California Residential Efficiency Market Share Tracking

Appliances 2002

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1

Introduction

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® 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 2002 period. Subsequent reports will be made available on a semi-annual basis, with the next report (Volume 1, 2003) covering through the first half of 2003.

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 shares 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).[1] The RMST, now in its fifth year, produces four separate semi-annual reports: Residential New Construction,[2] Lighting,[3] Appliances, and HVAC.[4] 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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1 Itron, Inc. *California Residential Efficiency Market Share Tracking: First-Year Interim Report.* Prepared for Southern California Edison. October 2000.

2 Itron, Inc. *Residential New Construction Study.* Prepared for Pacific Gas & Electric Company. September 2001.

3 Itron, Inc. *Residential Market Share Tracking: Lamps.* Prepared for Southern California Edison. April 2002.

4 Itron, Inc. *Residential Market Share Tracking: HVAC.* Prepared for Southern California Edison. October 2002.

The remainder of this report presents first a discussion of the data collection and analysis approach, including the identification of data sources, a description of the data analysis techniques and a summary of the geographical coverage of the collected data. Following this, the remaining sections present results for clothes washers, dishwashers, refrigerators, and room air conditioners. The final section discusses the work effort for the fifth year of the project.

2

Data Collection and Analysis

2.1 Overview

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

This section describes the data collection and analysis of the national and independent appliance retailer sales data. In addition, the number of California retail outlets is summarized. 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 data from a representative sample of appliance retailers. It is therefore important 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.

The table distinguishes 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 shown, all national chain storefronts are currently ENERGY STAR partners. Previous research has shown that, overall, national chains sell about half of the appliances in California. Independent retailers sell the remaining half. When breaking down sales by appliance, however, the percentage of sales between these two market channels varies.

D&R International is currently collecting data from approximately 43% of the national appliance retailer storefronts. Additionally, Itron collects data from 24 independent

[5] It is important to note that not all national ENERGY STAR partners share appliance sales data with D&R International.

storefronts (of the 412 total independent storefronts across the state) for tracking energy efficient appliance market share.

Table 2-1: California Appliance Retailer Entities and Storefronts – 2002

	National Chains	Independent Regional Chains	Independent Individual Stores	All Retailers
Companies/Retail Entities	6	32	300	338
California Retail Storefronts	515[1]	112	300	927
ENERGY STAR Partners[2]	6	1	0	7

1. CostCo and Sam's Club Membership Warehouses are included in this figure since 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 Itron 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 Itron to support the California RMST project. The national chain ENERGY STAR partners in the 2002 data include two national retail entities. The data include 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 five years in the retail participants who provide 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. The results of this study continue 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, and their market share of these items has increased in California. In the past, national chain stores' appliance selection was limited in comparison to independent appliance retailers, which typically offered a greater selection 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 as their customers are often 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

The sample frame of independent retailers used for this study 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.[6] Table 2-2 illustrates the breakdown of storefronts by utility area.

Table 2-3 provides the sampling targets for each utility service area.

Table 2-2: Independent Appliance Retailer Sample Frame

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

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

6 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			
	PG&E	**SCE**	**SDG&E**	**All**
Storefronts	39	19	7	65
Percent of Total	60%	30%	10%	100%

Independent Retailer Panel Recruitment

The quantity of data collected has changed from year to year. Recruitment efforts during 2001 substantially increased the sample size over that of the previous year, as well as improved ease of participation. However, the participant level decreased again in 2002. One factor has been some retailers' inability to provide the sales data in a timeframe compatible with the reporting process. The recruiting efforts will regroup and refocus to increase the sample size again for the 2003 reports. Additional efforts will focus on improving the geographic spread of the independent appliance retailers. In particular, Itron 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

Itron obtained appliance sales data from 20 individual storefronts, which represent a panel of seven independent retailers. This represents a decrease in both retailers and storefronts from 2001; however, the team believes that the results in this report are still representative of occurrences in the independent appliance retail market. As always, data continue to be updated whenever possible, and subsequent reports will contain the most recent data from these retailers. Table 2-4 presents the current panel.

The retailers in the panel provided data in various formats: electronic spreadsheets, hard-copy sales reports, and even handwritten tallies of units sold. Most retailers provide data to Itron in a monthly format. 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			
	PG&E	**Southern California**	**Other***	**All**
Storefronts	18	1	1	20
Percent of Total	90%	5%	5%	100%

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

Table 2-5 summarizes by year the market channels included in the data. As shown, the current database includes sales data from national retail chains for 1998 through 2002, as well as data from independent retailers for 1999 through 2002.

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

Market Channel	1998	1999	2000	2001	2002
National Chain Retailers *	X	X	X	X	X
Independent Retailers		X	X	X	X

* Two national chains provided 1998 data, four provided 1999 data, and two provided complete 2000-2002 data.

2.5 Analysis Approach

Results in this report are presented in two ways. For all appliances, the market share of ENERGY STAR qualified appliances is shown by market channel and by utility service area. In addition, energy factors were calculated for clothes washers, dishwashers, and refrigerators. Both types of results are presented by year or by quarter so that changes can be tracked over time. A brief description of both approaches is presented below, and a more detailed description is provided in Appendix A.

ENERGY STAR Market Share Analysis

The ENERGY STAR analysis estimates the market share of ENERGY STAR qualified appliances based on sales data from national chains and independent retailers. Since it is based on whether a tracked appliance sold in California met the qualifications for the ENERGY STAR program, the resulting market shares may be affected when changes occur to the ENERGY STAR specifications. Therefore, this type of analysis does not track or evaluate the actual efficiencies of the units sold, but rather indicates overall statewide changes in the percentages of qualifying products sold by the two aforementioned market channels. It is also important to note that the analysis examines appliances that would qualify for an ENERGY STAR label based on their efficiency level and not necessarily appliances that carry the ENERGY STAR label.

Energy Factor Analysis

In contrast to the ENERGY STAR analysis described above, the energy factor (EF) analysis indicates the actual average energy efficiencies of the tracked appliances sold by independent appliance retailers throughout California. This EF analysis allows more precise illustrations of the changes in the average energy efficiencies over time. Data collected from independent appliance retailers included sufficient detail to conduct this analysis. The national chain data collected by D&R International does not contain the actual EF of the units sold. Therefore, it

cannot be used for this type of analysis. The EF results are presented for clothes washers, dishwashers and refrigerators.[7]

An energy factor is an efficiency rating. Each appliance section details how its EF is calculated. Within each appliance type, the higher the energy factor, the more efficient a unit is. Additionally, energy factors cannot be compared between appliances, only within appliance types, It is not accurate to compare the average energy factor of refrigerators to the average energy factor of dishwashers or to say that refrigerators are more efficient than dishwashers are because they have a higher average energy factor.

This report presents average energy factors of units sold by independent appliance retailers statewide from 1999 through 2002. Again, it is important to understand that the energy factor results presented in this report were developed from independent appliance retailer sales data only, as the national chain sales data as shared with Itron did not include the necessary components to compute the energy factors.

[7] Room air conditioners use a different type of rating, called an Energy Efficiency Rating (EER), and therefore energy factors were not calculated for this appliance.

3

Clothes Washers

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	2002
Clothes Washers	702,000	721,100	731,500	766,500	819,500

* AHAM Shipment Data

3.3 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.[8] Current clothes washer efficiency ratings are expressed as an energy factor rating (EF), which is a measurement based the following equation:[9]

$$EF = \frac{\text{Tub Volume in Cubic Feet}}{\text{Annual Energy Usage}\,(\text{kWh})/\,\text{Cycles}}$$

[8] Average loads of laundry per year are also referred to as cycles.

[9] However, the new federal standards are based on a modified energy factor (MEF). 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).

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 are required to have an unheated rinse option.

Changes to these federal minimum energy efficiency standards have been approved and will take effect on January 1, 2004. These changes have been guided, in part, by the Super-Efficient Home Appliance Initiative (SEHA) standards created by the Consortium for Energy Efficiency (CEE). The change also includes a second increase in the standard, which begins 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 CEC amended their appliance efficiency regulations in January 2002 to reflect the increase in the federal energy use standards. Table 3-2 summarizes the changes.

The change in analysis that will occur due to the switch to a modified energy factor (MEF), rather than the current EF, will be addressed in upcoming reports. According to the ENERGY STAR program, MEF is a new equation that takes into account the amount of dryer energy used in order to remove the remaining moisture content from the items washed.[10]

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
Federal Standard	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

3.4 Characteristics of Available Models

Currently, nationally comprehensive data sources that characterize all available clothes washer models are not available. Therefore, the CEC appliance database was the basis in determining general characteristics about the clothes washer models available. The CEC appliance database did not change between the November 2001 and November 2002

[10] http://www.energystar.gov/index.cfm?c=clotheswash.pr_crit_clothes_washers

versions. Therefore, the results showing the approximate model availability results for clothes washers in California are identical for those two years.

Figure 3-1 presents the percentage of available clothes washer models in each efficiency category that are above standard efficiency.

Figure 3-2 shows the average percentage above standard for available models from 2000 through 2002. As shown, the mean percentage above standard during this time remained roughly around 14%.

Figure 3-3 presents the distribution of energy factors for available models. As shown, for each year analyzed, the majority of models had an energy factor of between 1.19 and 2.49.

Figure 3-1: Clothes Washer Model Availability by Percent above Standard

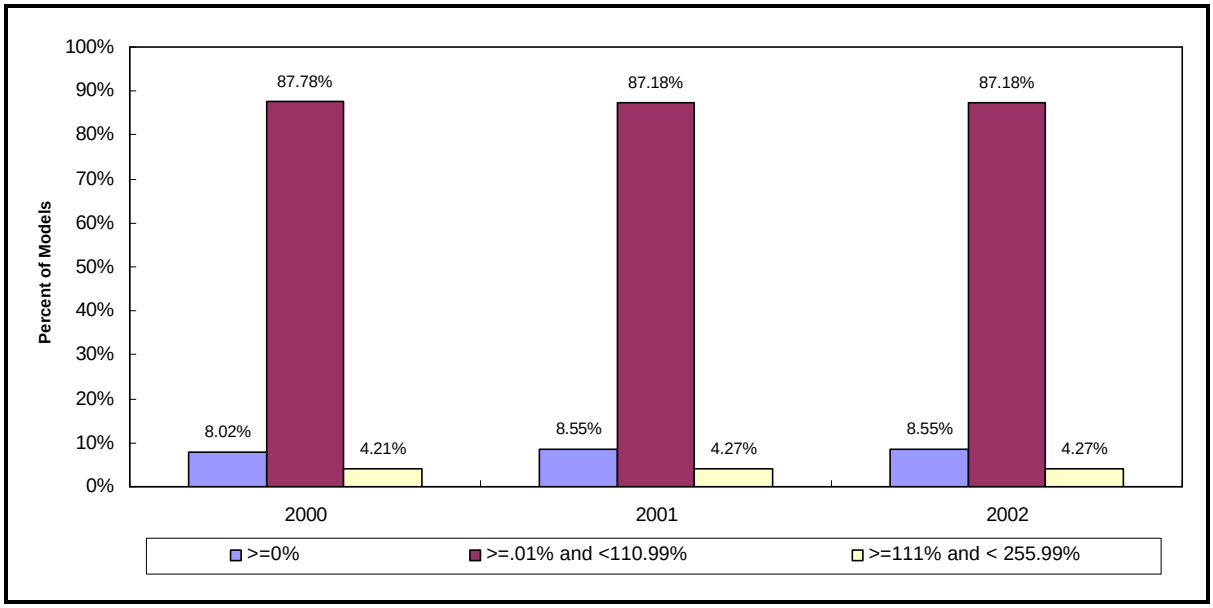


Figure 3-2: Available Clothes Washer Models, Average Percent above Standard

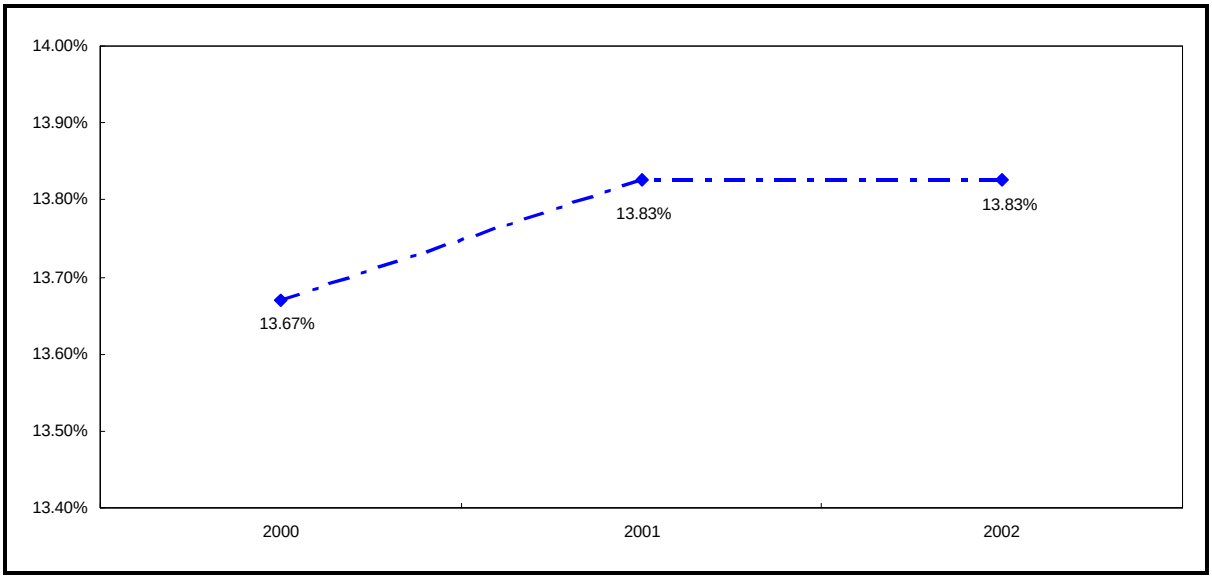
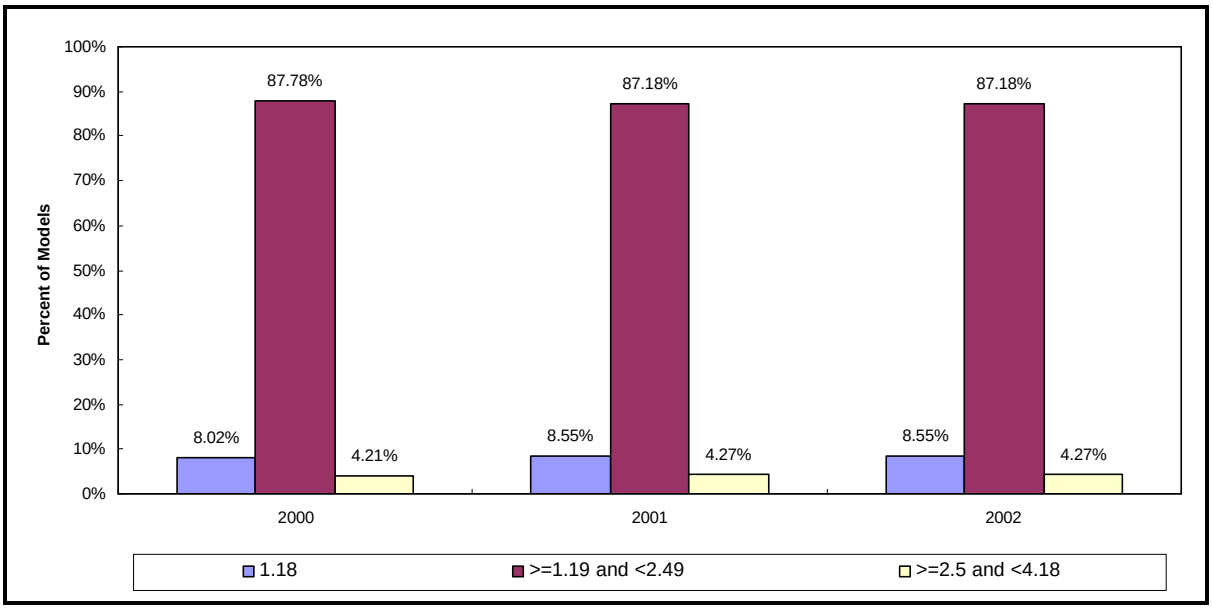


