff. Augmenting the EGIA sample with Associated Volume Buyers (AVB) members helped to alleviate this problem.



**Table 2-3: Independent Appliance Retailer Long-Term Sample Targets**

	Utility Service Area			All
	PG&E	SCE	SDG&E	
Storefronts	39	19	7	65
Percent of Total	60%	30%	10%	100%

***Independent Retailer Panel Recruitment***

The collection of 2001 data benefited from recruitment efforts that substantially increased the 2000 sample, as well as improved ease of participation. However, the sample size did decrease due to some retailers’ inability to provide the sales data in a timeframe compatible with the reporting process. The project team expects additional 2001 sales data to be integrated into future appliance reports. The recruiting efforts will regroup and refocus to increase the sample size again for the 2002 reports. Additional efforts will focus on improving the geographic spread of the independent appliance retailers. RER plans to focus renewed recruiting efforts on increasing coverage in the SDG&E territory as well as in some cities in central and eastern California.

***Current Independent Retailer Panel***

As shown in Table 2-4, RER obtained appliance sales data from a panel of 11 independent retailers representing 30 individual storefronts. This represents a decrease from 2000. Three retailers were unable to provide 2001 data in a timeframe consistent with the other independent retailers. Therefore, the project team decided to produce the 2001 report without these data. The team believes that the results in this report are still representative of occurrences in the independent appliance retail market. In addition, these retailers have stated that they will provide 2001 data in time for the semi-annual 2002 report. As always, data continue to be updated whenever possible, and the subsequent report should contain the most recent data from these retailers. The inclusion of this information will bring the number of independent appliance retailers that share sales data for the RMST to over 50. The retailers in the panel provided data in a variety of formats: electronic spreadsheets, hard-copy sales reports, and even handwritten tallies of units sold. Most retailers provide data to RER on a monthly basis. In general, the data includes the appliance type, manufacturer, manufacturer model number, quantity sold, and date of sale.

**Table 2-4: Current Independent Appliance Retailer Panel**

	Utility Service Area			All
	PG&E	Southern California	Other*	
Storefronts	23	5	3	31
Percent of Total	74%	16%	10%	100%

\* "Other" includes municipal utilities such as LADWP, SMUD, LMUD, and many others.

It is important to comment here about the sample sizes of each year covered by the analysis. As illustrated in Table 2-5, the current analysis database includes sales data from national retail chains for 1998, 1999, 2000 and 2001, as well as data from independent retailers for 1999 through 2001.

**Table 2-5: Appliance Sales Data Coverage, by Market Channel**

Market Channel	1998	1999	2000	2001
National Chain Retailers *	X	X	X	X
Independent Retailers		X	X	X

\* Two national chains provided 1998 data, four provided 1999 data, and two provided 2000 and 2001 data.

## 2.5 Energy Factor Analysis

The level of detail available from the independent appliance retailer sales data has allowed for a new type of analysis. Clothes washers, dishwashers and refrigerators now all have an energy factor analysis included. An energy factor is simply an efficiency rating. Within each appliance type, the higher the energy factor, the more efficient a unit is.

This energy factor analysis estimates actual efficiency trends over time for clothes washers, dishwashers and refrigerators. This differs from the ENERGY STAR analysis. The ENERGY STAR analysis measures the market share of ENERGY STAR qualified appliances based on sales data from both national chains and independent retailers. It is strictly based on the whether a tracked appliance sold in California qualified for the ENERGY STAR program. When changes to specifications occur in the ENERGY STAR program, they affect the measured market share. In most cases, a specification change leads to a decrease, although usually temporary in market share of ENERGY STAR qualified appliances. However, the ENERGY STAR analysis does not evaluate the actual efficiencies of the units sold.

However, the energy factor analysis examines the actual efficiencies of the clothes washers, dishwashers and refrigerators sold by independent appliance retailers throughout the State. It is important to understand that it does not include data from national chains. Additionally, energy factors cannot be compared between appliances, only within appliance types. For instance, it is not possible to compare the average energy factor of refrigerators and compare

it to the average energy factor of dishwashers. This is due to the manner in which energy factors are determined. For all three types of appliances, the higher the energy factor, the more efficient the unit. However, it is not accurate to say that refrigerators are more efficient than dishwashers because the average energy factor of refrigerators is much higher than that belonging to dishwashers. Each appliance has its energy factor determined by an equation that uses the kWh energy use of the appliance. Since refrigerators have larger kWh than dishwashers, the energy factors for refrigerators will reflect this. This is the reason that the energy factors of different appliances cannot be compared.

Each appliance's energy factor analysis illustrates the average efficiency of that appliance sold by independent appliance retailers throughout California. These graphs illustrate the average energy factors of all units sold by independent appliance retailers statewide from 1999 through 2001. Generally speaking, correlations can be seen between the average energy factors and the percentage of ENERGY STAR qualified appliances sold by independents. However, this energy factor analysis is important because it shows what is happening to actual average efficiencies over time, regardless of standards or specifications changes.

# 3

## Clothes Washers

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### 3.1 Overview

This section discusses total clothes washer unit sales, characteristics of available models, efficiency standards, market share of ENERGY STAR® qualified units, and analysis of ENERGY STAR sales by market channel.

### 3.2 Total Unit Sales

Table 3-1 presents estimates of annual unit sales of clothes washers used in the development of market shares in this report. The Association of Home Appliance Manufacturers (AHAM) was the main source of information for these estimates.

**Table 3-1: Estimate of Total Clothes Washer Unit Sales in California\***

Measure	1998	1999	2000	2001
Clothes Washers	702,000	721,100	731,500	766,500

\*AHAM

### 3.3 Characteristics of Available Models

Currently, comprehensive data sources that characterize available clothes washer models, such as those found for refrigerators, are not available. However, the ENERGY STAR program illustrated some interesting trends in available models. As of April 11, 2001, D&R International made the following observation about clothes washers: “84 qualified models are listed with ENERGY STAR at present; this is about 13% of all models currently available.”<sup>7</sup> In addition, D&R International has studied the market for ENERGY STAR appliances. In November 2000, they found that 567 models of clothes washers (42 brands) met the federal standard. Of these, 64 models (18 brands) met the higher ENERGY STAR

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<sup>7</sup> D&R International, Ltd. Appliance Update: ENERGY STAR Qualified Products in 2001. [www.energystar.gov/opie/library/studiesreports/natmarketstudies/2001applianceupdatespring.pdf](http://www.energystar.gov/opie/library/studiesreports/natmarketstudies/2001applianceupdatespring.pdf).

specification.<sup>8</sup> The increase in available models from November to April was expected because new ENERGY STAR standards did not affect washers in the same manner as other appliances. Essentially, the new ENERGY STAR specification for clothes washer is the same as the former specification. The major shift for clothes washers has been the change from energy factor (EF) to modified energy factor (MEF). The old ENERGY STAR specification of 2.50 EF and the new specification of 1.26 MEF are basically the same. Therefore, the standard did not truly tighten for clothes washers.

### **3.4 Clothes Washer Efficiency Standards**

Clothes washer energy use is expressed in estimated annual energy use (kWh) under “typical conditions” and is based on an average 392 loads of laundry per year. Current clothes washer efficiency ratings are expressed as an energy factor rating (EF), which is a measurement based on ft<sup>3</sup>/kWh/cycle. However, the new standards are based on a modified energy factor (MEF).<sup>9</sup>

Current federal energy use standards for residential clothes washers vary by tub volume and have been in place since May 1994. Compact washers with a tub capacity less than 1.6 cubic feet have a minimum EF requirement of 0.90. Top loading clothes washers with a tub capacity of 1.6 cubic feet or greater must have an EF of 1.18. Front-loading units were required to have an unheated rinse option. Changes to the federal minimum energy efficiency standard have been approved. These changes have been guided, in part, by the Super-Efficient Home Appliance Initiative (SEHA) standards created by the Consortium for Energy Efficiency (CEE). President George W. Bush finalized the new standard, initially started during the Clinton administration, in April 2001. It will take effect on January 1, 2004. The new provision also includes a second increase in the standard, which will commence on January 1, 2007. The new federal standards require units to be 22% more efficient in 2001 and 35% more efficient in 2004 than today’s baseline washer. Additionally, the California Energy Commission (Commission) amended their appliance efficiency regulations in January 2002 to reflect the increase in the federal energy use standards. The Commission did not surpass the federal requirements for appliance efficiency standards. All these standards are shown below in Table 3-2.

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<sup>8</sup> D&R International, Ltd. ENERGY STAR Appliances: 2001 Market Forecast. [www.energystar.gov/opie/library/studiesreports/natmarketstudies/2001applianceforecast.PDF](http://www.energystar.gov/opie/library/studiesreports/natmarketstudies/2001applianceforecast.PDF).

<sup>9</sup> The MEF considers the moisture content remaining in clothes after washing. It does so to correlate the effectiveness of the washer to the amount of dryer use required or, in other words, the dryer savings. The MEF concept is similar to the Super Efficient Home Appliance (SEHA) initiative standards created by the Consortium for Energy Efficiency (CEE).

**Table 3-2: Comparison of Federal and ENERGY STAR Clothes Washer Energy Standards**

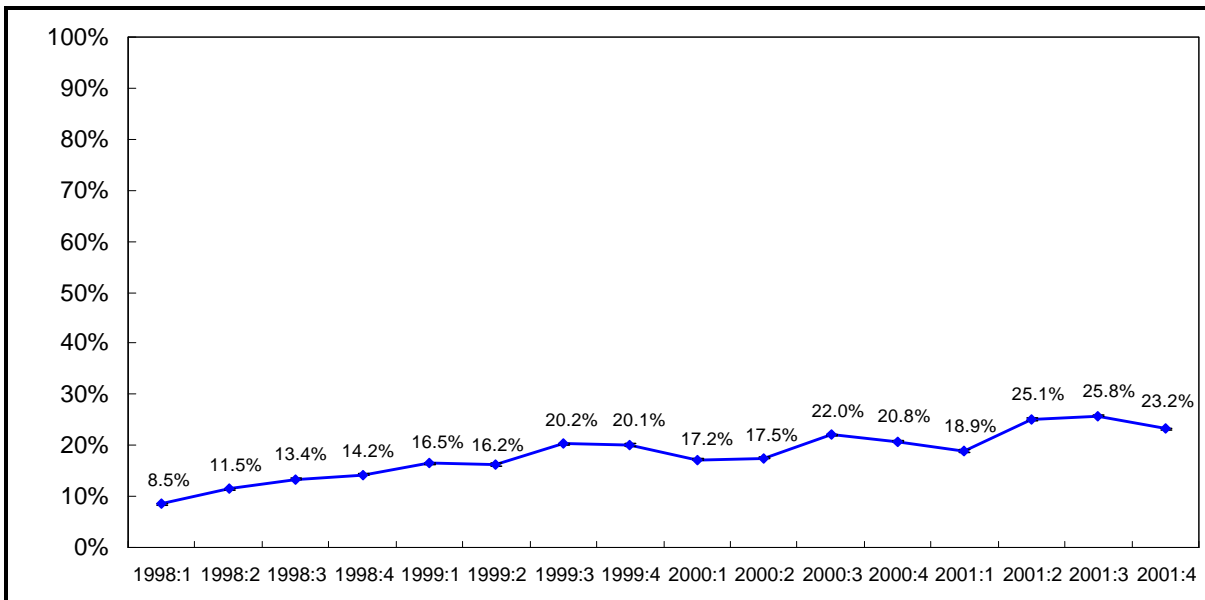
	1994 Standard	January 1, 2001 Standard	January 1, 2004 Standard	January 1, 2007 Standard
NAECA	1.18 EF	1.18 EF	1.04 MEF	1.26 MEF
Percent Improved	n/a	n/a	22% over 2001	35% over 2001
ENERGY STAR	2.50 EF	1.26 MEF (~ 2.50 EF)	1.42 MEF	n/a
California Standards	1.18 EF	1.18 EF	1.04 MEF	1.26 MEF

### 3.5 Market Share of ENERGY STAR Qualified Clothes Washers

Figure 3-1 and Table 3-3 present the percentage of ENERGY STAR qualified clothes washers sold in California during the first quarter of 1998 through the fourth quarter of 2001. As shown, the market share of ENERGY STAR qualified clothes washers has increased during the past four years—climbing from a low of 8.5% in the first quarter of 1998 to over 25% during the second and third quarters of 2001.

Table 3-4 reports the percentage of ENERGY STAR compliant clothes washers sold in each utility service area annually and by quarter.

**Figure 3-1: Clothes Washer Sales, Percent of ENERGY STAR Qualified Units**



Error bands for the 90% confidence interval.

Data from 1998 reflect national chain D&R data only. Because of this and the adjustments made to better estimate 1998 results, the standard errors are not listed.

**Table 3-3: Clothes Washer Sales, Percent of ENERGY STAR Qualified Units (Statewide)**

Year	Percent of ENERGY STAR Qualified Clothes Washers				
	Annual	Q1	Q2	Q3	Q4
1998	<b>11.96%</b> (-) n = 180,983	<b>8.52%</b> (-) n = 44,233	<b>11.46%</b> (-) n = 43,366	<b>13.39%</b> (-) n = 44,746	<b>14.22%</b> (-) n = 48,638
1999	<b>18.17%</b> (0.0006) n = 425,528	<b>16.45%</b> (0.0011) n = 115,621	<b>16.23%</b> (0.0011) n = 107,984	<b>20.24%</b> (0.0013) n = 101,691	<b>20.07%</b> (0.0013) n = 100,232
2000	<b>19.26%</b> (.0006) n=414,505	<b>17.20%</b> (.0013) n=113,966	<b>17.48%</b> (.0011) n=114,385	<b>22.01%</b> (.0011) n=88,754	<b>20.79%</b> (.0014) n=97,400
2001	<b>23.17%</b> (0.0006) n = 427,489	<b>18.88%</b> (0.0012) n = 109,184	<b>25.06%</b> (0.0013) n = 103,324	<b>25.78%</b> (0.0014) n = 103,185	<b>23.16%</b> (0.0013) n = 111,796

- 1 Standard errors in parentheses.
- 2 Data from 1998 reflect national chain D&R data only. Because of this and the adjustments made to better estimate 1998 results, the standard errors are not listed.

**Table 3-4: Clothes Washer Sales, Percent of ENERGY STAR Qualified Units by Utility Service Area**

Utility	Year	Percent of ENERGY STAR Qualified Clothes Washers <sup>1,2</sup>				
		Annual	Q1	Q2	Q3	Q4
PG&E	1998	<b>12.65%</b> (-) n=83,563	<b>80.63%</b> (-) n=19,916	<b>13.65%</b> (-) n=20,751	<b>15.29%</b> (-) n=20,520	<b>12.87%</b> (-) n=22,376
	1999	<b>14.68%</b> (0.0008) n=165,144	<b>12.91%</b> (0.0015) n=47,436	<b>13.67%</b> (0.0017) n=42,090	<b>15.56%</b> (0.0019) n=37,916	<b>17.16%</b> (0.0019) n=37,702
	2000	<b>24.29%</b> (.0011) n=165,405	<b>20.36%</b> (.0019) n=43,959	<b>23.99%</b> (.0020) n=45,042	<b>28.1%</b> (.0023) n=37,038	<b>25.04%</b> (.0022) n=39,366
	2001	<b>29.47%</b> (0.0011) n=170,360	<b>23.47%</b> (0.0020) n=43,035	<b>31.08%</b> (0.0023) n=40,366	<b>32.72%</b> (0.0023) n=41,868	<b>30.68%</b> (0.0022) n=45,091
SCE	1998	<b>8.74%</b> (-) n=47,708	<b>7.55%</b> (-) n=12,287	<b>7.16%</b> (-) n=11,357	<b>7.88%</b> (-) n=11,693	<b>12.19%</b> (-) n=12,371
	1999	<b>17.38%</b> (0.0010) n=140,863	<b>15.59%</b> (0.0018) n=36,820	<b>15.41%</b> (0.0019) n=35,609	<b>19.73%</b> (0.0021) n=34,829	<b>19.03%</b> (0.0021) n=33,605
	2000	<b>14.95%</b> (.0009) n=136,046	<b>14.06%</b> (.0018) n=38,696	<b>12.21%</b> (.0017) n=38,212	<b>16.75%</b> (.0022) n=27,790	<b>17.25%</b> (.0021) n=31,348
	2001	<b>18.99%</b> (0.0010) n=144,802	<b>15.86%</b> (0.0019) n=37,341	<b>21.10%</b> (0.0022) n=35,457	<b>21.71%</b> (0.0022) n=34,187	<b>17.57%</b> (0.0019) n=37,817
SDG&E	1998	<b>11.70%</b> (-) n=14,582	<b>10.59%</b> (-) n=3,491	<b>11.65%</b> (-) n=3,359	<b>14.19%</b> (-) n=3,413	<b>10.66%</b> (-) n=4,319
	1999	<b>18.03%</b> (0.0020) n=38,302	<b>18.67%</b> (0.0039) n=9,915	<b>14.68%</b> (0.0035) n=9,943	<b>18.70%</b> (0.0041) n=9,229	<b>20.18%</b> (0.0042) n=9,215
	2000	<b>21.29%</b> (.0022) n=35,560	<b>19.91%</b> (.0040) n=9,890	<b>16.25%</b> (.0037) n=9,816	<b>24.36%</b> (.0050) n=7,492	<b>24.72%</b> (.0047) n=8,362
	2001	<b>18.17%</b> (0.0020) n=39,016	<b>14.20%</b> (0.0035) n=9,835	<b>18.73%</b> (0.0040) n=9,592	<b>18.67%</b> (0.0040) n=9,621	<b>21.07%</b> (0.0041) n=9,968
Other	1998	<b>13.37%</b> (-) n=35,130	<b>7.82</b> (-) n=8,539	<b>10.36%</b> (-) n=7,899	<b>14.39%</b> (-) n=9,120	<b>19.82%</b> (-) n=9,57203
	1999	<b>15.71%</b> (0.0013) n=81,219	<b>14.65%</b> (0.0024) n=21,450	<b>14.91%</b> (0.0025) n=20,342	<b>17.67%</b> (0.0027) n=19,717	<b>15.72%</b> (0.0026) n=19,710
	2000	<b>16.20%</b> (.0013) n=77,494	<b>16.02%</b> (.0025) n=21,421	<b>15.11%</b> (.0025) n=21,315	<b>17.47%</b> (.0030) n=16,434	<b>16.43%</b> (.0027) n=18,324
	2001	<b>22.03%</b> (0.0015) n=73,311	<b>18.51%</b> (0.0028) n=18,973	<b>25.02%</b> (0.0032) n=17,909	<b>23.20%</b> (0.0032) n=17,509	<b>21.58%</b> (0.0030) n=18,920

1. Standard errors in parentheses.
2. "Other" includes municipal utilities such as LADWP, SMUD, and others.
3. Data from 1998 reflect national chain D&R data only. Because of this and the adjustments made to better estimate 1998 results, the standard errors are not listed.

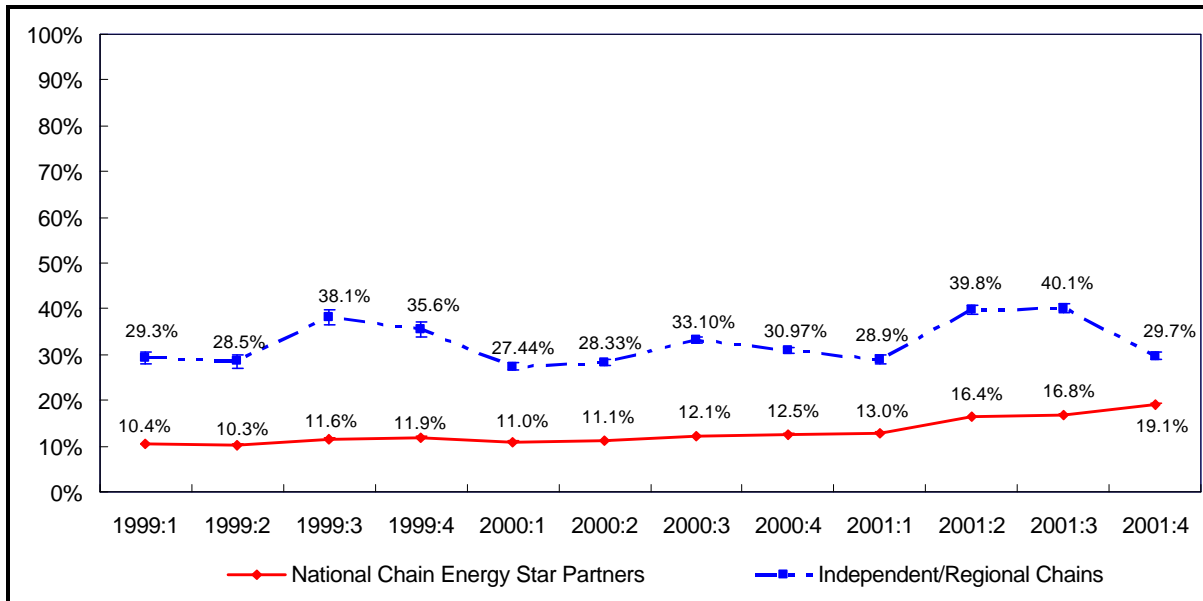


### 3.6 Analysis by Market Channel

#### Comparison of National Chain and Independent Appliance Retailers

Figure 3-2 and Table 3-5 compare the shares of ENERGY STAR qualified clothes washers sold by national chain ENERGY STAR partners to sales by independently owned stores and regional chains. As shown, national chains sell a considerably lower percentage of ENERGY STAR clothes washers than independent retailers. Over the four-year period, the share sold by national chain ENERGY STAR partners almost doubled. It grew from 10.4% in the first quarter of 1999 to 19.1% by the last quarter of 2001. During the same period, the independent appliance retailers also experienced a growth in share, although their share has fluctuated. The four-year lowest share for independents occurred in the first quarter of 2000 at 27.44%, whereas their highest share was in the third quarter of 2001 at 40.1%.

**Figure 3-2: Clothes Washer Sales, Percent of ENERGY STAR Qualified Units by Market Channel**



Error bands for the 90% confidence interval.

**Table 3-5: Clothes Washer Sales, Percent of ENERGY STAR Qualified Units by Market Channel**

Year/Quarter	Market Channel	
	National Chain ENERGY STAR Partners	Independent and Regional Chains
1999:1	<b>10.36%</b> (0.0009) n =113,050	<b>29.28%</b> (0.0090) n =2,571
1999:2	<b>10.30%</b> (0.0009) n =105,551	<b>28.47%</b> (0.0091) n =2,433
1999:3	<b>11.63%</b> (0.0010) n =99,385	<b>38.10%</b> (0.0101) n =2,306
1999:4	<b>11.88%</b> (0.0010) n =97,766	<b>35.58%</b> (0.0096) n =2,466
2000:1	<b>10.98%</b> (0.0010) n =102,845	<b>27.44%</b> (0.0042) n =11,121
2000:2	<b>11.05%</b> (0.0010) n =103,399	<b>28.33%</b> (0.0043) n =10,986
2000:3	<b>12.12%</b> (0.0012) n =76,422	<b>33.09%</b> (0.0042) n =12,332
2000:4	<b>12.48%</b> (0.0011) n =85,304	<b>30.97%</b> (0.0042) n =12,096
2001:1	<b>12.98%</b> (0.0011) n = 102,255	<b>28.90%</b> (0.0054) n = 6,929
2001:2	<b>16.40%</b> (0.0012) n = 96,959	<b>39.81%</b> (0.0061) n = 6,365
2001:3	<b>16.84%</b> (0.0012) n = 96,088	<b>40.06%</b> (0.0058) n = 7,097
2001:4	<b>19.07%</b> (0.0012) n = 104,159	<b>29.65%</b> (0.0052) n = 7,637

### **Detailed, Statewide Independent Appliance Retailer Analysis**

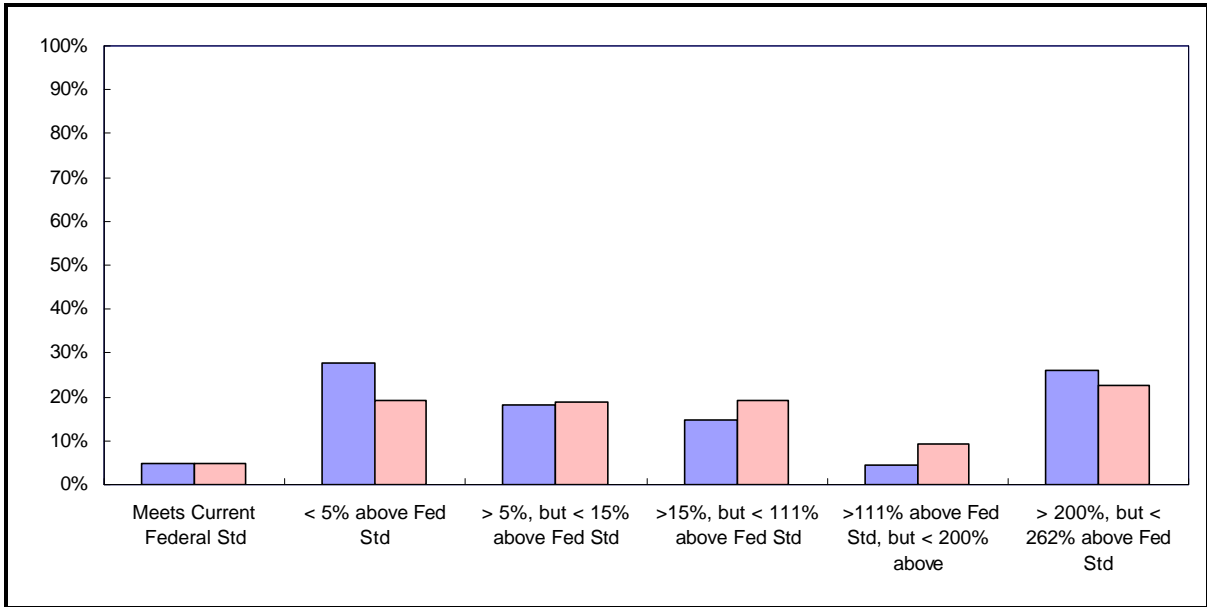
The detail in this portion of the RMST is available due to the line item detail provided by the participating independent appliance retailers throughout California. As with the 2000 report, this report includes an analysis that examines independent sales by efficiency groupings. This was done in order to illustrate different sales trends within independent appliance retailers.

Additionally, a new analysis has been added to this section. These previously unpublished results show the average energy factor (EF) of clothes washers sold by independent appliance retailers throughout California over time. This EF-level analysis is a more accurate measure of actual efficiency trends than the ENERGY STAR analysis. It will continue to be part of the fourth-year report for independent appliance retailers.

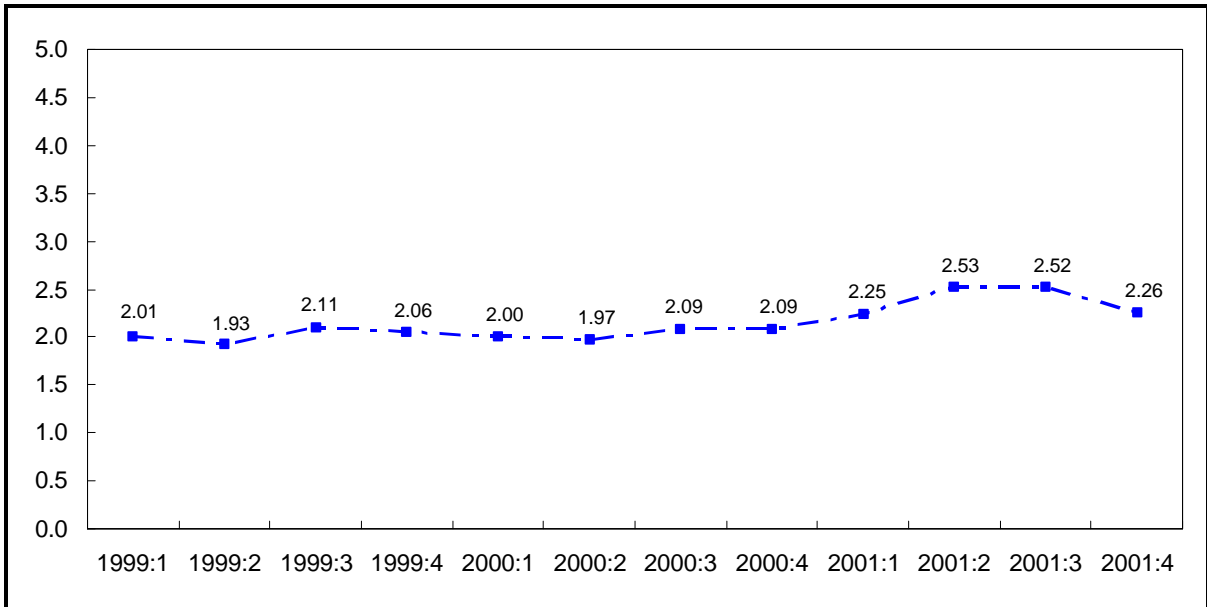
Figure 3-3 illustrates sales by independent retailers in 2000 and 2001, examined in groupings by efficiency level. Note that the ENERGY STAR threshold is 111% above the federal standard. Also of interest is that only a small percentage of clothes washers sold by participating independents only just meet the federal standard. This reinforces the concept that independent appliance retailers do not focus on sales of low price point appliance models, which often have low efficiency levels. Subsequently however, one-quarter of independent sales during 2000 were of models less than 5% above the standard. This decreased to less than one-fifth of sales in 2001. Generally, two-thirds of independent appliance sales are from non-ENERGY STAR qualified units. Approximately one-third are ENERGY STAR qualified. Beyond that, the ENERGY STAR qualified units sold by independents tend to be toward the high end of the ENERGY STAR qualification range. Many of these units have an EF of 4.01 or higher.