Figure 3-3: Clothes Washer Model Availability by Energy Factor

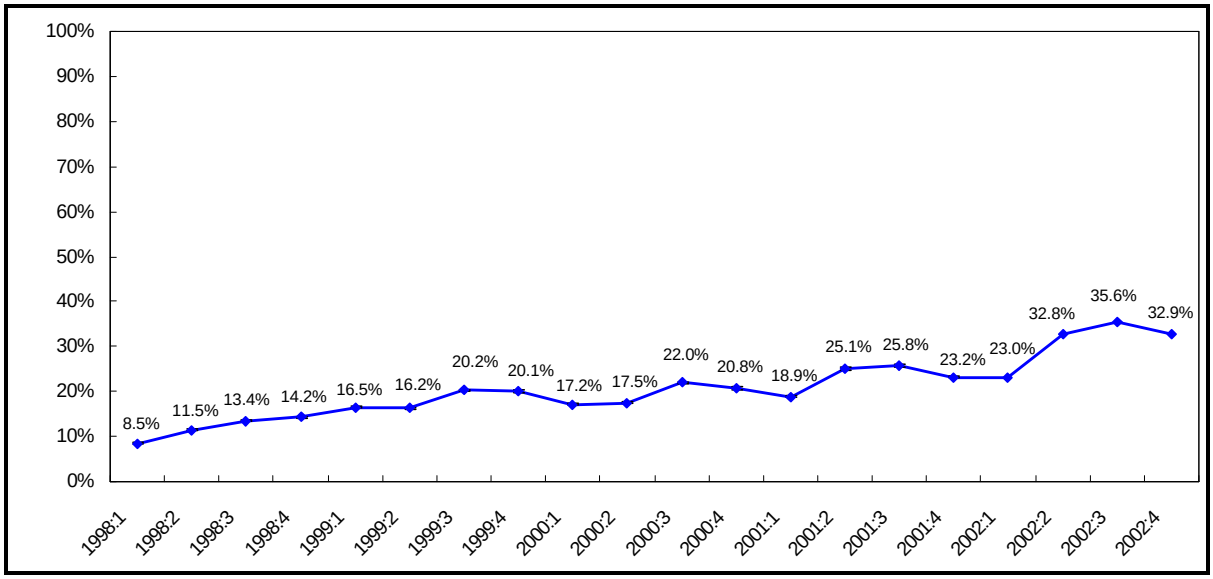


3.5 Market Share of ENERGY STAR Qualified Clothes Washers

Figure 3-4 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 2002. 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

35% during the third quarter of 2002. Table 3-4 reports the percentage of ENERGY STAR compliant clothes washers sold in each utility service area annually and by quarter.

Figure 3-4: Clothes Washer 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 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	**11.96%** (-) n = 180,983	**8.52%** (-) n = 44,233	**11.46%** (-) n = 43,366	**13.39%** (-) n = 44,746	**14.22%** (-) n = 48,638
1999	**18.17%** (0.0006) n = 425,528	**16.45%** (0.0011) n = 115,621	**16.23%** (0.0011) n = 107,984	**20.24%** (0.0013) n =101,691	**20.07%** (0.0013) n = 100,232
2000	**19.26%** (.0006) n=414,505	**17.20%** (.0013) n=113,966	**17.48%** (.0011) n=114,385	**22.01%** (.0011) n=88,754	**20.79%** (.0014) n=97,400
2001	**23.17%** (0.0006) n = 427,489	**18.88%** (0.0012) n = 109,184	**25.06%** (0.0013) n = 103,324	**25.78%** (0.0014) n = 103,185	**23.16%** (0.0013) n = 111,796
2002	**30.58%** (0.0007) n = 462,069	**23.04%** (0.0011) n = 150,430	**32.82%** (0.0014) n = 108,486	**35.58%** (0.0015) n = 102,046	**32.89%** (0.0015) n = 101,107

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 [1, 2]				
		Annual	Q1	Q2	Q3	Q4
PG&E	1998	**12.65%** (-) n =83,563	**80.63%** (-) n = 19,916	**13.65%** (-) n = 20,751	**15.29%** (-) n = 20,520	**12.87%** (-) n = 22,376
	1999	**14.68%** (0.0008) n =165,144	**12.91%** (0.0015) n = 47,436	**13.67%** (0.0017) n = 42,090	**15.56%** (0.0019) n = 37,916	**17.16%** (0.0019) n = 37,702
	2000	**24.29%** (.0011) n=165,405	**20.36%** (.0019) n=43,959	**23.99%** (.0020) n=45,042	**28.1%** (.0023) n=37,038	**25.04%** (.0022) n=39,366
	2001	**29.47%** (0.0011) n = 170,360	**23.47%** (0.0020) n = 43,035	**31.08%** (0.0023) n = 40,366	**32.72%** (0.0023) n = 41,868	**30.68%** (0.0022) n = 45,091
	2002	**36.68%** (0.0012) n = 170,593	**30.34%** (0.0020) n = 53,861	**39.78%** (0.0025) n = 39,911	**41.30%** (0.0025) n = 38,456	**37.62%** (0.0025) n = 38,365
SCE	1998	**8.74%** (-) n =47,708	**7.55%** (-) n = 12,287	**7.16%** (-) n = 11,357	**7.88%** (-) n = 11,693	**12.19%** (-) n = 12,371
	1999	**17.38%** (0.0010) n =140,863	**15.59%** (0.0018) n = 36,820	**15.41%** (0.0019) n = 35,609	**19.73%** (0.0021) n = 34,829	**19.03%** (0.0021) n = 33,605
	2000	**14.95%** (.0009) n=136,046	**14.06%** (.0018) n=38,696	**12.21%** (.0017) n=38,212	**16.75%** (.0022) n=27,790	**17.25%** (.0021) n=31,348
	2001	**18.99%** (0.0010) n = 144,802	**15.86%** (0.0019) n = 37,341	**21.10%** (0.0022) n = 35,457	**21.71%** (0.0022) n = 34,187	**17.57%** (0.0019) n = 37,817
	2002	**28.52%** (0.0011) n = 157,803	**20.50%** (0.0018) n = 51,295	**30.10%** (0.0024) n = 37,933	**32.90%** (0.0025) n = 34,570	**31.94%** (0.0025) n = 34,005
SDG&E	1998	**11.70%** (-) n =14,582	**10.59%** (-) n = 3,491	**11.65%** (-) n = 3,359	**14.19%** (-) n = 3,413	**10.66%** (-) n = 4,319
	1999	**18.03%** (0.0020) n =38,302	**18.67%** (0.0039) n = 9,915	**14.68%** (0.0035) n = 9,943	**18.70%** (0.0041) n = 9,229	**20.18%** (0.0042) n = 9,215
	2000	**21.29%** (.0022) n=35,560	**19.91%** (.0040) n=9,890	**16.25%** (.0037) n=9,816	**24.36%** (.0050) n=7,492	**24.72%** (.0047) n=8,362
	2001	**18.17%** (0.0020) n = 39,016	**14.20%** (0.0035) n = 9,835	**18.73%** (0.0040) n = 9,592	**18.67%** (0.0040) n = 9,621	**21.07%** (0.0041) n = 9,968
	2002	**25.53%** (0.0023) n = 37,314	**16.80%** (0.0036) n = 12,438	**27.26%** (0.0048) n = 8,668	**31.26%** (0.0050) n = 8,513	**31.33%** (0.0053) n = 7,695
Other	1998	**13.37%** (-) n = 35,130	**7.82** (-) n = 8,539	**10.36%** (-) n = 7,899	**14.39%** (-) n = 9,120	**19.82%** (-) n = 9,57203
	1999	**15.71%** (0.0013) n =81,219	**14.65%** (0.0024) n = 21,450	**14.91%** (0.0025) n = 20,342	**17.67%** (0.0027) n = 19,717	**15.72%** (0.0026) n = 19,710
	2000	**16.20%** (.0013) n=77,494	**16.02%** (.0025) n=21,421	**15.11%** (.0025) n=21,315	**17.47%** (.0030) n=16,434	**16.43%** (.0027) n=18,324
	2001	**22.03%** (0.0015) n = 73,311	**18.51%** (0.0028) n = 18,973	**25.02%** (0.0032) n = 17,909	**23.20%** (0.0032) n = 17,509	**21.58%** (0.0030) n = 18,920
	2002	**21.43%** (0.0013) n = 96,359	**13.98%** (0.0019) n = 32,836	**23.25%** (0.0028) n = 21,974	**27.84%** (0.0031) n = 20,507	**24.90%** (0.0030) n = 21,042

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.

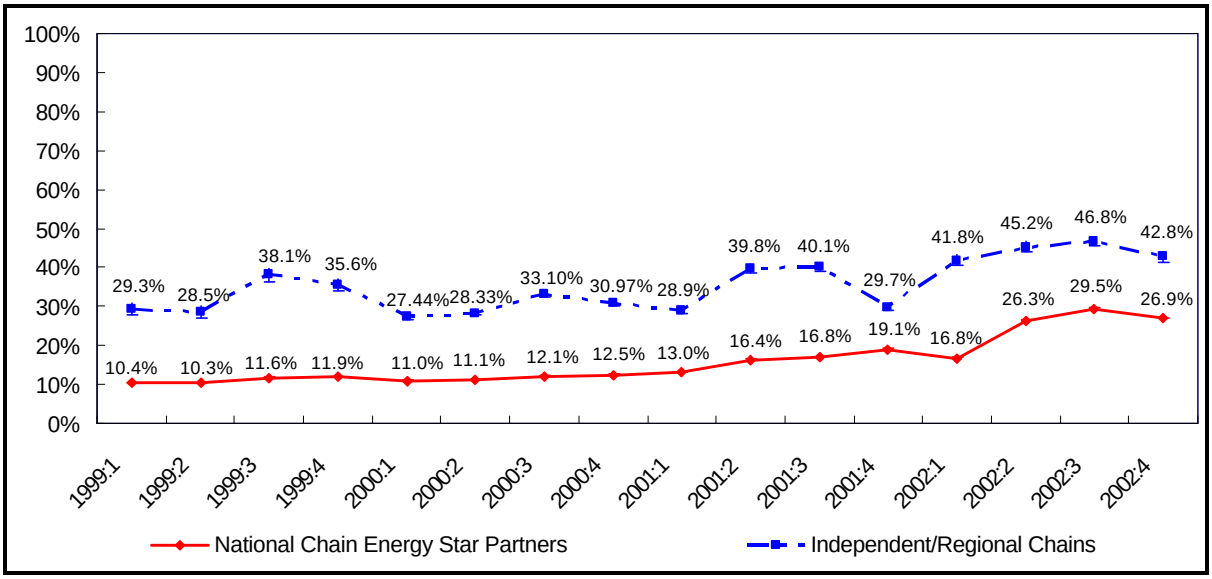
3.6 Analysis by Market Channel

Comparison of National Chain and Independent Appliance Retailers

Figure 3-5 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 lower percentage of ENERGY STAR clothes washers compared to sales by independent retailers.

Over the four-year period, the share sold by national chain ENERGY STAR partners has more than doubled. It grew from 10% in the first quarter of 1999 to 27% by the last quarter of 2002. 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%, whereas their highest share was in the third quarter of 2002 at 47%.

Figure 3-5: 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	**10.36%** (0.0009) n =113,050	**29.28%** (0.0090) n =2,571
1999:2	**10.30%** (0.0009) n =105,551	**28.47%** (0.0091) n =2,433
1999:3	**11.63%** (0.0010) n =99,385	**38.10%** (0.0101) n =2,306
1999:4	**11.88%** (0.0010) n =97,766	**35.58%** (0.0096) n =2,466
2000:1	**10.98%** (0.0010) n =102,845	**27.44%** (0.0042) n =11,121
2000:2	**11.05%** (0.0010) n =103,399	**28.33%** (0.0043) n =10,986
2000:3	**12.12%** (0.0012) n =76,422	**33.09%** (0.0042) n =12,332
2000:4	**12.48%** (0.0011) n =85,304	**30.97%** (0.0042) n =12,096
2001:1	**12.98%** (0.0011) n = 102,255	**28.90%** (0.0054) n = 6,929
2001:2	**16.40%** (0.0012) n = 96,959	**39.81%** (0.0061) n = 6,365
2001:3	**16.84%** (0.0012) n = 96,088	**40.06%** (0.0058) n = 7,097
2001:4	**19.07%** (0.0012) n = 104,159	**29.65%** (0.0052) n = 7,637
2002:1	**16.77%** (0.0010) n = 146,565	**41.83%** (0.0079) n = 3,865
2002:2	**26.27%** (0.0014) n = 104,567	**45.22%** (0.0080) n = 3,919
2002:3	**29.46%** (0.0015) n = 97,998	**46.77%** (0.0078) n = 4,048
2002:4	**26.90%** (0.0014) n = 96,899	**42.76%** (0.0076) n = 4,208

Detailed, Statewide Independent Appliance Retailer Analysis

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

The EF analysis is included. These results show the average energy factor (EF) of clothes washers sold by independent appliance retailers throughout California over time. National chain data is not included because the data received from D&R International does not contain the actual energy factors of the units sold. This EF-level analysis is a more accurate measure of actual efficiency trends than the ENERGY STAR analysis.