Additionally, Figure 3-4 illustrates the average energy factor of clothes washers sold by independent appliance retailers throughout California in 2000 and 2001. Please keep in mind that this is a new type of analysis not previously contained in any RMST reports, and was possible due to the more detailed data provided by the independent appliance retailers. It illustrates the average estimated EF of all the clothes washers sold by independent appliance retailers throughout the state.

**Figure 3-3: Percent of Independent Clothes Washer Sales by Efficiency Level**



**Figure 3-4: Average Energy Factor for Clothes Washers Sold By Independent Appliance Retailers**





# 4

## Dishwashers

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### 4.1 Overview

This section discusses total dishwasher unit sales, characteristics of available models, efficiency standards, market shares of ENERGY STAR® qualified units and analysis of ENERGY STAR sales by market channel.

### 4.2 Total Unit Sales

Table 4-1 presents estimates of annual unit sales of dishwashers used in the development of market shares in this report. The Association of Home Appliance Manufacturers (AHAM) was the main source of information for these estimates.

**Table 4-1: Estimate of Total Dishwashers Units Sales in California\***

Measure	1998	1999	2000	2001
Dishwashers	509,000	566,800	579,100	595,800

\* AHAM

### 4.3 Characteristics of Available Models

There is not currently a comprehensive resource with which dishwasher model availability may be conducted with accuracy. However, as of April 11, 2001, D&R International made the following observation about dishwashers: “167 qualified models are listed with ENERGY STAR at present; this is over 22% of models currently on the market.”<sup>10</sup> It is important to note that as of January 1, 2001 when the new ENERGY STAR specification took effect,<sup>11</sup> approximately 100 models fell short of the new qualification level. By August 2001, 262 models of dishwashers, out of over 800, qualified for the new higher ENERGY STAR standard.

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<sup>10</sup> D&R International, Ltd. Appliance Update: ENERGY STAR Qualified Products in 2001. [www.energystar.gov/opie/library/studiesreports/natmarketstudies/2001applianceupdatespring.pdf](http://www.energystar.gov/opie/library/studiesreports/natmarketstudies/2001applianceupdatespring.pdf).

<sup>11</sup> D&R International, Ltd. ENERGY STAR Appliances: 2001 Market Forecast. [www.energystar.gov/opie/library/studiesreports/natmarketstudies/2001applianceforecast.pdf](http://www.energystar.gov/opie/library/studiesreports/natmarketstudies/2001applianceforecast.pdf).

## 4.4 Dishwasher Efficiency Standards

Dishwasher energy use is based on estimated annual energy use (kWh) under “typical conditions” and an average of 322 loads, or cycles, per year. Dishwasher efficiency ratings are expressed as an energy factor rating (EF). The EF for dishwashers is computed as:

$$EF = \frac{322}{\text{Actual Annual Energy Usage (kWh)}}$$

As summarized in Table 4-2, all standard-sized dishwashers must have an energy factor equal to at least 0.46. The ENERGY STAR qualification for dishwashers changed on January 1, 2001. As of that date, ENERGY STAR qualified dishwashers must exceed the minimum federal standard by at least 25%. The previous standard for 2000 was 13%. Once again, the new ENERGY STAR specification stems from the SEHA program from the CEE.<sup>12</sup> Additionally, the California Energy Commission amended their appliance efficiency regulations in January 2002 to reflect the increase in the federal energy use standards for several appliances. However, the dishwasher standard did not change during these proceedings. All these standards are shown in Table 4-2.

Additionally, it is important to realize that although the federal standard for dishwasher energy factors has not changed, on December 18, 2001 the Department of Energy published changes to the testing procedure. The change decreased the number of cycles per year. This figure is directly used to calculate a dishwasher’s energy factor. Therefore, the reduction from 322 cycles to 264 cycles will decrease energy consumption for dishwashers in order to meet the new federal standard at the same EF. This test procedure change took effect on June 17, 2002.<sup>13</sup>

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<sup>12</sup> Many parties are hoping that new federal dishwasher efficiency standards will be passed this year. If this comes to fruition, it would likely take effect on January 1, 2005. Consortium for Energy Efficiency. Super Efficient Home Appliance Initiative: Dishwashers. [www.ceeformt.org/resid/seha/dishw/dishw-main.php3](http://www.ceeformt.org/resid/seha/dishw/dishw-main.php3)

<sup>13</sup> 16 CFR Part 305. [www.ftc.gov/os/2002/05/16cfrpart305.htm](http://www.ftc.gov/os/2002/05/16cfrpart305.htm).

**Table 4-2: Dishwasher Energy Efficiency Standards and Program Requirements**

	1994 Efficiency Rating (EF)	January 1, 2001 Standard
NAECA	0.46	0.46
ENERGY STAR	0.52	0.58
Percent Improved	13.0%	25.0%
California Standards	0.46	0.46

Does not apply to compact dishwashers.

#### 4.5 Market Share of ENERGY STAR Qualified Dishwashers

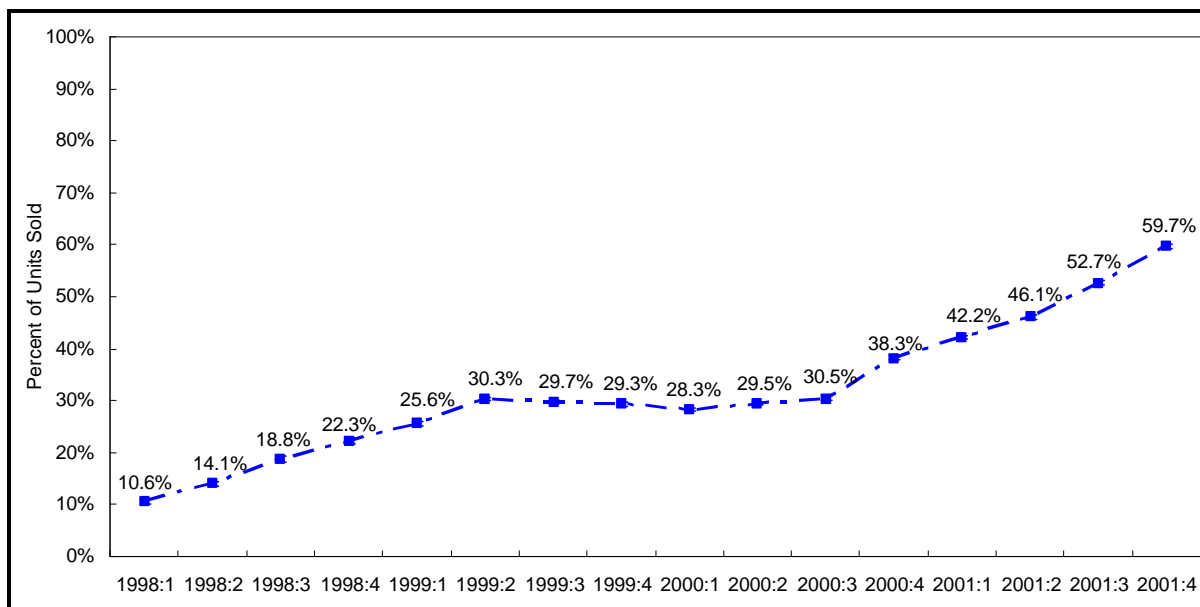
Figure 4-1 and Table 4-3 present the percentage of ENERGY STAR qualified dishwashers sold in California during the first quarter of 1998 through the fourth quarter of 2001. Shares of ENERGY STAR dishwasher sales in 1999 and 2000 were fairly level. There is a significant increase in late 2000 and throughout 2001. This is mainly driven by the large increase in the share of ENERGY STAR qualified dishwashers sold by the independent appliance retailers.

Additionally, the increase likely reflects the impact of the energy crisis in California, as well as manufacturers preparing for the testing procedure change (in 2002) early, and therefore taking advantage of the ability to have more of their models qualify for the higher ENERGY STAR specification during 2001.

Table 4-4 reports the percent of ENERGY STAR compliant dishwashers sold in each utility service area annually and by quarter.



**Figure 4-1: Dishwasher Sales, Percent of ENERGY STAR Qualified Units**



1. Error bands for the 90% confidence interval.
2. Data from 1998 reflect national chain D&R data only. Because of this and the adjustments made to better estimate 1998 results, the standard errors are not listed.

**Table 4-3: Dishwasher Sales, Percent of ENERGY STAR Qualified Units (Statewide)**

Year	Percent of ENERGY STAR Qualified Dishwashers				
	Annual	Q1	Q2	Q3	Q4
1998	<b>16.91%</b> (-) n = 66,161	<b>10.69%</b> (-) n = 15,478	<b>14.23%</b> (-) n = 15,012	<b>18.91%</b> (-) n = 16,775	<b>22.43%</b> (-) n = 18,896
1999	<b>28.76%</b> (0.001) n = 194,979	<b>25.58%</b> (0.0019) n = 47,633	<b>30.34%</b> (0.0021) n = 47,098	<b>29.74%</b> (0.0021) n = 46,689	<b>29.35%</b> (0.002) n = 53,559
2000	<b>31.64%</b> (.0010) n=214,069	<b>28.29%</b> (.0018) n=60,727	<b>29.54%</b> (.0019) n=56,656	<b>30.48%</b> (.0022) n=44,899	<b>38.28%</b> (.0021) n=51,787
2001	<b>47.71%</b> (0.0012) n = 184,187	<b>37.65%</b> (0.0023) n = 44,730	<b>42.67%</b> (0.0024) n = 42,940	<b>50.19%</b> (0.0024) n = 44,784	<b>58.38%</b> (0.0022) n = 51,733

1. Standard errors in parentheses.
2. Data from 1998 reflect national chain D&R data only. Because of this and the adjustments made to better estimate 1998 results, the standard errors are not listed.

**Table 4-4: Dishwasher Sales, Percent of ENERGY STAR Qualified Units by Utility Service Area**

Utility	Year	Percent of ENERGY STAR Qualified Dishwashers <sup>1,2</sup>				
		Annual	Q1	Q2	Q3	Q4
PG&E	1998	<b>12.00%</b> (-) n =24,900	<b>7.62%</b> (-) n =5,671	<b>10.76%</b> (-) n =5,626	<b>13.54%</b> (-) n =6,522	<b>15.10%</b> (-) n =7,081
	1999	<b>16.19%</b> (0.0014) n =69,128	<b>11.57%</b> (0.0024) n =17,005	<b>13.26%</b> (0.0026) n =16,425	<b>18.09%</b> (0.003) n =16,172	<b>21.11%</b> (0.0029) n =19,526
	2000	<b>30.73%</b> (0.0015) n =94,925	<b>28.26%</b> (0.0028) n =25,748	<b>28.88%</b> (0.0029) n =24,730	<b>31.56%</b> (0.0032) n =20,976	<b>34.35%</b> (0.0031) n =23,471
	2001	<b>53.07%</b> (0.0017) n = 91,396	<b>42.98%</b> (0.0033) n = 22,532	<b>50.82%</b> (0.0034) n = 21,389	<b>57.82%</b> (0.0033) n = 22,475	<b>60.17%</b> (0.0031) n = 25,000
SCE	1998	<b>20.44%</b> (-) n =20,197	<b>12.01%</b> (-) n =4,893	<b>15.40%</b> (-) n =4,596	<b>22.14%</b> (-) n =4,940	<b>30.15%</b> (-) n =5,768
	1999	<b>29.6%</b> (0.0017) n =68,633	<b>26.23%</b> (0.0034) n =16,560	<b>32.47%</b> (0.0036) n =17,027	<b>30.78%</b> (0.0036) n =16,882	<b>28.9%</b> (0.0034) n =18,164
	2000	<b>32.16%</b> (0.0018) n =65,649	<b>28.45%</b> (0.0032) n =19,451	<b>30.38%</b> (0.0035) n =17,358	<b>29.95%</b> (0.0040) n =13,271	<b>39.90%</b> (0.0039) n =15,669
	2001	<b>47.52%</b> (0.0022) n = 51,430	<b>34.55%</b> (0.0043) n = 12,227	<b>37.34%</b> (0.0044) n = 11,849	<b>49.09%</b> (0.0045) n = 12,273	<b>63.24%</b> (0.0039) n = 15,081
SDG&E	1998	<b>15.41%</b> (-) n =6,510	<b>12.02%</b> (-) n =1,466	<b>14.29%</b> (-) n =1,487	<b>17.64%</b> (-) n =1,724	<b>17.30%</b> (-) n =1,833
	1999	<b>30.04%</b> (0.0032) n =20,564	<b>29.29%</b> (0.0064) n =4,995	<b>31.18%</b> (0.0066) n =4,868	<b>29.15%</b> (0.0065) n =4,872	<b>30.55%</b> (0.006) n =5,829
	2000	<b>36.28%</b> (0.0035) n =18,996	<b>30.74%</b> (0.0061) n =5,674	<b>32.54%</b> (0.0066) n =5,070	<b>33.42%</b> (0.0076) n =3,831	<b>47.79%</b> (0.0075) n =4,421
	2001	<b>25.55%</b> (0.0036) n = 14,803	<b>20.72%</b> (0.0068) n = 3,596	<b>24.33%</b> (0.0073) n = 3,485	<b>25.14%</b> (0.0073) n = 3,493	<b>31.02%</b> (0.0071) n = 4,229
Other	1998	<b>12.92%</b> (-) n =14,554	<b>8.18%</b> (-) n = 3,448	<b>11.77%</b> (-) n =3,303	<b>14.76%</b> (-) n =3,589	<b>16.15%</b> (-) n =4,214
	1999	<b>27.68%</b> (0.0023) n =36,654	<b>24.10%</b> (0.0045) n =9,073	<b>27.92%</b> (0.0048) n =8,778	<b>28.28%</b> (0.0048) n =8,763	<b>29.35%</b> (0.0045) n =10,040
	2000	<b>29.72%</b> (0.0025) n =34,399	<b>26.47%</b> (0.0044) n =9,854	<b>27.41%</b> (0.0046) n =9,898	<b>27.18%</b> (0.0054) n =6,821	<b>37.80%</b> (0.0053) n =8,226
	2001	<b>39.22%</b> (0.0030) n = 26,558	<b>34.48%</b> (0.0060) n = 6,375	<b>38.91%</b> (0.0062) n = 6,217	<b>38.11%</b> (0.0060) n = 6,543	<b>45.00%</b> (0.0058) n = 7,423

1 Standard errors in parentheses.

2 "Other" includes municipal utilities such as LADWP, LMUD, PP&L, SMUD, and others.

3 Data from 1998 reflect national chain D&R data only. Because of this and the adjustments made to better estimate 1998 results, the standard errors are not listed.

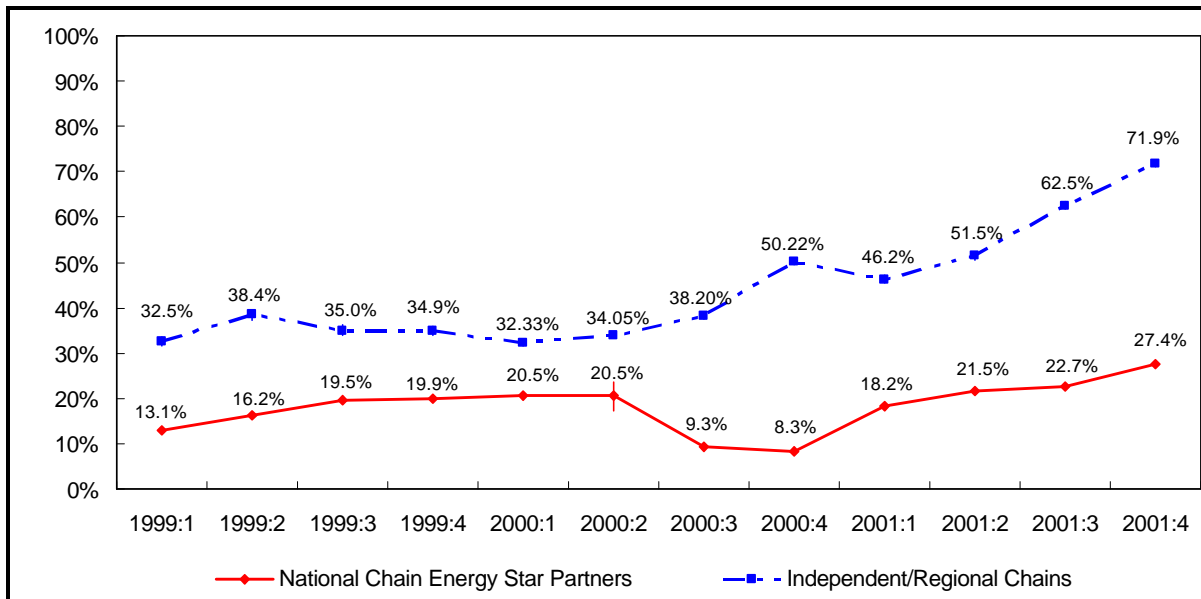
## 4.6 Analysis by Market Channel

### Comparison of National Chain and Independent Appliance Retailers

Figure 4-2 and Table 4-5 compare the shares of ENERGY STAR qualified dishwashers sold by national chain ENERGY STAR partners to sales by independently owned stores and regional chains. As shown, the share sold by the national chains continues to be considerably lower than the share sold by the independent appliance retailers. The share sold by national chain ENERGY STAR partners shows a decrease in the last two quarters of 2000,<sup>14</sup> from which it subsequently recovered. Throughout 2001, the national chain appliance retailers showed a trend of an increasing share of ENERGY STAR dishwashers being sold. Their historical data ranges from 13.1% at the beginning of 1999 to 27.4% by the last quarter of 2001.

The independents showed a slight weakening in their percentage of ENERGY STAR sales until one of the national chains appliance retailers exited the market. At that point, the share of ENERGY STAR qualified dishwashers sold by the independent retailers soared. At the end of 2001, over two-thirds of all the dishwashers sold by independent appliance retailers in California met the higher efficiency standards of the ENERGY STAR program. Figure 4-2 also illustrates this increase in independent ENERGY STAR qualified dishwasher sales.

**Figure 4-2: Dishwasher Sales, Percent of ENERGY STAR Qualified Units by Retailer Type**



Error bands for the 90% confidence interval.

<sup>14</sup> The significant decrease at the end of 2000 is attributed to partial data from D&R. D&R had partial data from a national retailer who carried an extensive line of dishwashers. This retailer accounted for a high percentage of ENERGY STAR sales. These particular sales data were available for the first two quarters of the year, but not for the last two. Therefore, when looking at Figure 4-2, one sees a sharp decline of ENERGY STAR dishwasher sales for the national chains during the last two quarters of 2000.

**Table 4-5: Dishwasher Sales, Percent of ENERGY STAR Qualified Units by Market Channel**

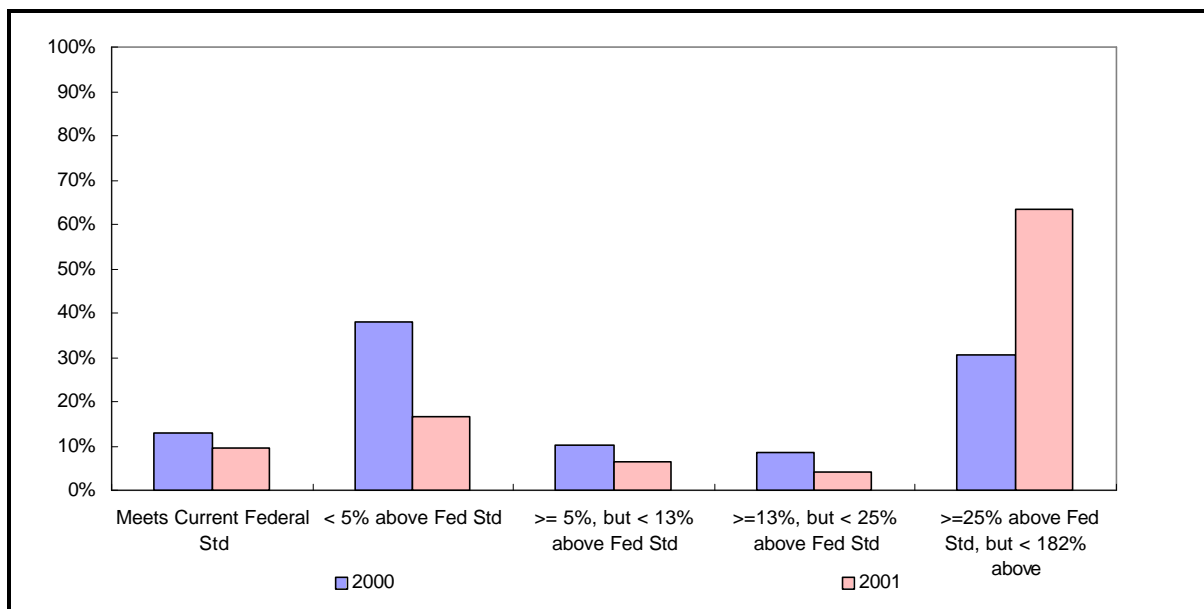
Year/Quarter	Market Channel	
	National Chain ENERGY STAR Partners	Independent and Regional Chains
1999:1	13.06% (0.0014) n =69,128	32.5% (0.0066) n =5,067
1999:2	16.17% (0.0018) n =42,227	38.42% (0.0069) n =4,871
1999:3	19.48% (0.0019) n=41,425	35.05% (0.0066) n =5,264
1999:4	19.94% (0.0018) n =48,184	34.88% (0.0065) n =5,375
2000:1	20.45% (0.0019) n =45,309	32.33% (0.0038) n =15,418
2000:2	20.50% (0.0020) n =41,854	34.05% (0.0039) n =14,802
2000:3	9.34% (0.0017) n =30,180	38.20% (0.0040) n =14,719
2000:4	8.34% (0.0015) n =35,928	50.22% (0.0040) n =15,859
2001:1	18.20% (0.0021) n = 35,045	46.20% (0.0051) n = 9,685
2001:2	24.53% (0.0022) n = 33,560	51.46% (0.0052) n = 9,380
2001:3	22.66% (0.0022) n = 35,237	62.48% (0.0050) n = 9,547
2001:4	27.43% (0.0022) n = 41,079	71.86% (0.0044) n = 10,654

**Detailed, Statewide Independent Appliance Retailer Analysis**

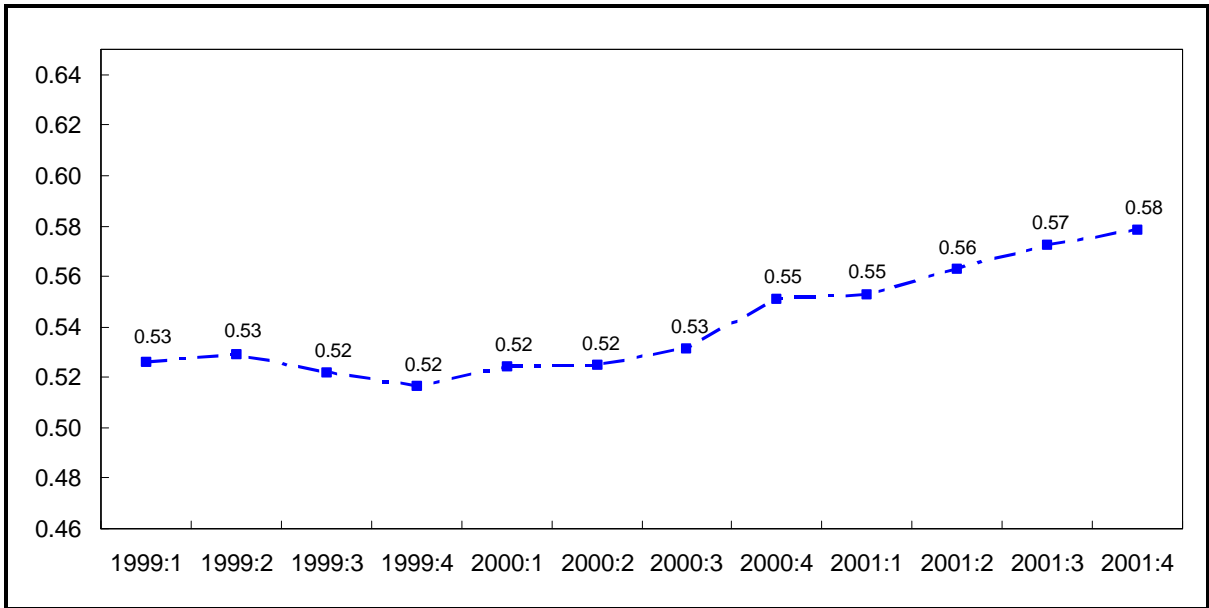
The detailed data shared by independent retailers in 2000 and 2001 has also enabled sales to be examined in groupings of efficiency levels. This is shown in Figure 4-3. Note that the ENERGY STAR threshold was 13% above the federal standard in 2000, and was 25% above the federal standard for 2001. In order to best illustrate the share of sales by efficiency category, in a way applicable to both 2000 and 2001, the efficiency buckets have been changed to reflect the change in the ENERGY STAR standard as a cutoff point between categories. Again, almost half of the dishwashers sold by independents in 2000 were ENERGY STAR qualified. This graph also illustrates the dramatic increase in ENERGY STAR sales by the independent appliance retailers in California. In particular, it is interesting to note that the ENERGY STAR qualified units sold by independents in 2000 tended to be the higher efficiency units within the ENERGY STAR dishwasher designation. Another point of interest is the dramatic shift in 2001. Independent stores have virtually shifted their sales of units that met or barely exceeded the federal standard during 2000 to high efficiency ENERGY STAR units in 2001. Please keep in mind that 25% above the federal standard (ENERGY STAR threshold) entails that these units have an EF of .58 or higher

Additionally, Figure 4-4 illustrates the average EF of dishwashers sold by independent appliance retailers throughout California in 2000 and 2001. Please keep in mind that this is a new type of analysis not previously contained in any RMST reports and was possible due to the more detailed data provided by the independent appliance retailers. It illustrates the average estimated EF of all dishwashers sold by independent appliance retailers throughout the state.

**Figure 4-3: Percent of 2000 Independent Dishwasher Sales by Efficiency Level**



**Figure 4-4: Average Energy Factor for Dishwashers Sold By Independent Appliance Retailers**





# 5

## Refrigerators

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### 5.1 Overview

This section discusses total refrigerator unit sales, characteristics of available models, efficiency standards, market share of ENERGY STAR qualified units, and analysis of ENERGY STAR sales by market channel.

### 5.2 Total Unit Sales

Table 5-1 presents estimates of annual unit sales of refrigerators used in the development of market shares in this report. The Association of Home Appliance Manufacturers (AHAM) was the main source of information for these estimates.

**Table 5-1: Estimate of Total Refrigerator Units Sales in California\***

Measure	1998	1999	2000	2001
Refrigerators	949,400	975,700	1,025,300	1,150,600

\*AHAM.

### 5.3 Characteristics of Available Models

The AHAM Directory of Certified Refrigerators and Freezers was used to examine energy use attributes of available refrigerator models. Figure 5-1 and Figure 5-2 characterize refrigerators available in the marketplace in terms of their energy use characteristics. Due to the change in federal energy use standard for refrigerators, which took effect on July 1, 2001 and is explained in detail in Section 5.4, the project team has illustrated its effect on the characteristics of available refrigerator models.

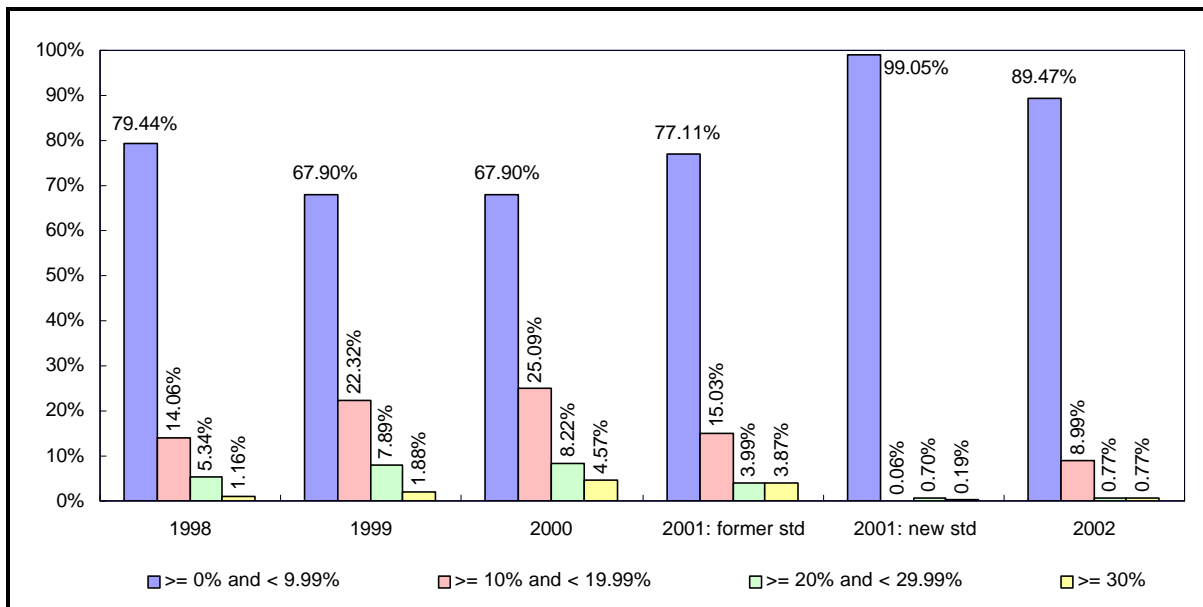
The model availability analysis has been refigured for this report to reflect availability trends in a more informative manner. Figure 5-1 illustrates refrigerator models from 1998 through 2002 in categories by percentages above standard. For 2001, the graph illustrates the annual distribution of units by both federal standards applicable in that year. The decrease in high



efficiency models available in late 2001 and 2002 is most likely due to the federal standard change.