Figure 3-6 illustrates sales by independent retailers from 2000 through 2002, examined in groupings by efficiency level. Note that the ENERGY STAR threshold is 111% above the federal standard. Over the next year, the project team will investigate the incorporation of the modified energy factor (MEF) information into the RMST. Please note that all of the clothes washers sold by participating independents are above the federal standard. The growth in sales of the high efficiency and ENERGY STAR units over the three years examined is noticeable in the graph. In particular, during 2000, most units did not meet the ENERGY STAR specification. By 2002, ENERGY STAR sales from independent appliance retailers have decreased. However, the sales of units greater than 111% more efficient than the federal standard have clearly grown over the past three years.

Figure 3-7 illustrates the average energy factor of clothes washers sold by independent appliance retailers throughout California from 2000 through 2002. As shown, the average energy factor has fluctuated during this time between 1.93 and 2.50. In addition, the average energy factor during 2002 is significantly higher than in the previous two years.

Figure 3-6: Percent of Independent Clothes Washer Sales by Efficiency Level

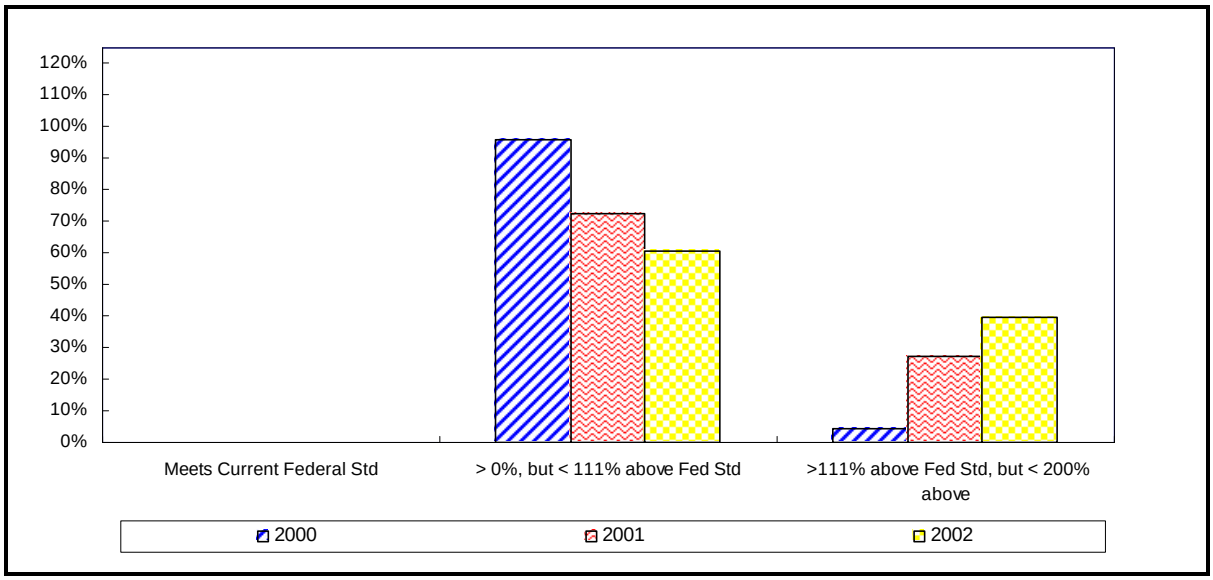
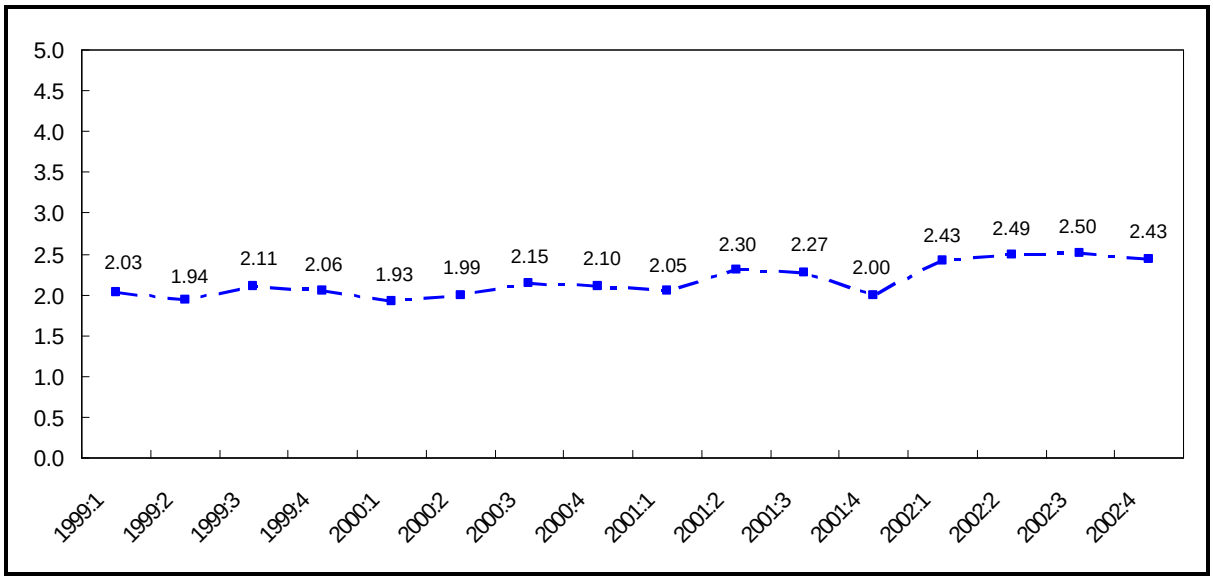


Figure 3-7: Average Energy Factor for Clothes Washers Sold By Independent Appliance Retailers



4

Dishwashers

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	2002
Dishwashers	509,000	566,800	579,100	595,800	660,300

* AHAM Shipment data

4.3 Dishwasher Efficiency Standards

Dishwasher efficiency ratings are based on estimated annual energy use (kWh) under "typical conditions" and an average of 322 loads, or cycles, per year. This energy factor rating (EF) is computed as follows:

$$\mathrm{EF} = \frac{\text{Average Cycles per Year}}{\text{Annual Energy Usage (kWh)}}$$

Table 4-2 presents the current energy efficiency standards and ENERGY STAR specification for dishwashers. As shown, all standard-sized dishwashers must have an energy factor equal to at least 0.46.

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

	Current Standard
NAECA *	0.46
ENERGY STAR	0.58
California Standards	0.46

* National Appliance Energy Consumption Act

The ENERGY STAR qualification for dishwashers changed on January 1, 2001, and the new qualification was based on the SEHA program from the CEE.[11] As of January 1, 2001, ENERGY STAR qualified dishwashers must exceed the minimum federal standard by at least 25%. The previous qualification for 2000 was 13%. The CEC amended their appliance efficiency regulations in January 2002 to reflect the increase in the federal energy use standards for several appliances. However, as with the federal standard, the actual dishwasher standard energy factor for California did not change during these proceedings.

Although the Federal and California standards for dishwasher energy factors have not changed, on September 29, 2003 a new test procedure was passed for soil sensing dishwashers. The Department of Energy (DOE) also made some changes to the test procedures for non-soil sensing dishwashers. The impact of these changes will be examined more closely during analysis of the 2003 sales data.

On June 17, 2002, the DOE decreased the number of cycles used to determine a dishwasher's energy factor, from 322 cycles to 264 cycles. In addition, with another rulemaking on August 29, 2003, the number of cycles used for the dishwasher energy factor equation was further decreased to 215 cycles. The 215 cycle level will take effect on February 24, 2004. As a result, without any alterations to the models available, the general energy factors of dishwashers will be lower, even though the energy efficiency standards have not changed. Therefore, in order to maintain the same efficiency relationship to the federal energy standard, dishwashers must become more efficient.

4.4 Characteristics of Available Models

Currently, nationally comprehensive data sources that characterize all available dishwasher models are not available. Therefore, the CEC appliance database was used as a basis to determine general characteristics about the model of clothes washers available. The CEC

[11] 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

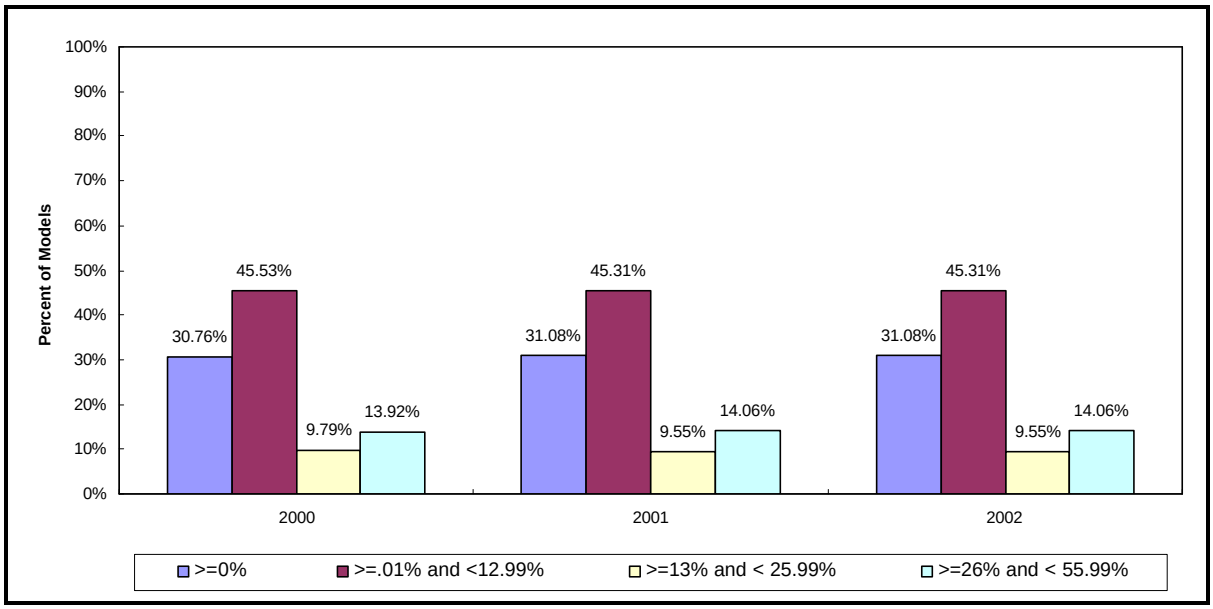
appliance database did not exhibit any changes between the November 2001 and November 2002 versions. Therefore, the results shown for available models of dishwashers in California are identical for those two years.

Figure 4-1 illustrates the availability of dishwashers by the efficiency groupings, which are grouped according to percentages above the federal energy standard. As shown, the results are stable over the three years. Roughly, 30% of available models remain at the standard efficiency, and approximately 14% of available models are in the highest efficiency group.

Figure 4-2 shows the change from 2000 to 2002 of the average percentage above standard for available models. As shown, the average has remained around 9% during this time.

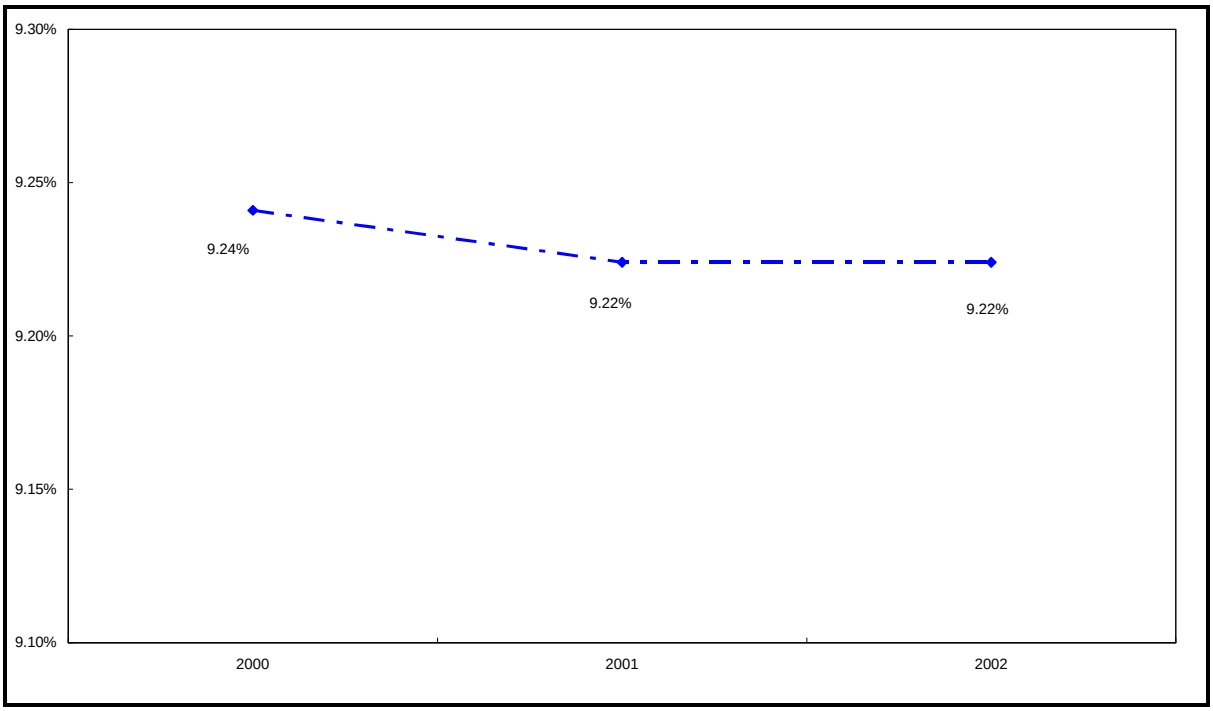
Figure 4-3 presents energy factors of available models for 2000 through 2002. As shown, the majority of available models were found to have an energy factor of 0.46 to 0.51.