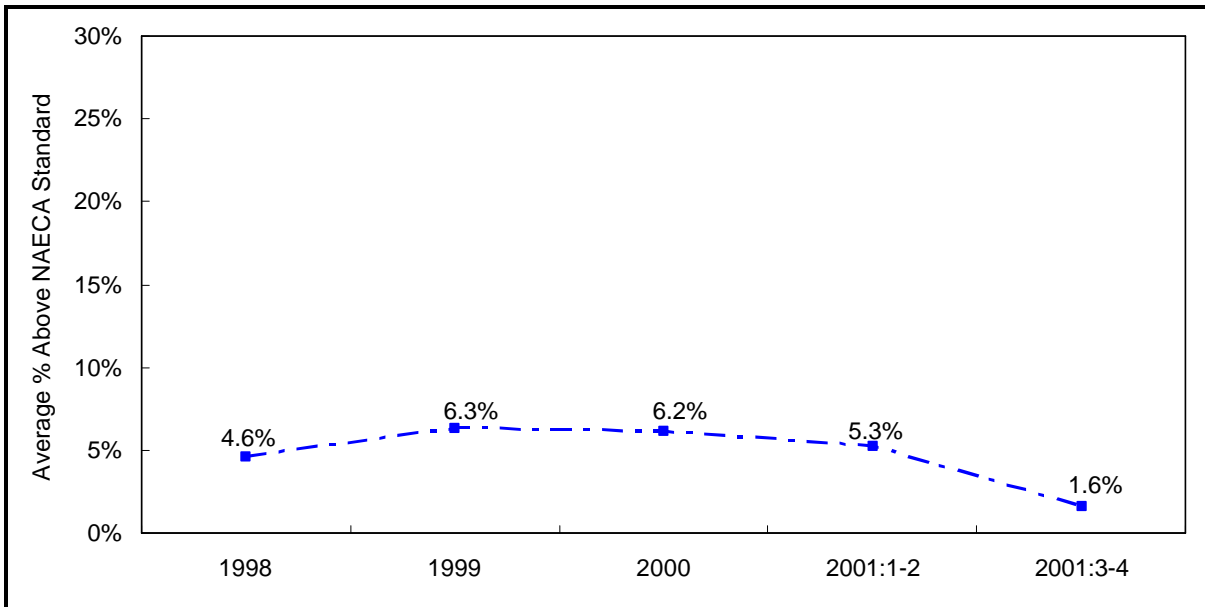
Figure 5-2 provides a time trend of the average percent above standard across all available refrigerator models. The decrease in the second half of the year corresponds to the increase in the federal energy use standard that took effect on July 1, 2001. Once again, due to the change in the standard, these units have higher average efficiencies. However, the average percent of available units, in comparison to the federal standard, is lower because of the higher efficiency requirements. Therefore, fewer units have a large percent above standard in the two quarters following the effective date of the new federal energy use standard. The project team expects this percentage to rebound to approximately the previous levels.

**Figure 5-1: Refrigerator Model Availability by Percent Above Standard**



Source: AHAM

**Figure 5-2: Available Refrigerator Models, Average Percent Above Standard**



Source: AHAM

## 5.4 Refrigerator Efficiency Standards

Refrigerator energy use ratings are expressed in terms of expected annual energy use (kWh) under “typical conditions.” Federal energy use standards vary by refrigerator configuration and are a function of the unit’s adjusted volume (AV). Table 5-2 includes formulas for computing the federally mandated maximum energy use requirements for each refrigerator configuration type. This table also shows the energy reductions required for a refrigerator to qualify for the ENERGY STAR label (at least 20% less kWh) and the Super Efficient Home Appliance (SEHA) initiative.

Updated federal energy use standards for refrigerators became effective on July 1, 2001.<sup>15</sup> Both the former and current formulas for computing maximum energy usage are included in Table 5-2. The required energy use reductions from the former standard to the current standard vary by configuration, ranging between 27% and 32%. In January 2001, AHAM's Directory of Certified Refrigerators and Freezers contained 1,217 refrigerator/freezer models with automatic defrost. Only 25 of these met the new standard. All of the aforementioned models will decrease their energy consumption, on average, 25% annually under the new National Appliance Energy Consumption Act (NAECA). Additionally, the new 2001 ENERGY STAR qualification (effect January 1, 2001) is that refrigerators use 10% less energy than the new federal standard. AHAM's Directory of Certified Refrigerators and Freezers for July 2001 showed that 515 of the 1094 refrigerator/freezer models with automatic defrost complied with the new federal standard. Additionally, the California Energy Commission amended their appliance efficiency regulations in January 2002 to reflect the increase in the federal energy use standards. The Commission did not surpass the federal requirements for appliance efficiency standards. All these standards are shown below in Table 5-2.

**Table 5-2: Refrigerator Energy Use Standards and Program Requirements**

	Standard Prior to July 1, 2001 (Max. kWh)	Current Standard
<b>Federal Standard</b>		
Manual defrost	13.5*AV+299	8.82*AV+248.4
Partial defrost	10.4*AV+398	8.82*AV+248.4
Automatic defrost, top mount without TTD	16.0*AV+355	9.80*AV+276.0
Automatic defrost, side mount without TTD	11.8*AV+501	4.91*AV+507.5
Automatic defrost, bottom mount without TTD	16.5*AV+367	4.40*AV+459.0
Automatic defrost, top mount with TTD	17.6*AV+391	10.2*AV+356.0
Automatic defrost, side mount with TTD	16.3*AV+527	10.1*AV+406.0
<b>ENERGY STAR Qualification</b>	20% less kWh	10% less kWh (as of Jan. 1, 2001)
<b>SEHA Tier 1 Qualification</b>	30% less kWh	n/a
<b>SEHA Tier 2 Qualification</b>	37% less kWh	n/a
<b>CALIFORNIA STANDARDS</b>	Identical to Federal Std	Identical to Federal Std

TTD = through-the-door ice dispenser.

AV = Adjusted Volume = Fresh Volume + (1.63\*Freezer Volume).

<sup>15</sup> The new 2001 federal standard for refrigerators can be found in the following: Energy Conservation Program for Consumer Products: Energy Conservation Standards for Refrigerators, Refrigerator-Freezers and Freezers. *Federal Register*. Vol. 62, No. 81. April 28, 1997.

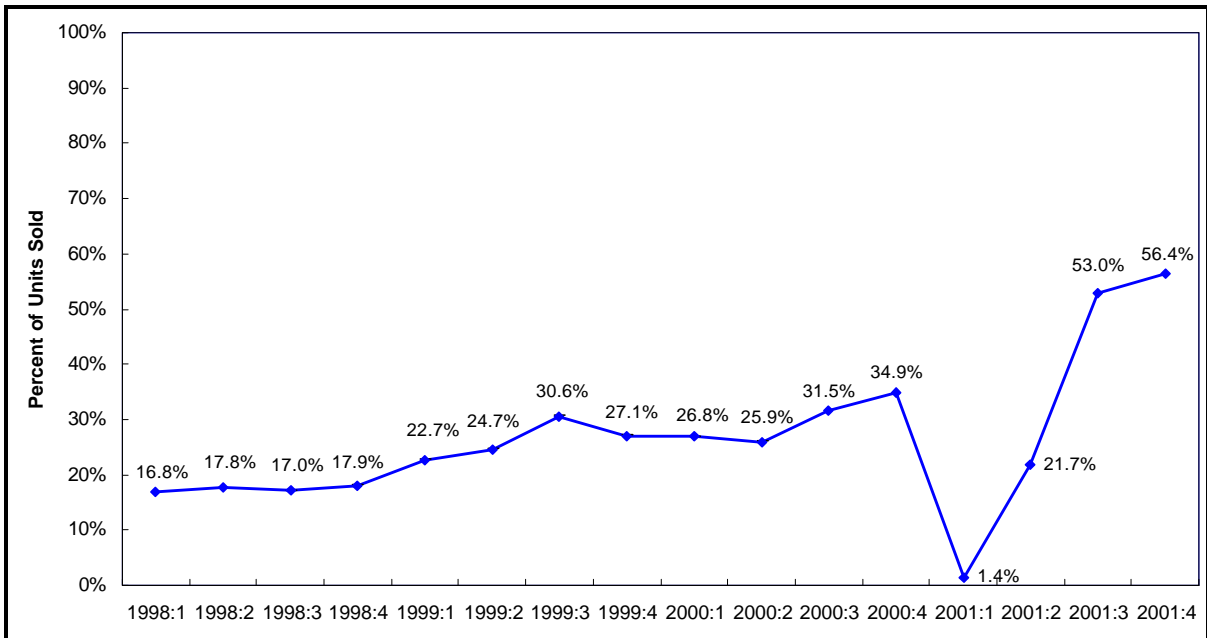
### 5.5 Market Share of ENERGY STAR Qualified Refrigerators

Figure 5-2 and Table 5-3 present the percentage of ENERGY STAR qualified refrigerators sold in California during the first quarter of 1998 through the fourth quarter of 2001. As shown, the percent of ENERGY STAR refrigerators remained relatively steady throughout 1999 and 2000. Then, in late 2000, ENERGY STAR refrigerators began to gain market share.

Since Figure 5-3 deals with the percentage of ENERGY STAR qualified units, it is important to understand that the sudden decrease to almost 0% during the first quarter of 2001 is attributable to the change in ENERGY STAR specifications. During the first quarter of the year, no units qualified for the new, higher efficiency ENERGY STAR threshold. Therefore, there could not be any ENERGY STAR refrigerator market share during the first quarter of 2001. In turn, the spike in share from the first to the second quarter and then again from the second to the third quarter, is due to manufacturers preparing for the upcoming federal standard change. As part of this preparation, ENERGY STAR qualified refrigerator units became available. As this occurred, these units began to regain market share.

Table 5-3 and Table 5-4 report the percentage of ENERGY STAR compliant refrigerators sold statewide as well as in each utility service area, both annually and by quarter.

**Figure 5-3: Refrigerator Sales, Percent of ENERGY STAR Qualified Units**



- 1 Error bands for the 90% confidence interval.
- 2 Data from 1998 reflect national chain D&R data only.

**Table 5-3: Refrigerator Sales, Percent of ENERGY STAR Qualified Units, Statewide**

Year	Percent of ENERGY STAR Qualified Refrigerators				
	Annual	Q1	Q2	Q3	Q4
1998	<b>17.35%</b> (-) n = 230,171	<b>16.81%</b> (-) n = 46,004	<b>17.77%</b> (-) n = 55,309	<b>17.03%</b> (-) n = 76,525	<b>17.93%</b> (-) n = 52,333
1999	<b>26.49%</b> (0.0006) n = 473,882	<b>22.65%</b> (0.0013) n = 110,181	<b>24.66%</b> (0.0012) n = 121,250	<b>30.55%</b> (0.0013) n = 130,514	<b>27.09%</b> (0.0013) n = 111,937
2000	<b>29.78%</b> (0.0007) n = 490,296	<b>26.84%</b> (0.0013) n = 115,865	<b>25.93%</b> (0.0012) n = 145,173	<b>31.49%</b> (0.0013) n = 122,865	<b>34.94%</b> (0.0015) n = 106,393
2001	<b>35.39%</b> (0.0007) n = 522,010	<b>0.01%</b> (0.0004) n = 104,765	<b>21.71%</b> (0.0010) n = 146,412	<b>52.99%</b> (0.0013) n = 148,463	<b>56.41%</b> (0.0014) n = 122,370

1 Standard errors in parentheses.

2 Data from 1998 reflect national chain D&R data only.

**Table 5-4: Refrigerator Sales, Percent of ENERGY STAR Qualified Units by Utility Service Area**

Utility	Year	Percent of ENERGY STAR Qualified Refrigerators <sup>1,2</sup>				
		Annual	Q1	Q2	Q3	Q4
PG&E	1998	<b>17.37%</b> (-) n =90,493	<b>17.88%</b> (-) n = 19,547	<b>19.13%</b> (-) n =21,576	<b>16.29%</b> (-) n =28,722	<b>16.53%</b> (-) n =20,648
	1999	<b>28.43%</b> (0.0011) n =157,639	<b>23.36%</b> (0.0021) n =38,313	<b>24.60%</b> (0.0021) n =40,307	<b>31.46%</b> (0.0023) n =41,424	<b>34.38%</b> (0.0025) n =37,595
	2000	<b>34.97%</b> (0.0011) n =179,113	<b>34.30%</b> (0.0023) n =42,475	<b>31.14%</b> (0.0020) n =52,914	<b>34.57%</b> (0.0023) n =43,030	<b>40.57%</b> (0.0024) n =40,694
	2001	<b>35.50%</b> (0.0011) n = 206,711	<b>0.02%</b> (0.0006) n = 43,728	<b>26.75%</b> (0.0018) n = 58,424	<b>54.55%</b> (0.0021) n = 57,738	<b>53.94%</b> (0.0023) n = 46,821
SCE	1998	<b>16.17%</b> (-) n =69,987	<b>14.16%</b> (-) n =13,179	<b>15.81%</b> (-) n =17,023	<b>16.25%</b> (-) n =24,049	<b>18.13%</b> (-) n =15,736
	1999	<b>25.39%</b> (0.0011) n =168,527	<b>21.47%</b> (0.0021) n =37,392	<b>23.68%</b> (0.0020) n =43,460	<b>30.44%</b> (0.0021) n =48,231	<b>24.62%</b> (0.0022) n =39,444
	2000	<b>24.59%</b> (0.0011) n =165,926	<b>19.99%</b> (0.0020) n =39,486	<b>20.44%</b> (0.0018) n =49,416	<b>27.98%</b> (0.0022) n =42,985	<b>29.14%</b> (0.0024) n =34,039
	2001	<b>42.80%</b> (0.0012) n = 174,894	<b>0.01%</b> (0.0006) n = 32,063	<b>20.38%</b> (0.0018) n = 49,836	<b>63.69%</b> (0.0021) n = 50,445	<b>68.12%</b> (0.0023) n = 42,550
SDG&E	1998	<b>23.10%</b> (-) n =17,969	<b>25.41%</b> (-) n =2,980	<b>21.12%</b> (-) n =4,484	<b>22.83%</b> (-) n =6,434	<b>24.00%</b> (-) n =4,071
	1999	<b>29.80%</b> (0.0023) n =39,695	<b>28.53%</b> (0.0046) n =9,483	<b>29.01%</b> (0.0045) n =10,237	<b>32.16%</b> (0.0046) n =10,417	<b>28.99%</b> (0.0046) n =9,558
	2000	<b>37.37%</b> (0.0024) n =39,102	<b>29.53%</b> (0.0048) n =9,036	<b>29.99%</b> (0.0044) n =10,749	<b>41.96%</b> (0.0047) n =10,671	<b>44.66%</b> (0.0053) n =8,646
	2001	<b>28.99%</b> (0.0022) n = 43,135	<b>0.01%</b> (0.0010) n = 9,221	<b>23.29%</b> (0.0039) n = 11,829	<b>40.15%</b> (0.0045) n = 12,045	<b>48.10%</b> (0.0050) n = 10,040
Other	1998	<b>13.90%</b> (-) n =51,722	<b>13.00%</b> (-) n = 10,298	<b>13.94%</b> (-) n =12,226	<b>13.87%</b> (-) n =17,320	<b>14.69%</b> (-) n =11,878
	1999	<b>21.69%</b> (0.0013) n =108,021	<b>18.56%</b> (0.0025) n =24,993	<b>20.11%</b> (0.0024) n =27,246	<b>22.82%</b> (0.0024) n =30,442	<b>24.72%</b> (0.0027) n =25,340
	2000	<b>25.03%</b> (0.0013) n =106,155	<b>22.70%</b> (0.0026) n =24,868	<b>23.19%</b> (0.0024) n =32,094	<b>26.63%</b> (0.0027) n =26,179	<b>27.89%</b> (0.0029) n =23,014
	2001	<b>18.95%</b> (0.0013) n = 97,270	<b>0.01%</b> (0.0008) n = 19,753	<b>12.02%</b> (0.0020) n = 26,323	<b>26.23%</b> (0.0026) n = 28,235	<b>33.36%</b> (0.0031) n = 22,959

1 Standard errors in parentheses.

2 "Other" includes municipal utilities, such as LADWP, LMUD, PP&L, SMUD, and others.

3 Data from 1998 reflect national chain D&R data only.

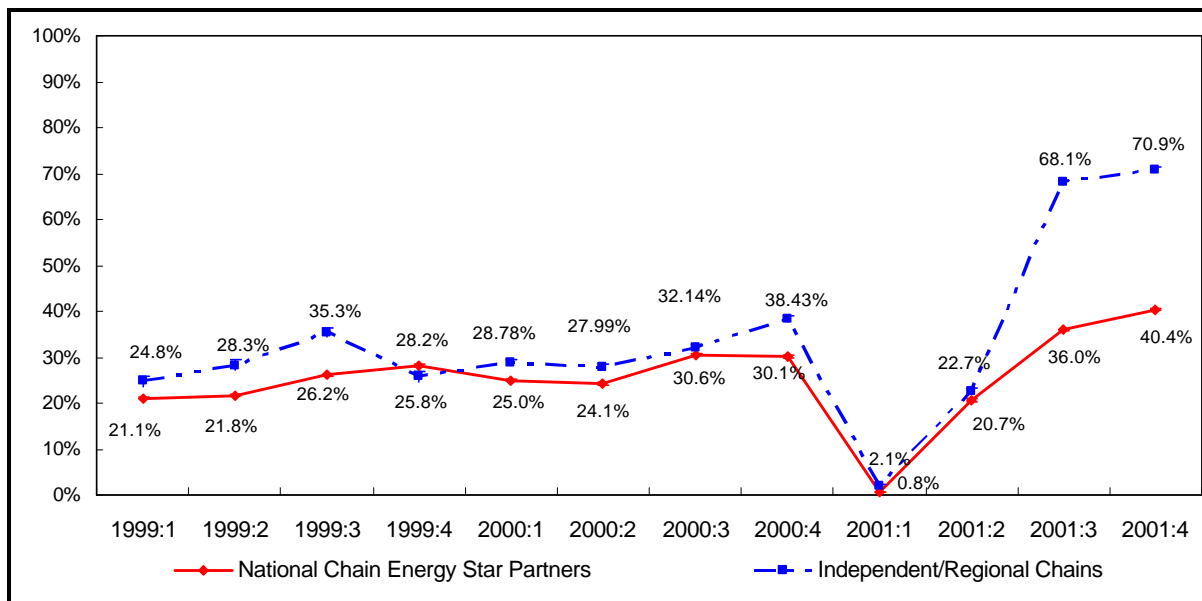
## 5.6 Analysis by Market Channel

### Comparison of National Chain and Independent Appliance Retailers

Figure 5-4 and Table 5-5 compare the shares of ENERGY STAR qualified refrigerators sold by national chain ENERGY STAR partners to sales by independently owned stores and regional chains. With the exception of the fourth quarter of 1999, the share sold by the national chains is lower than the share sold by the independent appliance retailers in California. However, the 1999 independent sample was much smaller than 2000 and 2001. This may have impacted the results for that quarter.

Once again, the decrease seen in Figure 5-3 reflects again in Figure 5-4. This simply reiterates that the lack of ENERGY STAR qualified refrigerators affected the market share of these units for both national and independent appliance retailers.

**Figure 5-4: Refrigerator Sales, Percent of ENERGY STAR Qualified Units by Market Channel**



Error bands for the 90% confidence interval.

**Table 5-5: Refrigerator Sales, Percent of ENERGY STAR Qualified Units by Market Channel**

Year/Quarter	Market Channel	
	National Chain ENERGY STAR Partners	Independent and Regional Chains
1999:1	21.08% (0.0012) n=106,212	24.83% (0.0069) n=3,969
1999:2	21.79% (0.0012) n=116,872	28.32% (0.0068) n=4,378
1999:3	26.16% (0.0012) n=124,803	35.31% (0.0063) n=5,711
1999:4	28.24% (0.0014) n=107,273	25.81% (0.0064) n=4,664
2000:1	25.03% (0.0014) n=100,864	28.78% (0.0037) n=15,001
2000:2	24.14% (0.0012) n=127,557	27.99% (0.0034) n=17,616
2000:3	30.62% (0.0014) n=101,910	32.14% (0.0032) n=20,955
2000:4	30.08% (0.0015) n=87,641	38.43% (0.0036) n=18,752
2001:1	0.01% (0.0003) n = 93,368	0.02% (0.0013) n = 11,397
2001:2	20.66% (0.0011) n = 128,000	22.69% (0.0031) n = 18,412
2001:3	35.98% (0.0013) n = 129,037	68.07% (0.0033) n = 19,426
2001:4	40.43% (0.0015) n = 106,864	70.93% (0.0036) n = 15,506

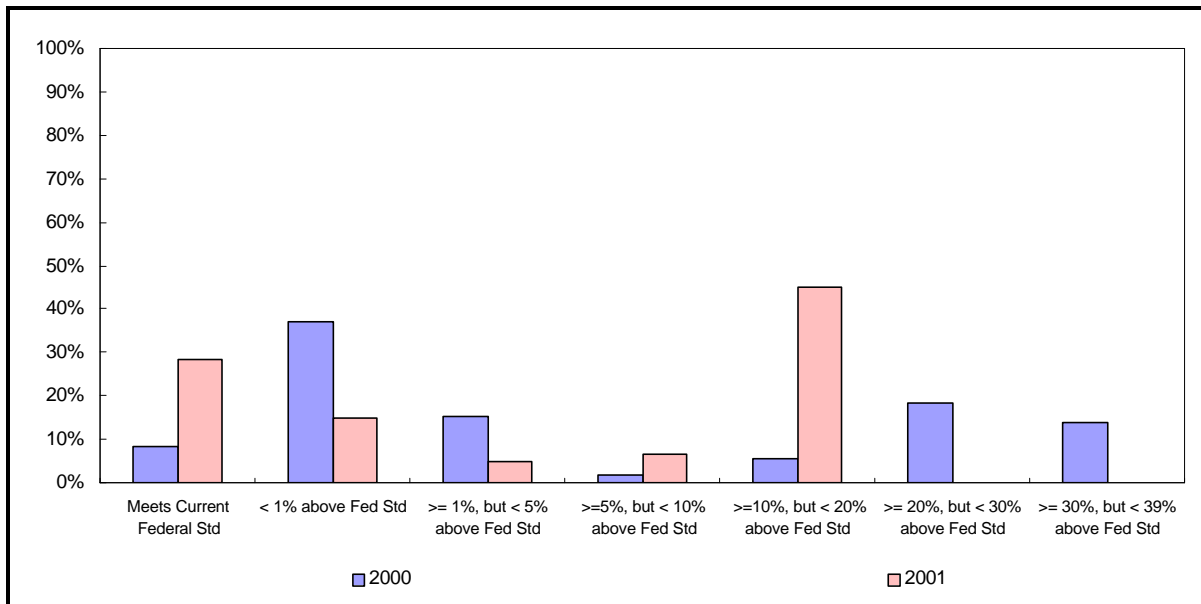
**Detailed, Statewide Independent Appliance Retailer Analysis**

The detail in this portion of the RMST is available due to the line item detail provided by the participating independent appliance retailers throughout California. As with the 2000 report, this report includes an analysis that examines independent sales by efficiency groupings. This was done to illustrate different sales trends within independent appliance retailers.



Figure 5-5 **Error! Reference source not found.** examines independent retail sales by groupings within efficiency levels. This analysis stems from the detailed data shared by independent retailers in 2000 and 2001. Please keep in mind that the ENERGY STAR threshold is 20% above the federal standard for 2000. Yet, the threshold is 10% above the July 1, 2001 standard for all of 2001. For consistency, this graph illustrates the entire 2001 independent sales categorized against the July 1, 2001 federal standard. During 2000, refrigerators with efficiencies of 20% and greater than the federal standard made up a fairly substantial share of the sales from independent appliance retailers. However, these extremely high efficiency categories are empty of sales in 2001 due to the standard change. Instead, note that almost 50% of sales in 2001 are in the 10% to 20% above standard mark. All these units are ENERGY STAR qualified.

**Figure 5-5: Independent Sales by Efficiency Level**



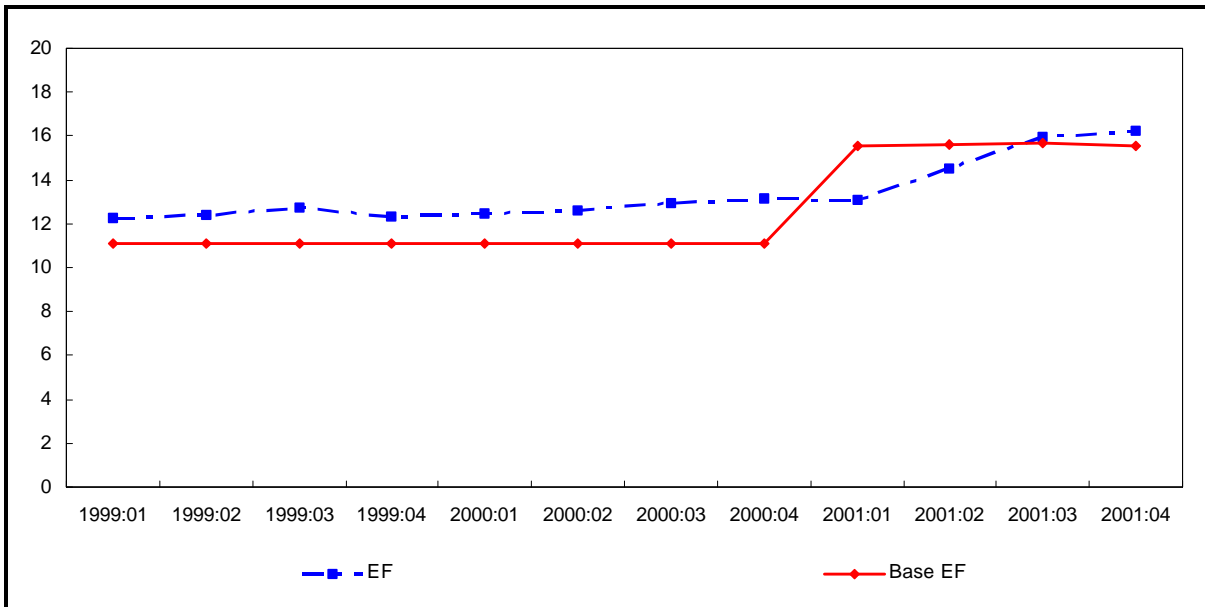
**Energy Factor Analysis**

These previously unpublished results show the average energy factor (EF) of refrigerators sold by independent appliance retailers throughout the State over time. This EF-level analysis is a more accurate measure of actual efficiency trends than the ENERGY STAR analysis. In particular, the circumstance with refrigerators in 2001 (the standards changes for the both ENERGY STAR and the NAECA) show the weakness of that analysis. This situation demonstrates the importance of detailed information, which will allow for EF analysis in tracking efforts. It will continue to be part of the fourth-year report for independent appliance retailers.

Figure 5-6 illustrates the average EF of refrigerators sold by independent appliance retailers throughout California in 2000 and 2001. Please keep in mind that this is a new type of analysis not previously contained in any RMST reports, and was possible because the independent appliance retailers provided more detailed data. It contains an EF line, which indicates the estimated EF of all the refrigerators sold by independent appliance retailers throughout the state. Additionally, it has a base EF line, which represents the base against which the ENERGY STAR standard is measured. It is not called the federal standard because during the first two quarters of 2001, the ENERGY STAR program measured their efficiency threshold against the upcoming federal standard, which did not take effect until July 1, 2001. Therefore, it is not equal to the federal standard during the first two quarters of 2001.