Figure 4-1: Dishwasher Model Availability by Percent above Standard



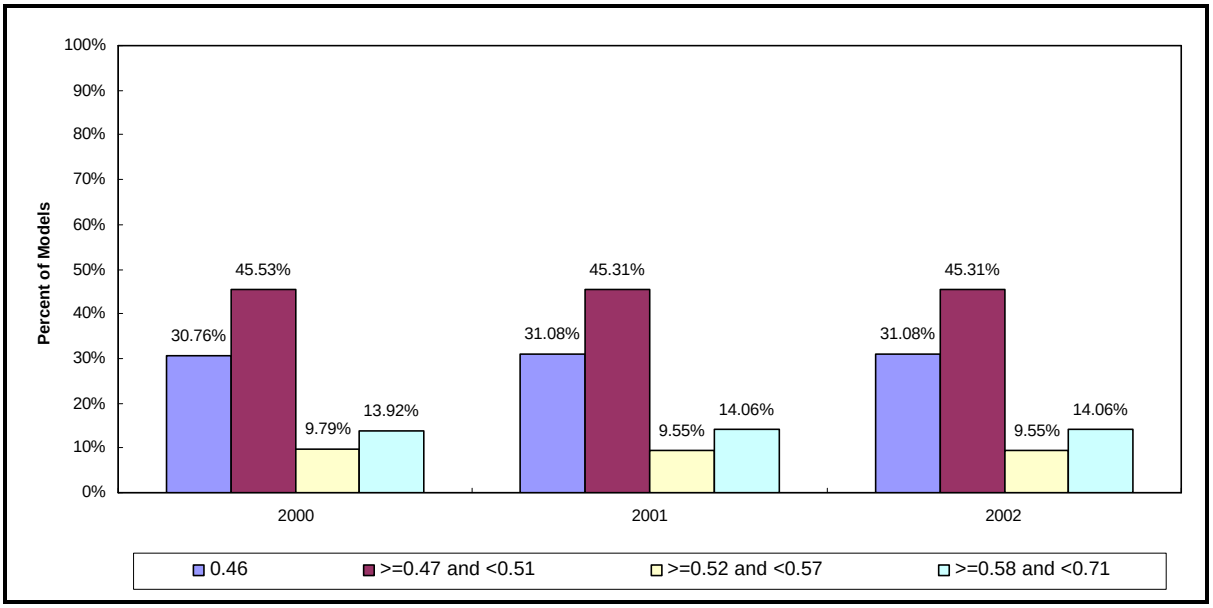
Source: CEC

Figure 4-2: Available Dishwasher Models, Average Percent above Standard



Source: CEC

Figure 4-3: Dishwasher Model Availability by Average Energy Factor



Source: CEC

4.5 Market Share of ENERGY STAR Qualified Dishwashers

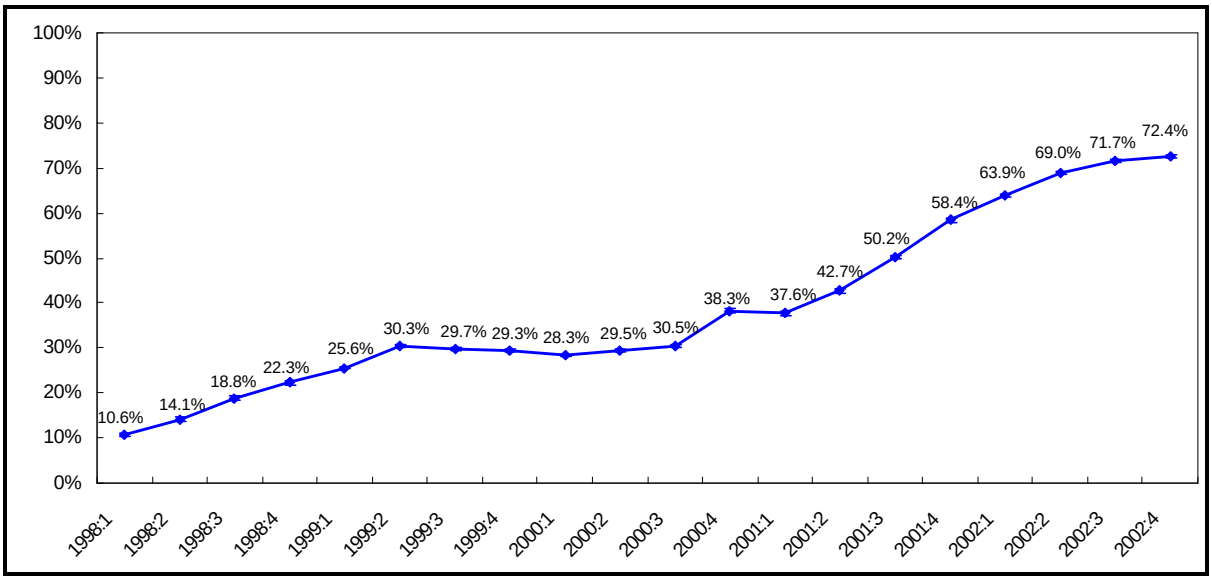
Figure 4-4 and Table 4-3 present the percentage of ENERGY STAR qualified dishwashers sold in California during the first quarter of 1998 through the fourth quarter of 2002. As shown, shares of ENERGY STAR dishwasher sales in 1999 and 2000 were fairly level. There is a significant increase in late 2000, which continues to increase throughout 2001 and 2002. This increase is driven largely by the increasing shares of ENERGY STAR qualified dishwashers sold by the independent appliance retailers in California. Additionally, it is interesting to note that although the EF calculation changes in mid-2002, the percentage of ENERGY STAR qualified units continues to increase throughout the year. One reason for this result is that dishwasher manufacturers adjusted their models available prior to the January 1, 2001 change to the ENERGY STAR specification.[12, 13] They would have most likely done this in order for there to be no decrease in models available that met the specifications for the ENERGY STAR program, since ENERGY STAR usually forms the basis for incentive programs.

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

[12] This possibility is not reflected in the previous graphs in this Section which used data from the CEC database, most likely because that database is not as comprehensive as the tracking data collected and developed for this study.

[13] The adjustment needed to improve dishwasher efficiency does not require completely changing the unit in question. The CEC lists a few changes manufacturers can make in order to increase the efficiency of their dishwashers. http://www.cee1.org/resid/seha/dishw/dishw-main.php3

Figure 4-4: 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	**16.91%** (-) n = 66,161	**10.69%** (-) n = 15,478	**14.23%** (-) n = 15,012	**18.91%** (-) n = 16,775	**22.43%** (-) n = 18,896
1999	**28.76%** (0.001) n = 194,979	**25.58%** (0.0019) n = 47,633	**30.34%** (0.0021) n = 47,098	**29.74%** (0.0021) n = 46,689	**29.35%** (0.002) n = 53,559
2000	**31.64%** (.0010) n=214,069	**28.29%** (.0018) n=60,727	**29.54%** (.0019) n=56,656	**30.48%** (.0022) n=44,899	**38.28%** (.0021) n=51,787
2001	**47.71%** (0.0012) n = 184,187	**37.65%** (0.0023) n = 44,730	**42.67%** (0.0024) n = 42,940	**50.19%** (0.0024) n = 44,784	**58.38%** (0.0022) n = 51,733
2002	**69.19%** (0.0011) n = 192,032	**63.92%** (0.0022) n = 47,405	**68.95%** (0.0021) n = 47,971	**71.68%** (0.0021) n = 45,298	**72.43%** (0.0020) n = 51,358

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 STARQualified Dishwashers [1, 2]				
		Annual	Q1	Q2	Q3	Q4
PG&E	1998	**12.00%** (-) n =24,900	**7.62%** (-) n =5,671	**10.76%** (-) n =5,626	**13.54%** (-) n =6,522	**15.10%** (-) n =7,081
	1999	**16.19%** (0.0014) n =69,128	**11.57%** (0.0024) n =17,005	**13.26%** (0.0026) n =16,425	**18.09%** (0.003) n =16,172	**21.11%** (0.0029) n =19,526
	2000	**30.73%** (0.0015) n =94,925	**28.26%** (0.0028) n =25,748	**28.88%** (0.0029) n =24,730	**31.56%** (0.0032) n =20,976	**34.35%** (0.0031) n =23,471
	2001	**53.07%** (0.0017) n = 91,396	**42.98%** (0.0033) n = 22,532	**50.82%** (0.0034) n = 21,389	**57.82%** (0.0033) n = 22,475	**60.17%** (0.0031) n = 25,000
	2002	**73.68%** (0.0015) n = 85,869	**67.90%** (0.0032) n = 21,314	**73.80%** (0.0030) n = 21,844	**76.94%** (0.0029) n = 20,540	**75.64%** (0.0029) n = 22,171
SCE	1998	**20.44%** (-) n =20,197	**12.01%** (-) n =4,893	**15.40%** (-) n =4,596	**22.14%** (-) n =4,940	**30.15%** (-) n =5,768
	1999	**29.6%** (0.0017) n =68,633	**26.23%** (0.0034) n =16,560	**32.47%** (0.0036) n =17,027	**30.78%** (0.0036) n =16,882	**28.9%** (0.0034) n =18,164
	2000	**32.16%** (0.0018) n =65,649	**28.45%** (0.0032) n =19,451	**30.38%** (0.0035) n =17,358	**29.95%** (0.0040) n =13,271	**39.90%** (0.0039) n =15,669
	2001	**47.52%** (0.0022) n = 51,430	**34.55%** (0.0043) n = 12,227	**37.34%** (0.0044) n = 11,849	**49.09%** (0.0045) n = 12,273	**63.24%** (0.0039) n = 15,081
	2002	**72.57%** (0.0018) n = 60,392	**67.10%** (0.0038) n = 14,981	**71.47%** (0.0037) n = 14,823	**74.05%** (0.0037) n = 13,954	**78.64%** (0.0032) n = 16,634
SDG&E	1998	**15.41%** (-) n =6,510	**12.02%** (-) n =1,466	**14.29%** (-) n =1,487	**17.64%** (-) n =1,724	**17.30%** (-) n =1,833
	1999	**30.04%** (0.0032) n =20,564	**29.29%** (0.0064) n =4,995	**31.18%** (0.0066) n =4,868	**29.15%** (0.0065) n =4,872	**30.55%** (0.006) n =5,829
	2000	**36.28%** (0.0035) n =18,996	**30.74%** (0.0061) n =5,674	**32.54%** (0.0066) n =5,070	**33.42%** (0.0076) n =3,831	**47.79%** (0.0075) n =4,421
	2001	**25.55%** (0.0036) n = 14,803	**20.72%** (0.0068) n = 3,596	**24.33%** (0.0073) n = 3,485	**25.14%** (0.0073) n = 3,493	**31.02%** (0.0071) n = 4,229
	2002	**31.11%** (0.0040) n = 13,357	**27.40%** (0.0077) n = 3,318	**31.71%** (0.0081) n = 3,330	**34.85%** (0.0084) n = 3,185	**30.65%** (0.0078) n = 3,524
Other	1998	**12.92%** (-) n =14,554	**8.18%** (-) n = 3,448	**11.77%** (-) n =3,303	**14.76%** (-) n =3,589	**16.15%** (-) n =4,214
	1999	**27.68%** (0.0023) n =36,654	**24.10%** (0.0045) n =9,073	**27.92%** (0.0048) n =8,778	**28.28%** (0.0048) n =8,763	**29.35%** (0.0045) n =10,040
	2000	**29.72%** (0.0025) n =34,399	**26.47%** (0.0044) n =9,854	**27.41%** (0.0046) n =9,898	**27.18%** (0.0054) n =6,821	**37.80%** (0.0053) n =8,226
	2001	**39.22%** (0.0030) n = 26,558	**34.48%** (0.0060) n = 6,375	**38.91%** (0.0062) n = 6,217	**38.11%** (0.0060) n = 6,543	**45.00%** (0.0058) n = 7,423
	2002	**33.09%** (0.0026) n = 32,414	**29.47%** (0.0052) n = 7,792	**34.04%** (0.0053) n = 7,974	**35.62%** (0.0055) n = 7,619	**33.24%** (0.0050) n = 9,029

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

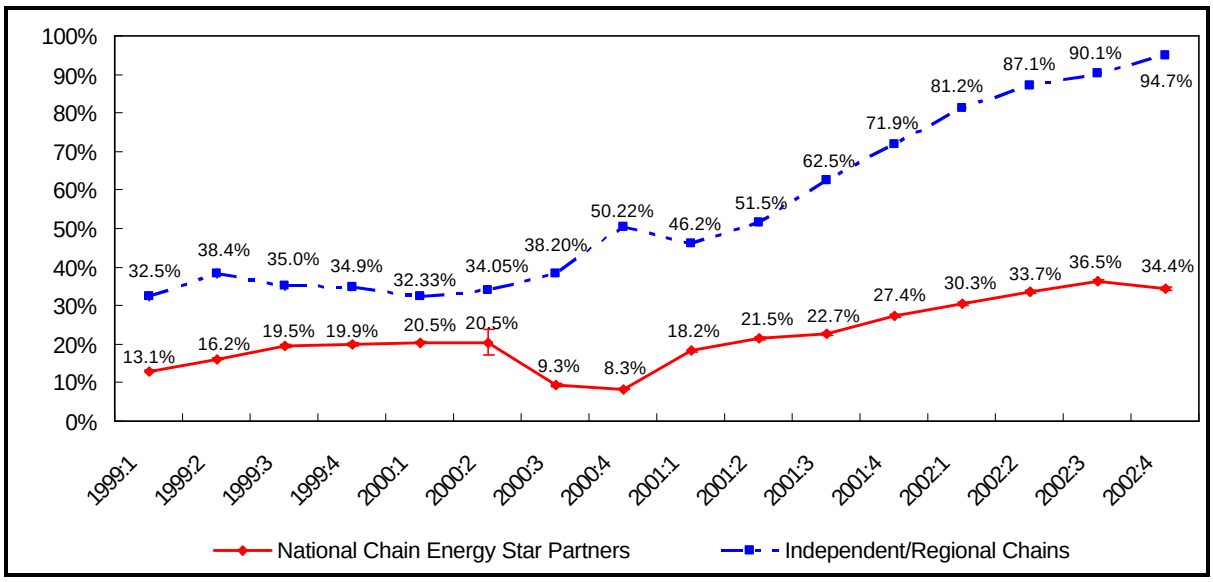
Comparison of National Chain and Independent Appliance Retailers

Figure 4-5 and Table 4-5 compare the shares of ENERGY STAR qualified dishwashers sold by national chain ENERGY STAR partners to shares of 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. Over the past four years, both national chains and independent appliance retailers have experienced significant growth in the share of ENERGY STAR dishwashers sold. With the exception of the decrease in the third and fourth quarters of 2000,[14] the share sold by national chains grew from 13.1% in the first quarter of 1999 to 34.4% in the last quarter of 2002. Even more noticeable is the increase among independent appliance retailers, which show an increase from 32.5% at the beginning of 1999 to 94.7% in the last quarter of 2002. In other words, almost all of the dishwashers sold by independent appliance retailers throughout California meet the criteria for ENERGY STAR qualification.

This growth in proportion of ENERGY STAR qualified models is most likely due to manufacturers creating more efficient models to meet upcoming expected changes in the testing procedures (i.e. changing from 322 cycles to 264 cycles and subsequently to 215 cycles). For example, manufacturers planning to change model efficiency from 322 to 264 cycles to meet the new testing requirement would need to manufacture units that operate at an annual 125 kWh less than previously required by the federal standard. Similarly, manufacturers planning to change model efficiency from 322 to 215 cycles to meet the new testing requirement would need to manufacture units that operate at an annual 232 kWh less than previously required. As these more efficient models became available before they were actually required, their EF, calculated at the higher number of cycles, often met or exceeded the ENERGY STAR qualification. Thus, the proportion of available models that met ENERGY STAR qualifications grew significantly, reaching 95% among independent retailers by the end of 2002. It is important to note that this growth reflects a changing mix of available models, with a larger proportion qualifying for ENERGY STAR, and not necessarily a change in consumer preferences. It is also important to note that this discussion refers to appliances that would qualify for an ENERGY STAR label based on their efficiency level, and it does not necessarily refer to appliances that carry the ENERGY STAR label.

[14] The decrease shown during the third and fourth quarters of 2000 is due to a change in participating retailers on a national level.

Figure 4-5: Dishwasher Sales, Percent of ENERGY STAR Qualified Units by Retailer Type



Error bands for the 90% confidence interval.

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
2002:1	**30.35%** (0.0027) n = 41,160	**81.18%** (0.0049) n = 6,245
2002:2	**33.72%** (0.0023) n = 40,640	**87.08%** (0.0039) n = 7,331
2002:3	**36.50%** (0.0025) n = 38,225	**90.08%** (0.0036) n = 7,073
2002:4	**34.43%** (0.0023) n = 44,304	**94.73%** (0.0027) n = 7,054

Detailed, Statewide Independent Appliance Retailer Analysis

The detailed data shared by independent retailers from 2000 through 2002 allowed the data to be analyzed in groupings of efficiency levels. Note that the ENERGY STAR threshold was 13% above the federal standard in 2000 and became 25% above the federal standard in 2001. In addition, when the DOE decreased the number of dishwasher cycles used in the calculation for energy factors for all units manufactured from July 1, 2002 onward, this change resulted in a lower efficiency rating of all dishwashers than previously calculated. This allowed the DOE to force higher efficiency levels without actually changing the federal standard energy factor for dishwashers.

Figure 4-6 clearly illustrates the high percentage of ENERGY STAR sales by the independent appliance retailers in California. For example, the majority of sales in 2000 were units with efficiencies between 13% to 26% above the federal standard, thus qualifying for ENERGY STAR. In 2001 when the ENERGY STAR specification changed, roughly 30% of units sold qualified for ENERGY STAR. In 2002, when the number of cycles used to calculate the energy factor rating was reduced, nearly all units sold by independent retailers qualified as ENERGY STAR.

Figure 4-6: Percent of Independent Dishwasher Sales by Efficiency Level

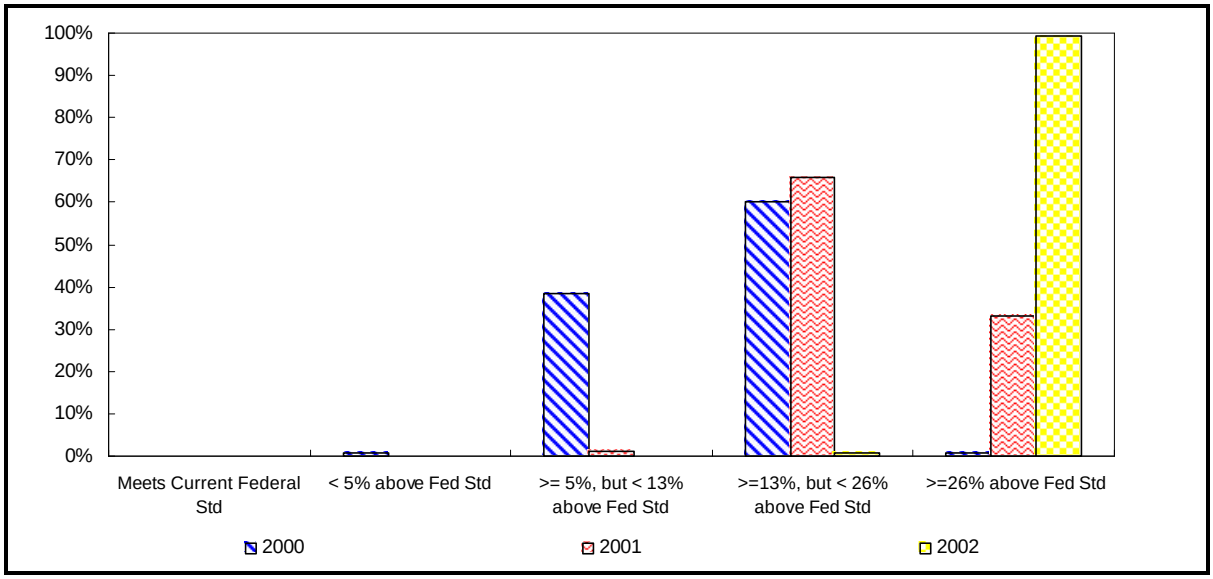
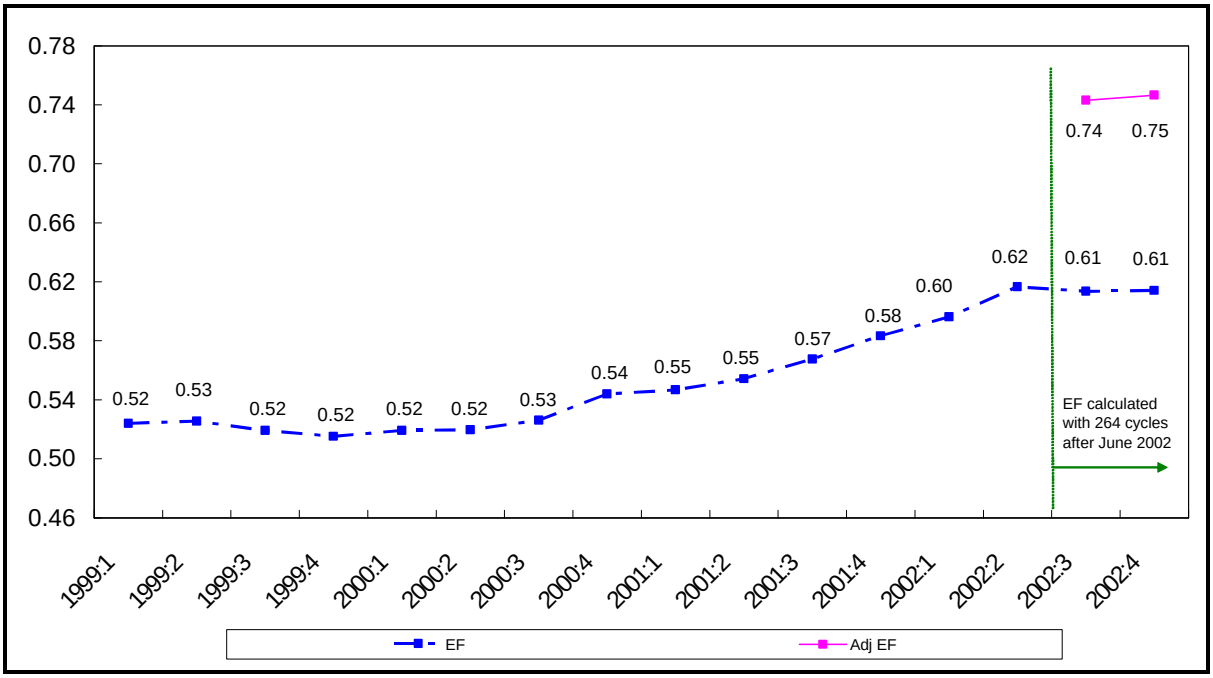


Figure 4-7 illustrates the average EF of dishwashers sold by independent appliance retailers throughout California from 2000 through 2002. As shown, after staying relatively stable during 1999 and 2000, the average EF rose during the fourth quarter of 2000 and continued to rise through the second quarter of 2002.

Please note that the energy factors for all dishwashers sold from July 1, 2002 onward, which were not directly matched to information from the ENERGY STAR program but where the project team calculated the EF, were calculated using the 264 cycles per year figure from the updated regulation by the DOE. For comparison, the second line in Figure 4-7, labeled "Adjusted EF," represents the EF as calculated with 322 cycles per year.

Figure 4-7: Average Energy Factor for Dishwashers Sold By Independent Appliance Retailers



As explained previously, the steady and significant increase in the share of ENERGY STAR qualified dishwashers sold by independent appliance retailers in California was caused by dishwasher manufacturers changing their products to adapt to changes in the number of cycles used to calculate energy factor. This also explains the dramatic growth in average EF throughout 2001 and the first two quarters of 2002. The reduction in the number of cycles has led manufacturers to create dishwashers with greater efficiency in order to continue to comply with the federal standard and/or to maintain ENERGY STAR qualification. In turn, the majority of available models offered to consumers by independent appliance retailers are now ENERGY STAR qualified, and the average EF of units sold exceeds the ENERGY STAR qualification.

5

Refrigerators

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 source of information for these estimates.

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

Measure	1998	1999	2000	2001	2002
Refrigerators	949,400	975,700	1,025,300	1,150,600	1,199,100

* AHAM.

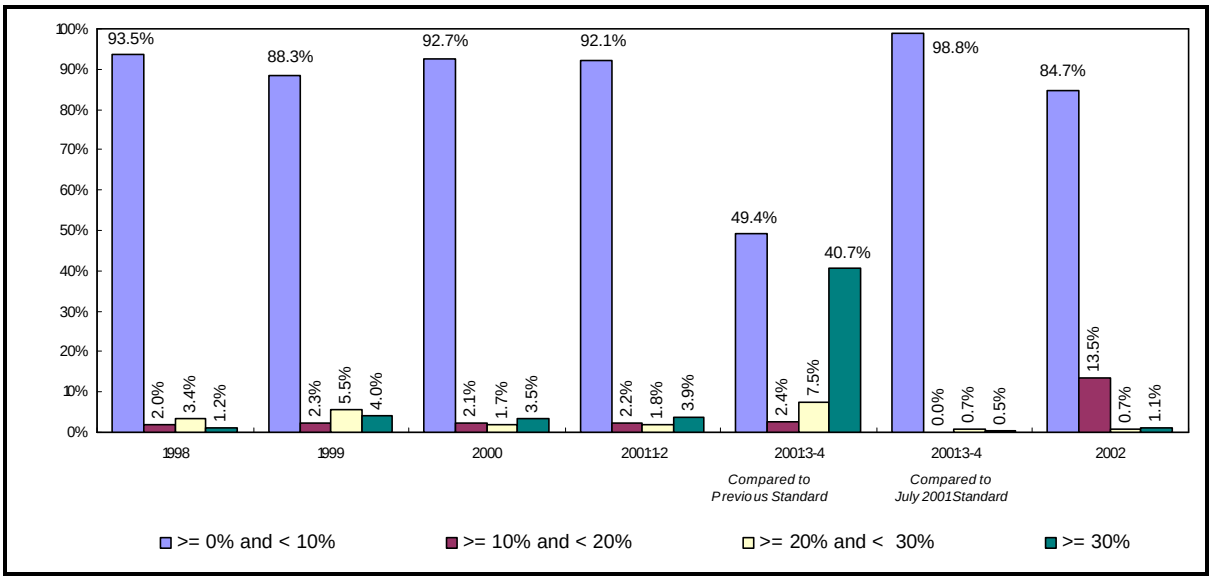
5.3 Characteristics of Available Models

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.