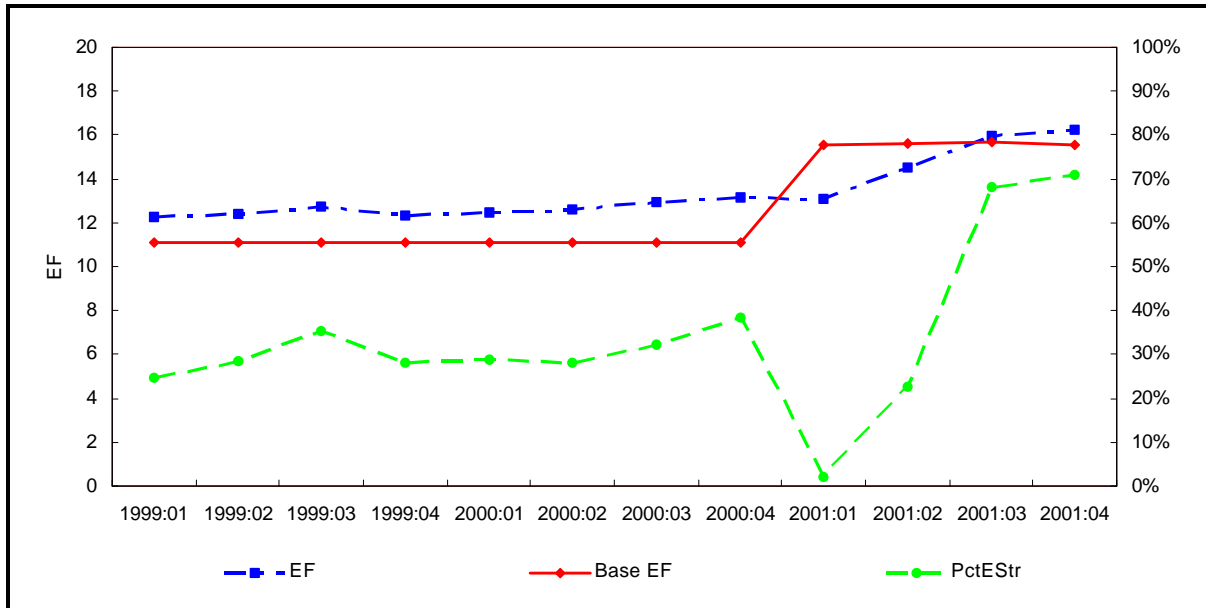
Figure 5-7 examines the relationship between the independent line in Figure 5-4 and the energy factors shown in Figure 5-6. It is of interest due to the clear visual representation of the increase in ENERGY STAR specifications for refrigerators, which led to the lack of ENERGY STAR qualified units sold in the first quarter, since no units met the July 1, 2001 federal standard at that time. As the average EF increases, until it surpasses the Base EF line in time to comply with the new federal standard, an increase in ENERGY STAR share is also seen.

**Figure 5-6: Average Energy Factor for Refrigerators Sold By Independent Appliance Retailers**



Base EF is the measure against which the ENERGY STAR standard is measured. In 1999 and 2000, this was the federal standard. In the first two quarters of 2001, the Base EF is actually the same as the federal standard that took effect on July 1, 2001.

**Figure 5-7: Comparison and Correlation of Independent Retailer Energy Factor Averages and ENERGY STAR Percentage Share for Refrigerators**



# 6

## Room Air Conditioners

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### 6.1 Overview

This section discusses total room air conditioner unit sales, characteristics of available models, efficiency standards, market share of ENERGY STAR qualified units, and analysis of ENERGY STAR sales by market channel.

### 6.2 Total Unit Sales

Table 6-1 presents estimates of annual unit sales of room air conditioners used in the development of market shares in this report. The project team uses manufacturer shipment data as the sales estimate. The Association of Home Appliance Manufacturers (AHAM) was the main source of information for these estimates. Clearly, the quantity of room air conditioning units shipped into California increased significantly. The project team could not determine the cause for the increase or whether these units were actually sold or returned to the manufacturers. Please note that upon examination of the sales data received, the project team was still uncertain if these additional units shipped into California were sold in the state during 2001. It is important to understand that the home improvement retail segment is continually obtaining a larger market share of the room air conditioner market. Currently, this market is not represented in either the national chain data or independent retailer sales data obtained for the RMST. It is possible that this retail segment sold the additional units. The project team will re-evaluate the units shipped in 2002 in order to determine if any clarifications need to be made at a later date with regard to room air conditioning units shipped into California during 2001.

Additionally, most of these room air conditioning units are sold during the second and third quarter of every year. All analysis beginning with this report will focus on annual averages, rather than the quarterly analysis previously reported.

**Table 6-1: Estimate of Total Room Air Conditioner Unit Sales in California\***

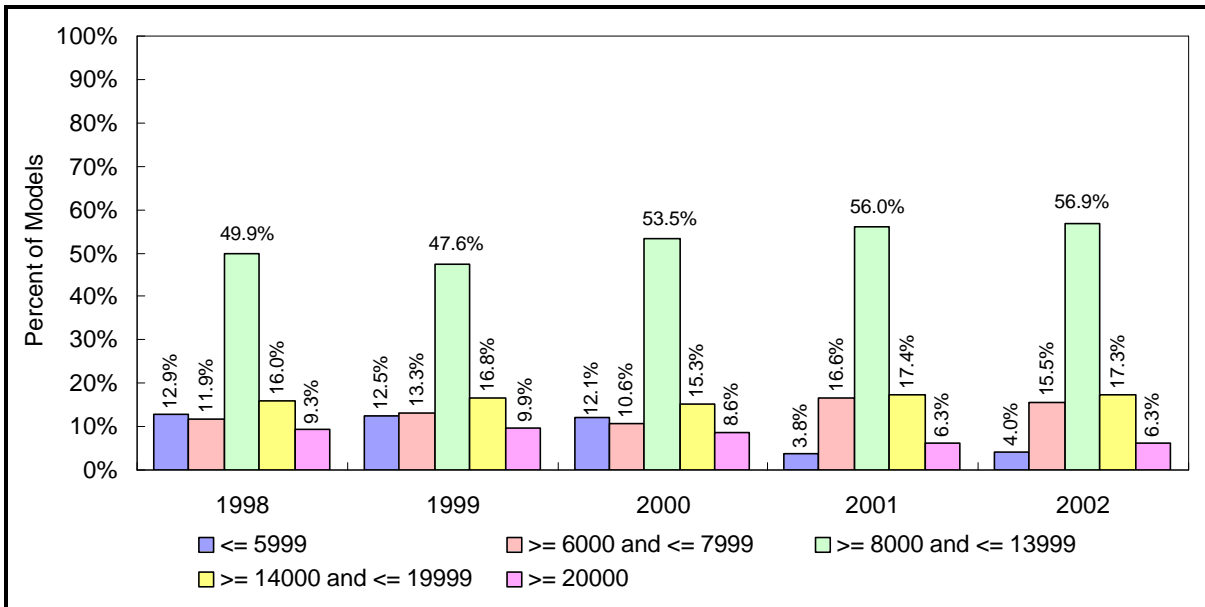
Measure	1998	1999	2000	2001
Room Air Conditioners	231,100	278,600	279,600	409,200

\* AHAM

### 6.3 Characteristics of Available Models

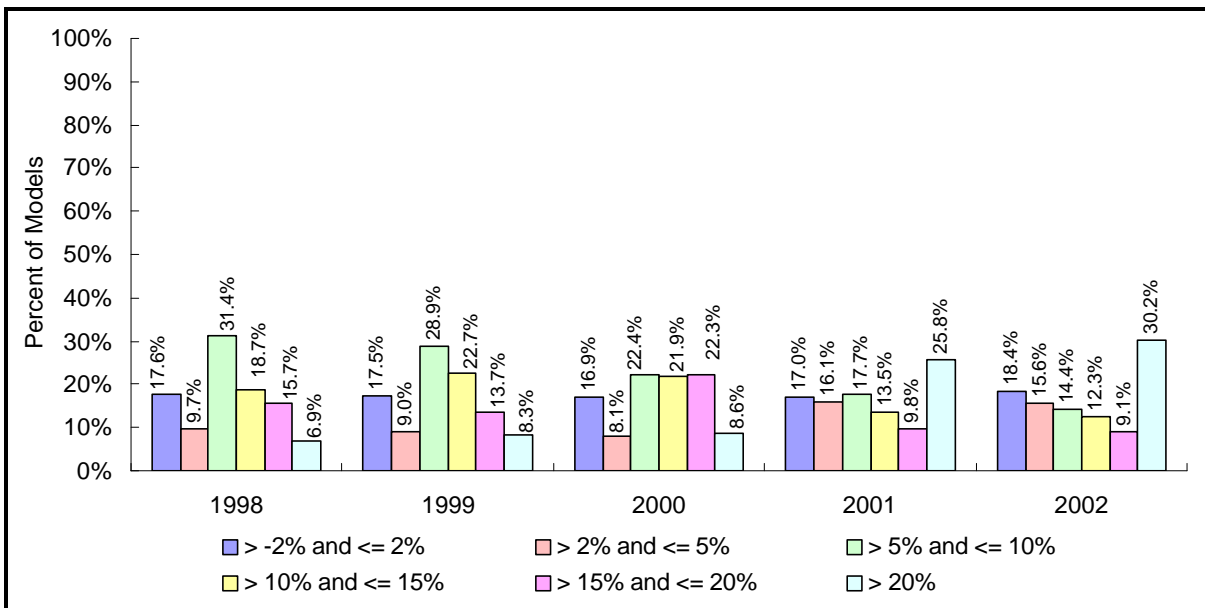
Figure 6-1 and Figure 6-2 characterize currently available room air conditioner models by output capacity and energy efficiency ratings relative to the federal standard. Figure 6-1 illustrates that approximately half of the room air conditioners available from 1998 through 2002 have rated output capacities between 8,000 and 14,000 Btuh. Figure 6-2 shows the percentages of available room air conditioners by efficiency levels, in comparison to the federal standard. Please note that 1998 through 2000 models have been compared to the federal energy use standard for room air conditioners. This standard ended on October 1, 2000. However, due to the low levels of room air conditioner sales in the fourth quarter of the year, the project team decided to analyze all 2000 units against the old standard. All 2001 and 2002 models have been analyzed in comparison to the current standard. The most significant change in the past two years has been the substantial increase in available models that are higher efficiency units. The most notable has been the increase in available units that are greater than 20% more efficient than the federal standard. In 1998, those units made up less than 7% of overall available units. In 2002, more than 30% of all available room air conditioners were in this higher efficiency category. These high efficiency units would all be eligible for the updated room air conditioner ENERGY STAR qualification.

**Figure 6-1: Available Room Air Conditioner Models by Output Capacity (Btuh)**



Source: California Energy Commission

**Figure 6-2: Room Air Conditioner Model Availability by Percent-Above-Standard**



Source: California Energy Commission

## **6.4 Room Air Conditioner Efficiency Standards**

The energy efficiency of room air conditioners is expressed as an Energy Efficiency Rating (EER), which varies by cooling capacity (Btuh) and configuration. Table 6-2 includes the minimum energy efficiency requirement for each configuration and size. Updated federal energy efficiency standards for room air conditioners took effective on October 1, 2000.

Both the former and current standards are included in the final column of Table 6-2. Room air conditioners must exceed the current standard by at least 10% to qualify for the ENERGY STAR label. Additionally, the California Energy Commission (Commission) amended their appliance efficiency regulations in January 2002 to reflect the increase in the federal energy use standards. The Commission did not surpass the federal requirements for appliance efficiency standards. All these standards are shown below in Table 6-2.

**Table 6-2: Energy Efficiency Standards for Room Air Conditioners**

Btuh	Configuration	Former Standard (EER prior to 10/1/00)	Current Standard	ENERGY STAR	California Standards
< 6,000	Without reverse cycle and with louvered sides	8.0	9.7	10.7	9.7
	Without reverse cycle and without louvered sides	8.0	9.0	10.7	9.0
6,000 – 7,999	Without reverse cycle and with louvered sides	8.5	9.7	10.7	9.7
	Without reverse cycle and without louvered sides	8.5	9.0	10.7	9.0
8,000 - 13,999	Without reverse cycle and with louvered sides	9.0	9.8	10.8	9.8
	Without reverse cycle and without louvered sides	8.5	8.5	10.8	8.5
14,000 - 19,000	Without reverse cycle and with louvered sides	8.8	9.7	10.7	9.7
	Without reverse cycle and without louvered sides	8.5	8.5	10.7	8.5
> 20,000	Without reverse cycle and with louvered sides	8.2	8.5	9.4	8.5
	Without reverse cycle and without louvered sides	8.2	8.5	9.4	8.5
< 14,000	With reverse cycle and without louvered sides	8.0	8.5		8.5
≥ 14,000	With reverse cycle and without louvered sides	8.0	8.0		8.0
< 20,000	With reverse cycle and with louvered sides	8.5	9.0		9.0
≥ 20,000	With reverse cycle and with louvered sides	8.5	8.5		8.5
	Casement only	*	8.7		8.7
	Casement slider	*	9.5		9.5

Former standards effective from January 1, 1990 through September 30, 2000.

Current standards took effect on October 1, 2000.

ENERGY STAR standards apply to Btu rating categories only.

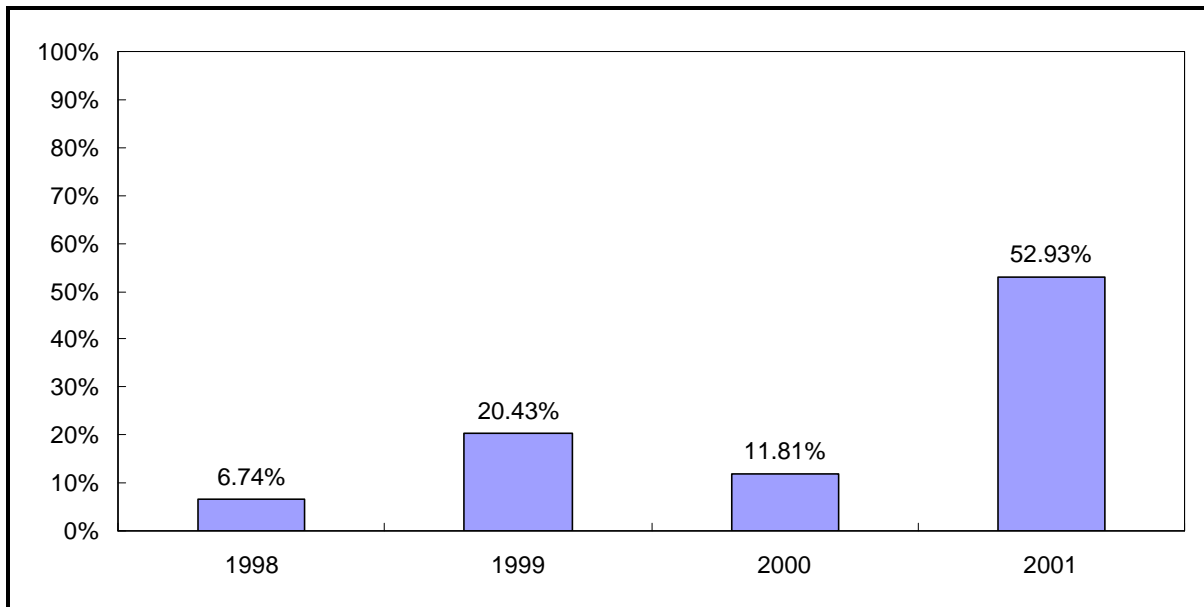


## 6.5 Market Share of ENERGY STAR Qualified Room Air Conditioners

Figure 6-3 depicts the statewide estimated share of ENERGY STAR qualified room air conditioners sold by appliance retailers annually in 2000 and 2001. The annual graph tends to reflect sales that occur during the middle two quarters of each year, as that is when most of the room air conditioner sales take place.