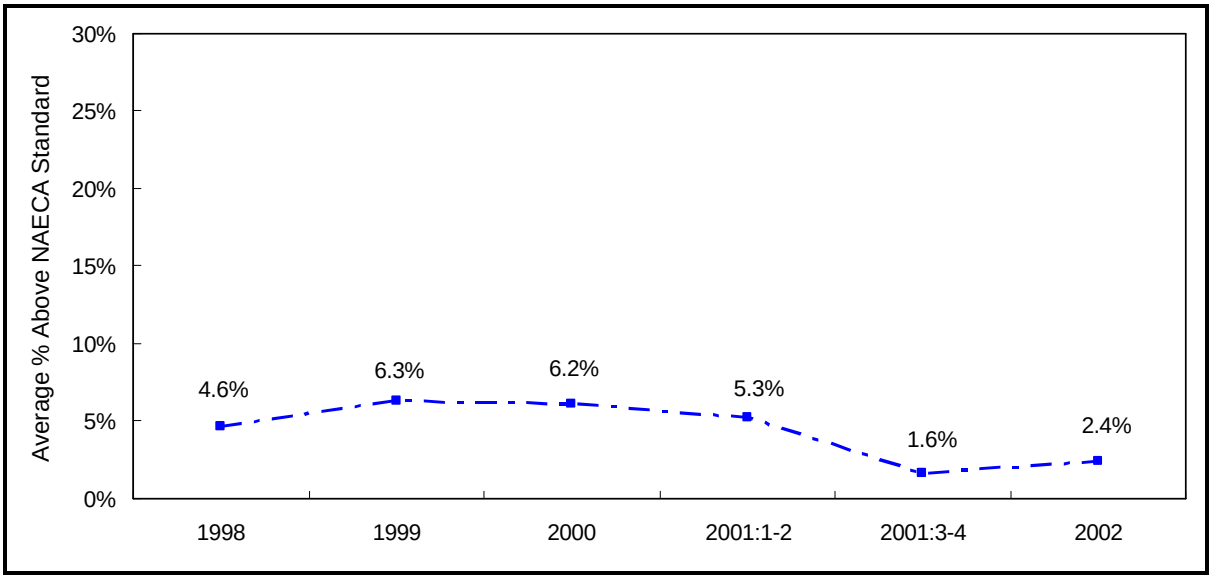
Figure 5-2 provides a time trend of the average percent above standard across all available refrigerator models. The decrease in the second half of 2001 corresponds to the increase in the federal energy use standard that took effect on July 1, 2001. The resulting average percent of available units above the federal standard is lower (i.e., fewer units are rated above standard 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).[15] 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 10% less kWh) and the Super Efficient Home Appliance (SEHA) initiative by the Consortium for Energy Efficiency (CEE).

Federal energy use standards for refrigerators changed on July 1, 2001.[16] The required energy use reductions from the former standard to the current standard vary by configuration, ranging between 27% and 32%. Six months prior to the standards change, AHAM's Directory of Certified Refrigerators and Freezers contained 1,217 refrigerator/freezer models with automatic defrost, yet only 25 of these already met the new standard. During the first half of 2001, manufacturers were preparing for the new energy use standards, which decreased refrigerators energy consumption an average of 25%.

Additionally, the ENERGY STAR standard, which took effect January 1, 2001, requires refrigerators to use 10% less energy than the July 1, 2001 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. The CEC also amended their appliance efficiency regulations in January 2002 to reflect the increase in the federal energy use standards. The CEC did not surpass the federal requirements for appliance efficiency standards.

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[15] Adjusted volume takes into account the differing temperatures between the refrigerator and freezer compartments with the following calculation: fresh volume plus (freezer volume times 1.63). The result is called the total adjusted volume and is used in the energy factor calculation.

[16] 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.

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

	Current Standard
Federal Standard	
Manual defrost	8.82*AV+248.4
Partial defrost	8.82*AV+248.4
Automatic defrost, top mount without TTD	9.80*AV+276.0
Automatic defrost, side mount without TTD	4.91*AV+507.5
Automatic defrost, bottom mount without TTD	4.40*AV+459.0
Automatic defrost, top mount with TTD	10.2*AV+356.0
Automatic defrost, side mount with TTD	10.1*AV+406.0
ENERGY STAR Qualification	10% less kWh than the Federal standard
SEHA Tier 1 Qualification	15%less kWh than the Federal standard
SEHA Tier 2 Qualification	20% less kWh than the Federal standard
SEHA Tier 3 Qualification	25% less kWh than the Federal standard
SEHA Tier 4 Qualification	30% less kWh than the Federal standard
CALIFORNIA STANDARDS	Identical to Federal Std

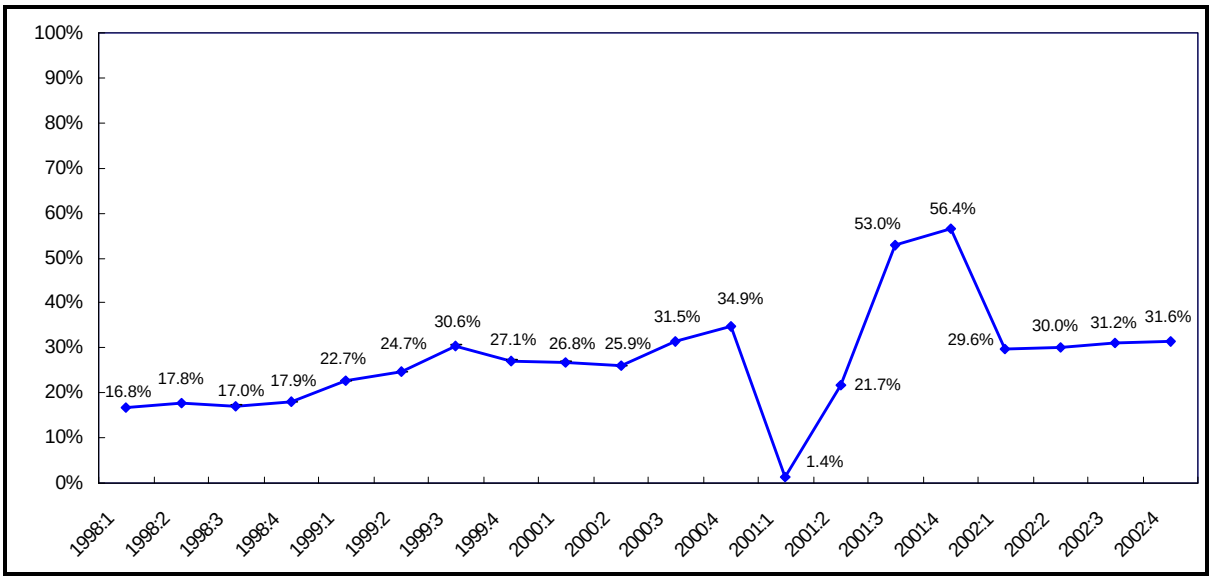
TTD = through-the-door ice dispenser.
AV = Adjusted Volume = Fresh Volume + (1.63*Freezer Volume).
SEHA (Super-Efficient Home Appliance) initiative standards were created by the Consortium for Energy Efficiency (CEE)

5.5 Market Share of ENERGY STAR Qualified Refrigerators

Figure 5-3 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 2002. In addition, Table 5-4 presents the same information broken down by utility area. As shown, the percent of ENERGY STAR refrigerators remained relatively steady throughout 1999 and 2000. The abrupt decrease in market share to almost 0% during the first quarter of 2001 is due to the lack of refrigerators available for purchase that met the new increased ENERGY STAR specification. The ENERGY STAR specification changed on January 1, 2001 and stated that qualified refrigerators had to use 10% less energy than allowed by the July 1, 2001 federal energy use standard. In turn, the growth in share from the first to the second quarter, and then again from the second to the third quarter of 2001, is attributable to manufacturers preparing for the 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.

In addition to the increasing availability of ENERGY STAR qualified refrigerators, it seems likely that utility incentive programs also affected market share shown in 2001. The peaks seen in the third and fourth quarter of 2001 seem to correlate with utility incentives that encouraged consumers to purchase ENERGY STAR qualified refrigerators. Recent research by the project team indicates that these incentives began July 1, 2001 and ended December 31, 2001. The subsequent decrease in ENERGY STAR share in 2002 would therefore be associated with the lack of utility incentives.

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	**17.35%** (-) n = 230,171	**16.81%** (-) n = 46,004	**17.77%** (-) n = 55,309	**17.03%** (-) n = 76,525	**17.93%** (-) n = 52,333
1999	**26.49%** (0.0006) n = 473,882	**22.65%** (0.0013) n = 110,181	**24.66%** (0.0012) n = 121,250	**30.55%** (0.0013) n = 130,514	**27.09%** (0.0013) n = 111,937
2000	**29.78%** (0.0007) n = 490,296	**26.84%** (0.0013) n = 115,865	**25.93%** (0.0012) n = 145,173	**31.49%** (0.0013) n = 122,865	**34.94%** (0.0015) n = 106,393
2001	**35.39%** (0.0007) n = 522,010	**0.01%** (0.0004) n = 104,765	**21.71%** (0.0010) n = 146,412	**52.99%** (0.0013) n = 148,463	**56.41%** (0.0014) n = 122,370
2002	**30.61%** (0.0006) n = 694,594	**29.62%** (0.0012) n = 155,115	**29.97%** (0.0011) n = 181,401	**31.24%** (0.0010) n = 198,236	**31.55%** (0.0012) n = 159,842

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 [1, 2]				
		Annual	Q1	Q2	Q3	Q4
PG&E	1998	**17.37%** (-) n =90,493	**17.88%** (-) n = 19,547	**19.13%** (-) n =21,576	**16.29%** (-) n =28,722	**16.53%** (-) n =20,648
	1999	**28.43%** (0.0011) n =157,639	**23.36%** (0.0021) n =38,313	**24.60%** (0.0021) n =40,307	**31.46%** (0.0023) n =41,424	**34.38%** (0.0025) n =37,595
	2000	**34.97%** (0.0011) n =179,113	**34.30%** (0.0023) n =42,475	**31.14%** (0.0020) n =52,914	**34.57%** (0.0023) n =43,030	**40.57%** (0.0024) n =40,694
	2001	**35.50%** (0.0011) n = 206,711	**0.02%** (0.0006) n = 43,728	**26.75%** (0.0018) n = 58,424	**54.55%** (0.0021) n = 57,738	**53.94%** (0.0023) n = 46,821
	2002	**37.29%** (0.0010) n = 252,536	**35.86%** (0.0020) n = 57,267	**37.83%** (0.0019) n = 66,242	**38.50%** (0.0018) n = 70,350	**36.71%** (0.0020) n = 58,677
SCE	1998	**16.17%** (-) n =69,987	**14.16%** (-) n =13,179	**15.81%** (-) n =17,023	**16.25%** (-) n =24,049	**18.13%** (-) n =15,736
	1999	**25.39%** (0.0011) n =168,527	**21.47%** (0.0021) n =37,392	**23.68%** (0.0020) n =43,460	**30.44%** (0.0021) n =48,231	**24.62%** (0.0022) n =39,444
	2000	**24.59%** (0.0011) n =165,926	**19.99%** (0.0020) n =39,486	**20.44%** (0.0018) n =49,416	**27.98%** (0.0022) n =42,985	**29.14%** (0.0024) n =34,039
	2001	**42.80%** (0.0012) n = 174,894	**0.01%** (0.0006) n = 32,063	**20.38%** (0.0018) n = 49,836	**63.69%** (0.0021) n = 50,445	**68.12%** (0.0023) n = 42,550
	2002	**26.43%** (0.0009) n = 231,730	**25.92%** (0.0019) n = 51,988	**24.30%** (0.0017) n = 60,352	**26.56%** (0.0017) n = 67,547	**29.16%** (0.0020) n = 51,843
SDG&E	1998	**23.10%** (-) n =17,969	**25.41%** (-) n =2,980	**21.12%** (-) n =4,484	**22.83%** (-) n =6,434	**24.00%** (-) n =4,071
	1999	**29.80%** (0.0023) n =39,695	**28.53%** (0.0046) n =9,483	**29.01%** (0.0045) n =10,237	**32.16%** (0.0046) n =10,417	**28.99%** (0.0046) n =9,558
	2000	**37.37%** (0.0024) n =39,102	**29.53%** (0.0048) n =9,036	**29.99%** (0.0044) n =10,749	**41.96%** (0.0047) n =10,671	**44.66%** (0.0053) n =8,646
	2001	**28.99%** (0.0022) n = 43,135	**0.01%** (0.0010) n = 9,221	**23.29%** (0.0039) n = 11,829	**40.15%** (0.0045) n = 12,045	**48.10%** (0.0050) n = 10,040
	2002	**29.14%** (0.0020) n = 53,498	**27.40%** (0.0077) n = 3,318	**31.71%** (0.0080) n = 3,330	**34.85%** (0.0084) n = 3,185	**30.65%** (0.0078) n = 3,524
Other	1998	**13.90%** (-) n =51,722	**13.00%** (-) n = 10,298	**13.94%** (-) n =12,226	**13.87%** (-) n =17,320	**14.69%** (-) n =11,878
	1999	**21.69%** (0.0013) n =108,021	**18.56%** (0.0025) n =24,993	**20.11%** (0.0024) n =27,246	**22.82%** (0.0024) n =30,442	**24.72%** (0.0027) n =25,340
	2000	**25.03%** (0.0013) n =106,155	**22.70%** (0.0026) n =24,868	**23.19%** (0.0024) n =32,094	**26.63%** (0.0027) n =26,179	**27.89%** (0.0029) n =23,014
	2001	**18.95%** (0.0013) n = 97,270	**0.01%** (0.0008) n = 19,753	**12.02%** (0.0020) n = 26,323	**26.23%** (0.0026) n = 28,235	**33.36%** (0.0031) n = 22,959
	2002	**24.85%** (0.0011) n = 156,830	**23.32%** (0.0023) n = 33,661	**23.78%** (0.0021) n = 41,022	**26.23%** (0.0021) n = 44,999	**25.76%** (0.0023) n = 37,148

1 Standard errors in parentheses.

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

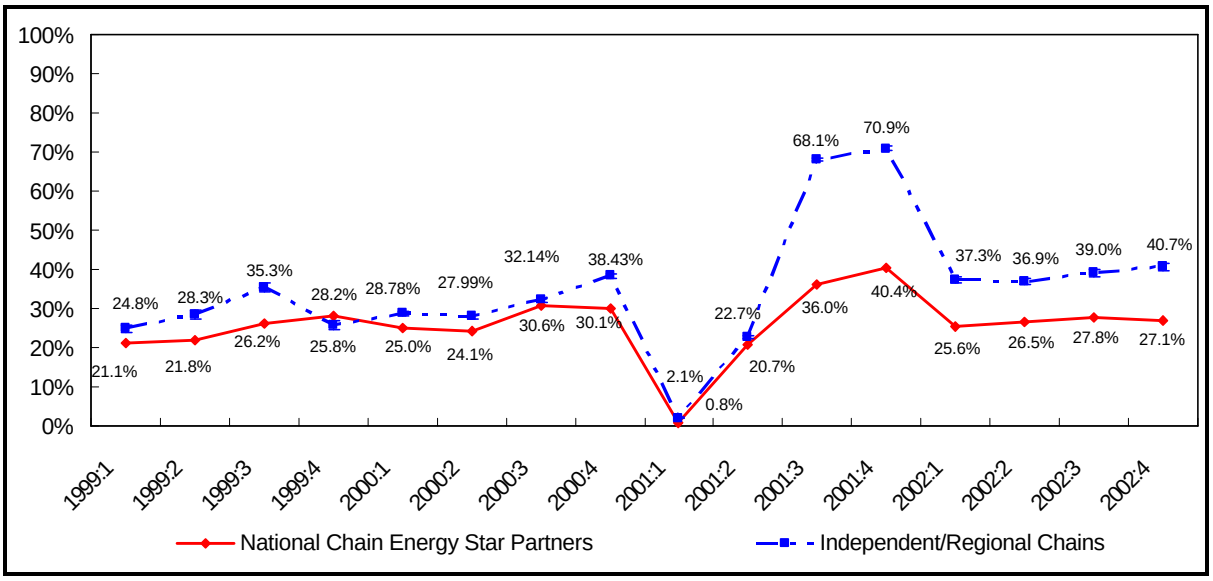
3 Data from 1998 reflect national chain D&R data only.

5.6 Analysis by Market Channel

Comparison of National Chain and Independent Appliance Retailers

Figure 5-4 and Table 5-5 compare the market shares of ENERGY STAR qualified refrigerators sold by national chain ENERGY STAR partners to market shares of ENERGY STAR qualified refrigerators sold by independently owned stores and regional chains. With the exception of the fourth quarter of 1999,[17] the share sold by the national chains is lower than the share sold by the independent appliance retailers in California. The decrease in market shares in 2001 was explained above in the discussion of Figure 5-3.

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



Error bands for the 90% confidence interval.

[17] A much smaller sample size was used for independent chains in 1999, as compared to sample sizes in 2000 and 2001, and this should be kept in mind when considering the results.

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
2002:1	**25.57%** (0.0011) n = 147,043	**37.27%** (0.0054) n = 8,072
2002:2	**26.51%** (0.0011) n = 172,062	**36.91%** (0.0050) n = 9,339
2002:3	**27.78%** (0.0010) n = 189,973	**39.05%** (0.0054) n = 8,263
2002:4	**27.07%** (0.0011) n = 152,300	**40.66%** (0.0057) n = 7,542

Detailed, Statewide Independent Appliance Retailer Analysis

This subsection presents percentages of sales of independent or regional retailers by efficiency groupings and average energy factors. These results are possible due to line item detail provided by the participating independent appliance retailers throughout California. Figure 5-5 presents the results. When viewing this graph, it is important to remember the change over time in the ENERGY STAR specification, summarized as follows:

- For 2000: 20% above the federal standard in effect for that year;
- For 2001: 10% above the federal standard which took effect July 1, 2001 (ENERGY STAR used the new standard for the entire year); and
- For 2002: continuation of the same specification used in 2001.

Figure 5-5: Percent of Independent Refrigerator Sales by Efficiency Level

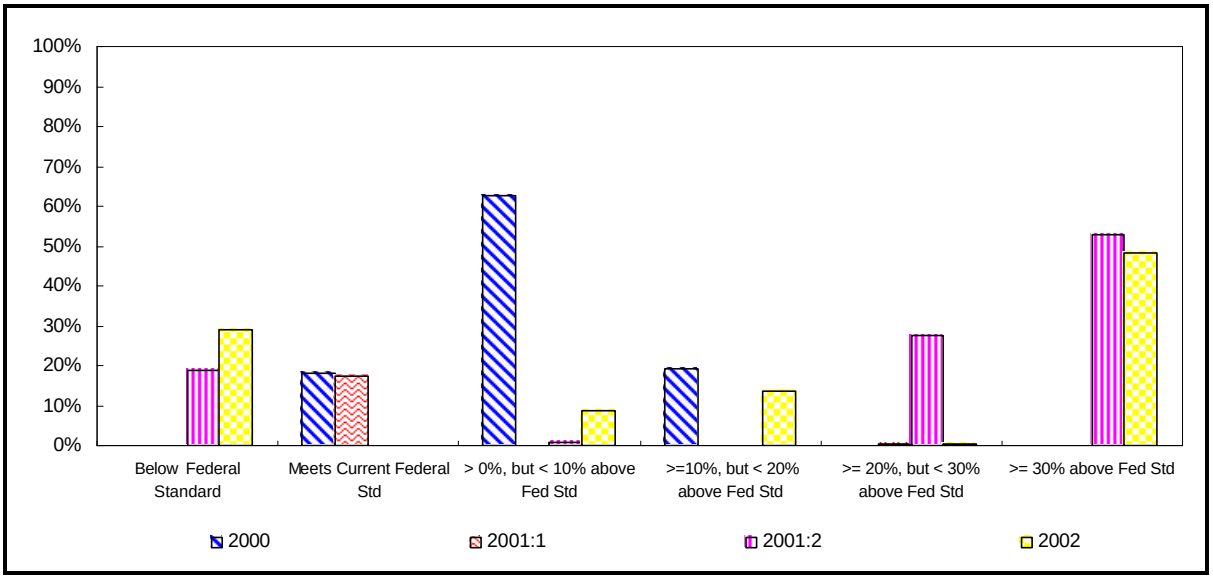


Figure 5-5 presents 2001 results in two halves, where "2001:1" refers to the first six months of the year, and "2001:2" refers to the latter six months of the year. As shown, during the first half of 2001, no sales of refrigerators by independent retailers met ENERGY STAR criteria. During the second half of the year, however, the majority of units sold met or exceeded ENERGY STAR criteria. This result is likely due to ENERGY STAR basing their specification on new standards, which were not yet in effect during the first half of the year.

Energy Factor Analysis

This section discusses 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

specification change for ENERGY STAR that took place in 2001 made it difficult to compare results over time.

The energy factor for refrigerators is calculated as follows:

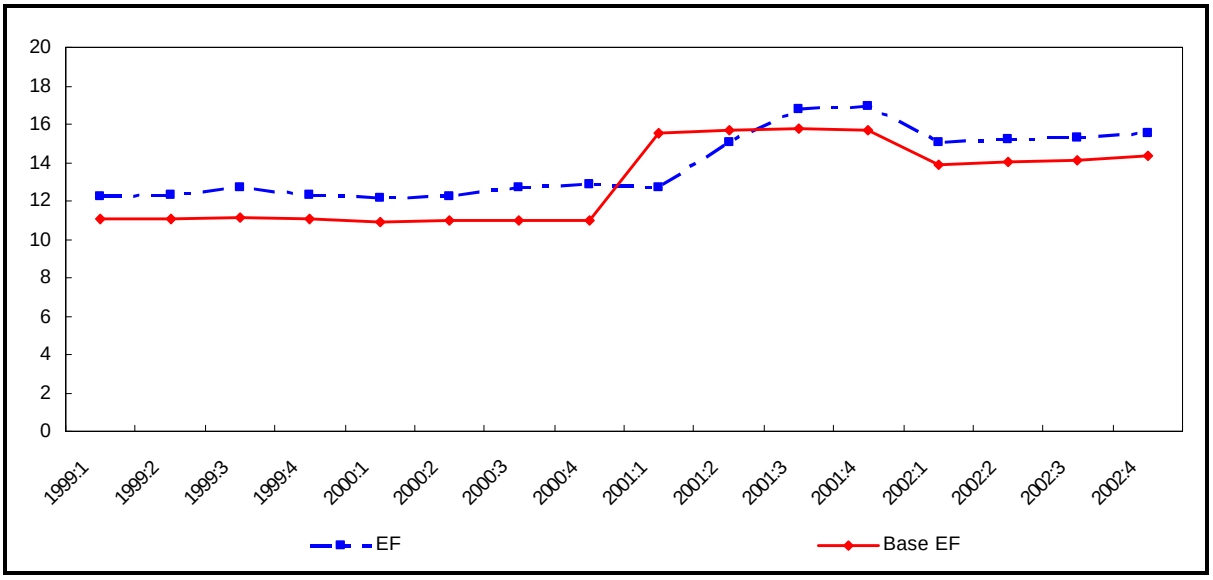
$$EF = \frac{\text{Adjusted Volume}}{\text{Annual Energy Usage}\left(\text{kWh}\right)/\,365}$$

where the *Adjusted Volume* is the fresh volume of the unit plus 1.63 times the unit's freezer volume.

Figure 5-6 illustrates the average EF of refrigerators sold by independent appliance retailers throughout California from 2000 through 2002. In addition, a second line called the "Base EF" is included and represents the ENERGY STAR standard against which to compare the EF. As described previously in this section, the "Base EF" is different from the actual federal standard because, during the first two quarters of 2001, the ENERGY STAR program measured their efficiency threshold against the new federal standard, which did not take effect until July 1, 2001.

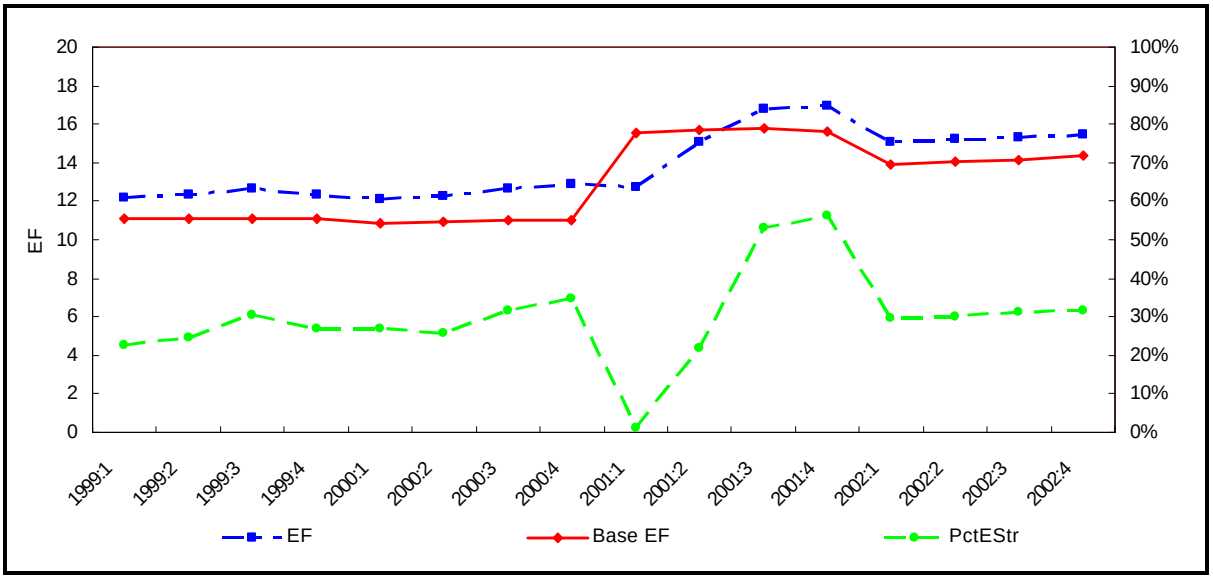
Figure 5-7 examines the relationship between the market share for independent appliance retailers of ENERGY STAR refrigerators, previously shown in Figure 5-4, and the average energy factors previously shown in Figure 5-6. It is of interest due to the clear visual representation of the increase in ENERGY 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.

Figure 5-6: Average Energy Factor for Refrigerators Sold By Independent Appliance Retailers Compared to Average ENERGY STAR Standard



Base EF is the average EF for refrigerator models sold by independent retailers, calculated with the appropriate federal standard for that time. It represents the measure against which the ENERGY STAR standard is measured. In 1999, 2000, the second half of 2001, and 2002, it is based on the actual federal standard. In the first half of 2001, however, the base EF is calculated from the new federal standard, which did not take effect until 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

6.1 Overview

This section discusses total room air conditioner (RAC) 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

Manufacturer shipment data from the Association of Home Appliance Manufacturers (AHAM) was used to estimate unit sales. After examining the data received, it was found that the number of units shipped in 2001 was significantly higher than other years, and it was unclear if all the RAC units that shipped into California during 2001 were actually sold in the state that same year. One explanation might be that the units in question were sold by the home improvement retail segment, as the units sold by this segment are not represented in either the national chain data or independent retailer sales data obtained for the RMST. However, because the number of units shipped in 2002 decreased, it is not likely that this explanation would account for all of the 2001 increase.

Table 6-1 presents the estimates of annual unit sales of room air conditioners used in the development of market shares in this report. The table reflects the increased quantity in 2001 as described above. Most room air conditioning units are typically sold during the second and third quarter of the year. Due to the seasonal nature of this appliance, quarterly analysis fluctuates greatly. Therefore, the results in this report are annual.

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

Measure	1998	1999	2000	2001	2002
Room Air Conditioners	231,100	278,600	279,600	409,200	316,200

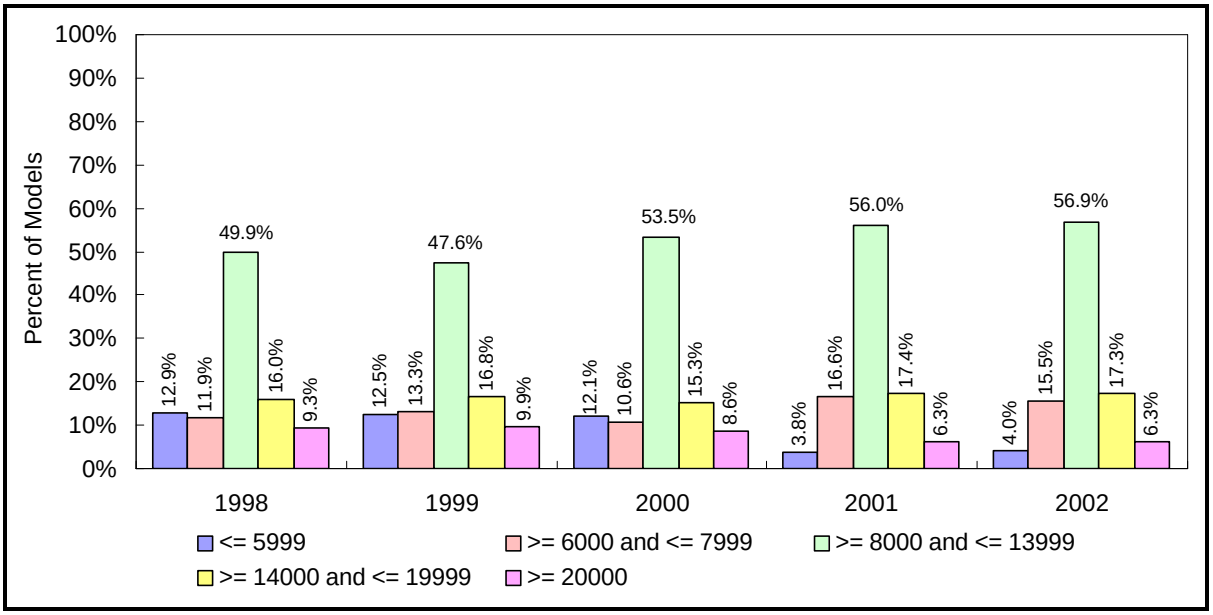
* AHAM

6.3 Characteristics of Available Models

Figure 6-1 presents currently available room air conditioner models by output capacity. As shown, approximately half of the room air conditioners available from 1998 through 2002 have rated output capacities between 8,000 and 14,000 Btuh.