Table 6-3 presents the percentage of ENERGY STAR qualified room air conditioners sold in California from 1998 through 2001. Table 6-4 reports the percent of ENERGY STAR compliant room air conditioners sold in each utility service area annually.

**Figure 6-3: Room Air Conditioner Sales, Annual Percent of ENERGY STAR Qualified Units**



**Table 6-3: Room Air Conditioner Sales, Percent of ENERGY STAR Qualified Units, Statewide**

<b>Year</b>	<b>Annual Percent of ENERGY STAR Qualified Room Air Conditioners</b>
1998	<b>6.73%</b> (-) n = 19,087
1999	<b>20.43%</b> (0.0038) n = 11,176
2000	<b>11.81%</b> (0.0016) n = 42,562
2001	<b>52.93%</b> (0.0027) n = 35,003

Standard errors in parentheses.

**Table 6-4: Room Air Conditioner Sales, Percent of ENERGY STAR Qualified Units by Utility Service Area**

Utility	Year	Annual Percent of ENERGY STAR Qualified Room Air Conditioners <sup>1,2</sup>
PG&E	1998	<b>6.41%</b> (-) n = 5,636
	1999	<b>21.65%</b> (0.0073) n = 3,217
	2000	<b>14.22%</b> (0.0028) n = 16,007
	2001	<b>80.46%</b> (0.0037) n = 11,331
SCE	1998	<b>5.88%</b> (-) n = 6,118
	1999	<b>6.46%</b> (0.0041) n = 3,576
	2000	<b>8.54%</b> (0.0025) n = 13,017
	2001	<b>28.58%</b> (0.0042) n = 11,322
SDG&E	1998	<b>4.53%</b> (-) n = 728
	1999	<b>6.35%</b> (0.0154) n = 252
	2000	<b>15.83%</b> (0.0083) n = 1,927
	2001	<b>18.92%</b> (0.0105) n = 1,401
Other	1998	<b>8.05%</b> (-) n = 6,605
	1999	<b>6.71%</b> (0.0039) n = 4,131
	2000	<b>17.01%</b> (0.0310) n = 147
	2001	<b>16.94%</b> (0.0036) n = 10,949

1 Standard errors in parentheses.

2 "Other" includes municipal utilities such as LADWP, SMUD, and others.

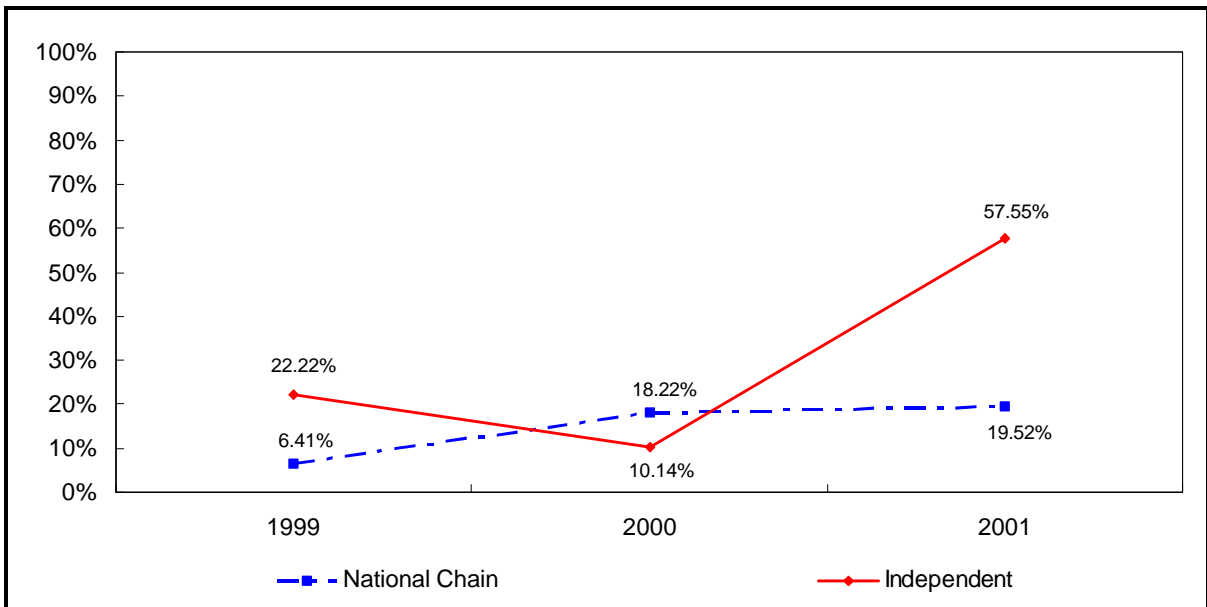
## 6.6 Analysis by Market Channel

Room air conditioners continue to depart from the traditional retail appliance market. This trend is especially seen in independent appliance retailers. Due to these changes, Figure 6-4 depicts some interesting behavior that reflects the analysis of the room air conditioner ENERGY STAR market share within appliance retailers throughout California. For instance, independent appliance retailers continue to sell a decreasing share of room air conditioners in general. However, the units that they are selling increasingly tended to be ENERGY STAR qualified during 2001.

Figure 6-4 and Table 6-5 compare the annual shares of ENERGY STAR qualified room air conditioners sold in California by market channel.

Figure 6-4 also presents independent retailer data for 2000 and 2001.

**Figure 6-4: Room Air Conditioner Sales, Annual Percent of ENERGY STAR Qualified Units by Market Channel**



**Table 6-5: Room Air Conditioner ENERGY STAR Sales by Market Channel**

Year/Quarter	Market Channel	
	National Chain ENERGY STAR Partners	Independent and Regional Chains
<b>2000</b>	<b>11.58%</b> (0.0005) n =367,970	<b>10.14%</b> (0.0063) n =2,314
<b>2001</b>	<b>16.32%</b> (0.0006) n =399,461	<b>30.09%</b> (0.0122) n =1,408

# 7

## Work in Progress and Third-Year Tracking Activities

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In the third year, the project team will continue its recruitment efforts in order to increase the precision of the impact analysis of independent retailers on the household appliance market. RER strives to meet the 20% goal for independent sample size, and continues efforts to improve geographic coverage. The project team experienced success with the recruitment of independent appliance retailers for 2000 data. However, the sample experienced some attrition for 2001. In response, recruitment efforts will be increased again to restore the 2000 sample, and hopefully increase it beyond the 2000 level. To enlarge the sample, special attention will be paid to underrepresented utility areas, such as SDG&E. The team looks forward to continuing the positive relationship forged with D&R International. The continuing fourth-year efforts will also focus on the following:

- Producing updated individual summaries for participating independent retailers,
- Maintaining the sample retailer base by regular contact/relationship building,
- Continuing recruitment efforts for independent retailers,
- Expanding recruitment efforts for large chains which are not ENERGY STAR partners,
- Assisting D&R International with their efforts to recruit their ENERGY STAR partner home improvement retailers to share appliance sales data, and
- Working with D&R International to obtain data more frequently than annually.

Moreover, the project team plans to move to a semi-annual summary. This update will contain California independent retailer information and estimated national data. RER will continue to monitor changes in federal standards (National Appliance Energy Consumption Act or NAECA). The impact of these changes will continue to be evaluated. The team is also considering some additional analysis of the independent data.

# Appendix A

## Data Detail and Analysis

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### A.1 Appliance ENERGY STAR Sales Data Analysis

RER analyzed sales data for each tracked appliance in order to estimate the statewide market share for each of these appliances. This was done by estimating the percent of units sold, of each appliance, that met ENERGY STAR qualifications from the first quarter of 1999 through 2001 with sales data from both national chain appliance retailers as well as independent appliance retailers throughout California. The 1998 analysis was based on national chain sales data only. Independent appliance retailer data was not available for that time frame.

#### ***Data Processing***

A considerable amount of effort is needed to transform the raw data collected from the various sources into a common format that will support this analysis. This process is discussed below for national retail chain data and for independent and regional chain data.

***National Retail Chain Data.*** The national chain sales data provided by D&R was converted into the same format as the independent data. Part of this conversion included the addition of a variable that indicates the percent above standard for each appliance sale shown. Since ENERGY STAR specifications are a specific threshold for each appliance, this variable functioned as the mechanism that separated the sales between units sold that were ENERGY STAR qualified and those that were not.

***Independent and Regional Chain Data.*** The data received from independent and regional chains was first converted to a common electronic format. For example, hard copy data were coded into an electronic database. The required efficiency parameters were then electronically merged to the sales data by the manufacturer model numbers provided in the sales data. The primary sources for efficiency parameters varied by appliance. For clothes washers and dishwashers, RER staff obtained the majority of efficiency data directly from manufacturers. Information was procured from their websites whenever possible. Additionally, telephone calls were made to obtain information for older models or for manufacturers without websites. For refrigerators and room air conditioners, the California Energy Commission's Appliance Efficiency Database and AHAM's Directory of Certified

Refrigerators and Freezers provided most of the efficiency data.<sup>1</sup> In addition to the efficiency or energy factor data, a variable that indicates the percent above efficiency standard for each model for the independent data is created. This is done to identify the various efficiency levels of units sold compared to the federal standard.

### **Appliance Sales Analysis**

The general analysis involved estimating the share of appliances sold that met or exceeded the ENERGY STAR qualification threshold. In particular, RER estimated the percentage of ENERGY STAR compliant units of each appliance sold in California and for the investor-owned utility service areas on an annual and quarterly basis from the first quarter of 1998 through the fourth quarter of 2001.

Two key points are worth noting regarding the appliance sales analysis. First, as noted in Table 2-5, the sample of retailers that provided 1998 is different from the sample that provided 1999 data. Specifically, in 1998 only two national chain retailers provided sales data, whereas four national chains and a panel of independent retailers provided data in 1999. To account for differences between the 1998 and 1999 data, the 1998 data were adjusted based on the ratio of the estimated percent of ENERGY STAR units sold during 1999 to the percent of ENERGY STAR units sold by national chains in 1999. Second, expansion weights were developed according to the sample design for this component of the project. In particular, separate expansion weights were developed for national chain sales and sales by independently owned retailers. This was particularly important because of speculation by industry professionals that retailers in the two market channels behave differently with respect to the product mixes they typically stock and sell.

**Expansion Weights.** RER developed weights to expand the sample to the total sales of each appliance in California and each utility service area. This required the estimation of 1) total appliance sales in California and each utility service area, and 2) total appliance sales through each market channel.

To estimate the total appliance sales in each utility area, RER developed the ratio of the total number of households in each utility service area to the total number of households in California. This ratio was used to estimate the proportion of total sales of each appliance in each utility service area for each year, based on total appliance shipments to California as published by AHAM.

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<sup>1</sup> California Energy Commission. Appliance Efficiency Database. [www.energy.ca.gov/efficiency/appliances](http://www.energy.ca.gov/efficiency/appliances). Association of Home Appliance Manufacturers. *AHAM Directory of Certified Refrigerators and Freezers. January and June Editions.* 1997 through 2000.



$$N_{ua} = \frac{P_u}{P_{CA}} \times S_{CAau}$$

where:

- $N_{ua}$  is an estimate of total sales of appliance  $a$  for utility  $u$ .
- $P_u$  is the total number of households in each utility's  $u$  service area.
- $P_{CA}$  is the total number of households in California.
- $S_{CAa}$  is the total shipments of appliance type  $a$  to California.

To estimate total sales for each market channel, RER estimated the total sales of each appliance by national chains by expanding the sales provided in the D&R database (representing two chains) to represent sales by all ENERGY STAR partner national chains. Because total unit sales by individual chains are not known, RER expanded sales by a revenue-multiplier as a proxy for total unit sales:<sup>2</sup>

$$N_{ua}^{nc} = n_{ua}^{nc} \left( \frac{R_{ua}^{nc}}{r^{nc}} \right)$$

where

- $N_{ua}^{nc}$  is the total estimated sales of appliance  $a$  in utility area  $u$  by all national chain ( $nc$ ) stores.
- $n_{ua}^{nc}$  is the reported sales by national chain ( $nc$ ) ENERGY STAR partners of appliance  $a$  for utility  $u$ .
- $R_{ua}^{nc}$  is the total revenues from appliance sales by all national chain ( $nc$ ) ENERGY STAR partners in 1999.<sup>3</sup>
- $r^{nc}$  is the total revenues from appliance sales by the national chain ( $nc$ ) retailers in the analysis sample in 1999.

Total sales by the independent retail channel is assumed to be the remainder of market, or

$$N_{ua}^{in} = N_{ua} - N_{ua}^{nc}$$

where

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<sup>2</sup> D&R International provided revenue data to RER for creation of revenue multipliers.

<sup>3</sup> Revenue data for 2000 were not available to update the revenue-multiplier. Therefore, the 1999 proxy was also used for 2000.

$N_{ua}^{in}$  is the total sales of appliance  $a$  for utility  $u$  by all independent retailers ( $in$ ).

The expansion weights for each appliance  $a$  sold in each utility area  $u$  for sales by the national chain ENERGY STAR partners and independent retailers are computed as the ratio of total units sold to the units sold represented in the analysis sample:

$$W_{ua}^{nc} = \frac{N_{ua}^{nc}}{n_{ua}^{nc}}$$

$$W_{ua}^{in} = \frac{N_{ua}^{in}}{n_{ua}^{in}}$$

where:

$w_{ua}^{nc}$  is the expansion weight applied to all sales by the national chain ENERGY STAR partners in the sample, and

$w_{ua}^{in}$  is the expansion weight applied to all sales by independently owned retailers in the sample.

Shares of ENERGY STAR qualifying appliances during each quarter were estimated by expanding the sales in the database by the appropriate expansion factor and computing the percent of the expanded sales that qualify for the ENERGY STAR label.<sup>4</sup>

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<sup>4</sup> Because 1998 sales data do not accurately represent California's appliance market, RER developed a rather simplistic approach to estimating the shares of ENERGY STAR appliances representing the entire market. In particular, the share of ENERGY STAR qualified sales of each appliance developed from the 1998 data was multiplied by the ratio of the share of ENERGY STAR sales in 1999 by the national chains in the 1998 sample to the share of ENERGY STAR sales in 1999 by the four national chains in the 1999 sample.