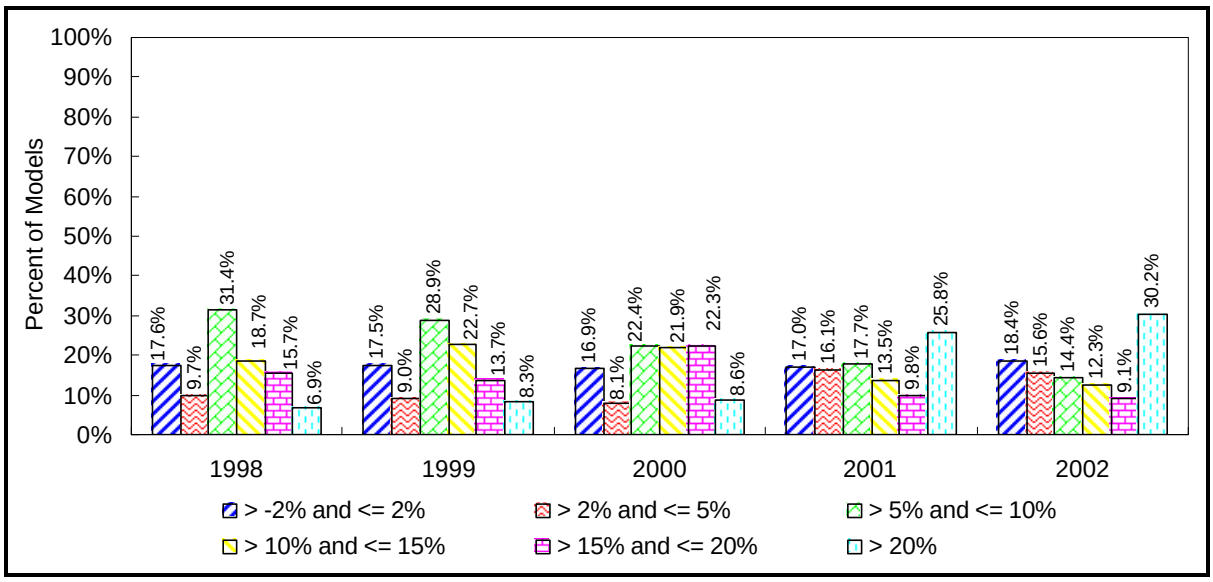
Figure 6-2 shows the percentages of available room air conditioners by efficiency groupings, which are grouped according to percentages above the federal standard. In this graph, 1998 through 2000 models are compared to the federal energy use standard for room air conditioners that was in effect during that time. This standard was updated on October 1, 2000. However, due to the low levels of room air conditioner sales in the fourth quarter of the year, all 2000 units were compared against the old standard. In contrast, all 2001 and 2002 models are compared 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, while 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: CEC

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



Source: CEC

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. As explained above, federal energy efficiency standards for room air conditioners were updated on October 1, 2000, and the former standards had been in effect since January 1, 1990. Room air conditioners must exceed the federal standard by at least 10% to qualify for the ENERGY STAR label. Additionally, the CEC amended their appliance efficiency regulations in January 2002 to reflect and equal the increase in the federal energy use standards.

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

Btuh	Configuration	Standard	ENERGY STAR	California Standards
< 6,000	Without reverse cycle and with louvered sides	9.7	10.7	9.7
	Without reverse cycle and without louvered sides	9.0		9.0
6,000 – 7,999	Without reverse cycle and with louvered sides	9.7	10.7	9.7
	Without reverse cycle and without louvered sides	9.0		9.0
8,000 - 13,999	Without reverse cycle and with louvered sides	9.8	10.8	9.8
	Without reverse cycle and without louvered sides	8.5		8.5
14,000 - 19,000	Without reverse cycle and with louvered sides	9.7	10.7	9.7
	Without reverse cycle and without louvered sides	8.5		8.5
> 20,000	Without reverse cycle and with louvered sides	8.5	9.4	8.5
	Without reverse cycle and without louvered sides	8.5		8.5
< 14,000	With reverse cycle and without louvered sides	8.5		8.5
≥ 14,000	With reverse cycle and without louvered sides	8.0		8.0
< 20,000	With reverse cycle and with louvered sides	9.0		9.0
≥ 20,000	With reverse cycle and with louvered sides	8.5		8.5
	Casement only	8.7		8.7
	Casement slider	9.5		9.5

1. These current standards took effect on October 1, 2000.
2. 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 from 1998 through 2002. As shown, the market share of ENERGY STAR room air conditioners has increased dramatically during the past two years. Note that, although results are shown annually, most sales typically occur during the middle two quarters of each year.

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

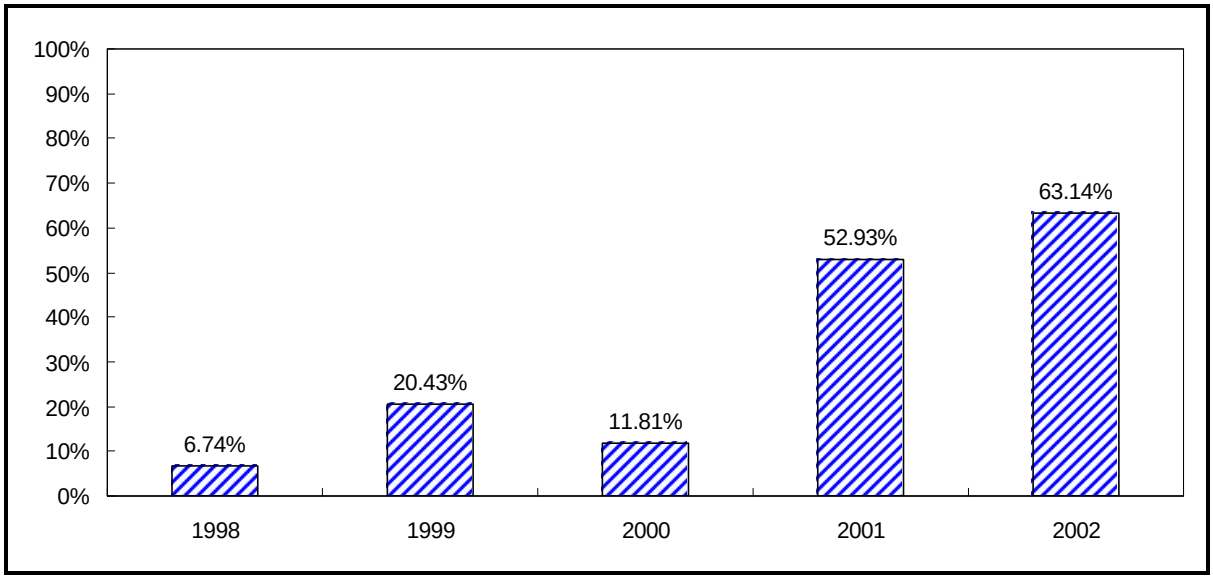


Table 6-3 presents the numbers represented in Figure 6-3. Table 6-4 presents the same information by utility area.

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

Year	Annual Percent of ENERGY STAR Qualified Room Air Conditioners
1998	**6.73%** (-) n = 19,087
1999	**20.43%** (0.0038) n = 11,176
2000	**11.81%** (0.0016) n = 42,562
2001	**28.80%** (0.0024) n = 35,003
2002	**63.14%** (0.0024) n = 39,504

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 [1, 2]
PG&E	1998	**6.41%** (-) n =5,636
	1999	**21.65%** (0.0073) n =3,217
	2000	**14.22%** (0.0028) n = 16,007
	2001	**80.46%** (0.0037) n = 11,331
	2002	**67.71%** (0.0043) n = 12,105
SCE	1998	**5.88%** (-) n =6,118
	1999	**6.46%** (0.0041) n =3,576
	2000	**8.54%** (0.0025) n = 13,017
	2001	**28.58%** (0.0042) n = 11,322
	2002	**44.80%** (0.0045) n = 12,024
SDG&E	1998	**4.53%** (-) n =728
	1999	**6.35%** (0.0154) n =252
	2000	**15.83%** (0.0083) n =1,927
	2001	**18.92%** (0.0105) n = 1,401
	2002	**43.58%** (0.0126) n = 1,558
Other	1998	**8.05%** (-) n =6,605
	1999	**6.71%** (0.0039) n =4,131
	2000	**17.01%** (0.0310) n = 147
	2001	**16.94%** (0.0036) n = 10,949
	2002	**47.49%** (0.0042) n = 13,817

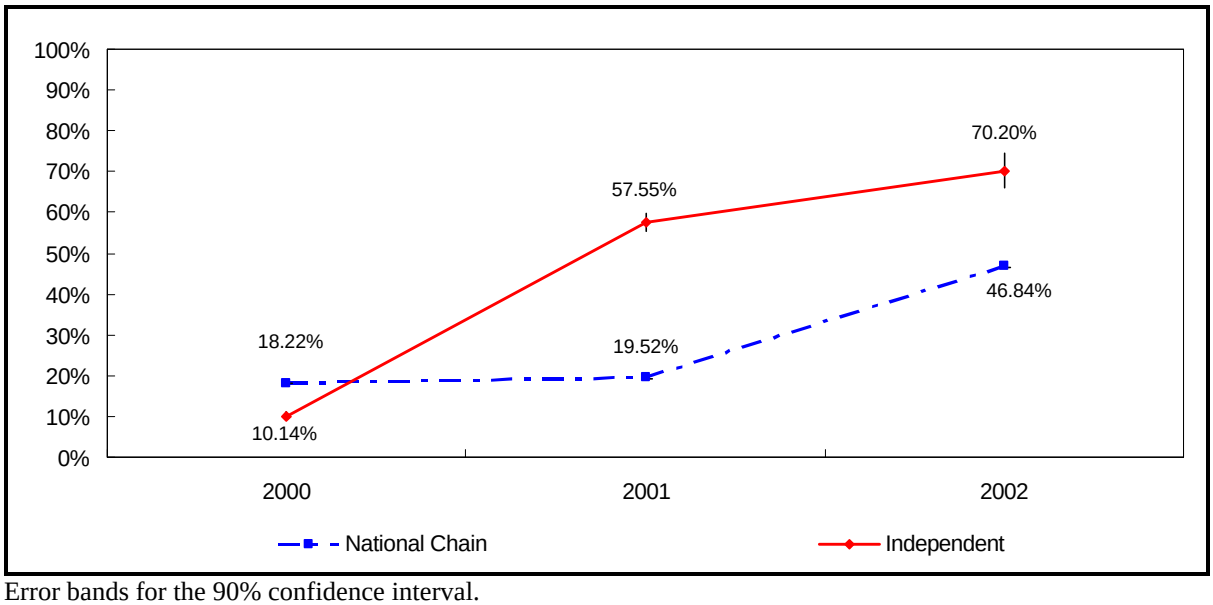
1 Standard errors in parentheses.

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

6.6 Analysis by Market Channel

Figure 6-4 and Table 6-5 present market shares of ENERGY STAR room air conditioners for independent retailers and national chains. As shown, over the past two years, a greater percentage of sales through independent retailers are ENERGY STAR units as compared to sales of national chains. For example, in 2002, 70% of independent retailer sales of room air conditioners were ENERGY STAR units, while roughly 47% of national chain sales qualified as ENERGY STAR. However, it is important to understand that room air conditioner sales are decreasingly sold by traditional retail appliance vendors and more by larger chain stores. Thus, while independent appliance retailers have generally sold a decreasing overall state market share of room air conditioners (some evidence of this is seen in Table 6-5), the percentage of units sold that meet the ENERGY STAR qualification is increasing (as shown in Figure 6-4).

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



Error bands for the 90% confidence interval.

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**
2000	**11.58%** (0.0005) n =367,970	**10.14%** (0.0063) n =2,314
2001	**16.32%** (0.0006) n =399,461	**30.09%** (0.0122) n =1,408
2002	**46.84%** (0.0025) n =399,202	**70.20%** (0.0263) n =302

7

Work in Progress and Fifth-Year Tracking Activities

In the fifth year, the project team will expand the overall market share tracking effort to include commercial air conditioning units. These results will be incorporated into the HVAC portion of the study. Therefore, the project will begin to be referred to as the MST, for Market Share Tracking, as opposed to RMST, for Residential Market Share Tracking.

Additionally, the team will renew its recruitment efforts in order to increase the precision of the impact analysis of independent retailers on the household appliance market. Itron strives to meet the 20% goal for independent sample size, and continues efforts to improve geographic coverage. 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 fifth-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, and
- Assisting D&R International with their efforts to recruit their ENERGY STAR partner home improvement retailers to share appliance sales data.

The project team plans to publish a semi-annual appliance summary, which will contain California independent retailer information and estimated national data for the first half of 2003. Itron will also continue monitoring changes in federal standards (National Appliance Energy Consumption Act or NAECA) or testing procedures. The impact of these changes will continue to be evaluated.

Appendix A

Data Detail and Analysis

A.1 Appliance ENERGY STAR Sales Data Analysis

Itron 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 2002 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, Itron 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.[1] 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, Itron 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. Itron 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, Itron 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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[1] California Energy Commission. Appliance Efficiency Database. 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, Itron 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, Itron expanded sales by a revenue-multiplier as a proxy for total unit sales:[2]

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

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^{nc} is the total revenues from appliance sales by all national chain (*nc)* ENERGY STAR partners in 1999.[3]
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

[2] D&R International provided revenue data to Itron for creation of revenue multipliers.

[3] 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.[4]

[4] Because 1998 sales data do not accurately represent California's appliance market, Itron 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.