California Residential Efficiency Market Share Tracking

Appliances 2006

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Appendix A Appliance Sales Data Analysis

1

Introduction

1.1. Overview

This report summarizes the analysis and results of the appliance component of the California Residential Market Share Tracking project (RMST).[1] The RMST project has monitored the market penetration of energy efficient measures in California since 1999 and supports California's investor-owned utilities (IOUs) in their program planning and efforts to measure statewide and IOU-specific program milestones for promoting short-term adoption of measures and longer-term market acceptance of energy efficient technologies.[2] In addition to appliances, the RMST project estimates the average efficiency rating and market penetration of high efficiency residential gas furnaces, central air conditioners, and heat pumps and examines the market penetration of compact fluorescent and other medium screw-based lamps.[3] In addition to the California IOUs, beneficiaries of this research include federal and state agencies, regional and state energy efficiency organizations, trade organizations, equipment manufacturers, distributors, and retailers.

This report presents the total estimated unit sales, average energy efficiency ratings, and percent of ENERGY STAR® qualified clothes washers, refrigerators, dishwashers, and room air conditioners sold in California from 1998 through 2006. Wherever possible, the results are presented within the following categories: statewide sales, sales within IOU service areas, and sales by retailer type (national chain versus independent retailer). This report contains general market information and a review of data collection and analysis methodologies. Summaries of applicable efficiency standards are provided for each appliance type, including federal energy use standards, national ENERGY STAR program standards, and California appliance efficiency standards.

The market trends of ENERGY STAR qualified appliances are especially pertinent to program administrators, especially the California IOUs. California's statewide appliance program uses the ENERGY STAR threshold as the qualifying criterion for appliance eligibility and has partnered with the federal ENERGY STAR program for marketing and

1 An eight-page companion report titled *California Appliance Trends 2006* summarizes the findings in this report.

2 This project is managed by Southern California Edison and funded by the California Public Goods Charge.

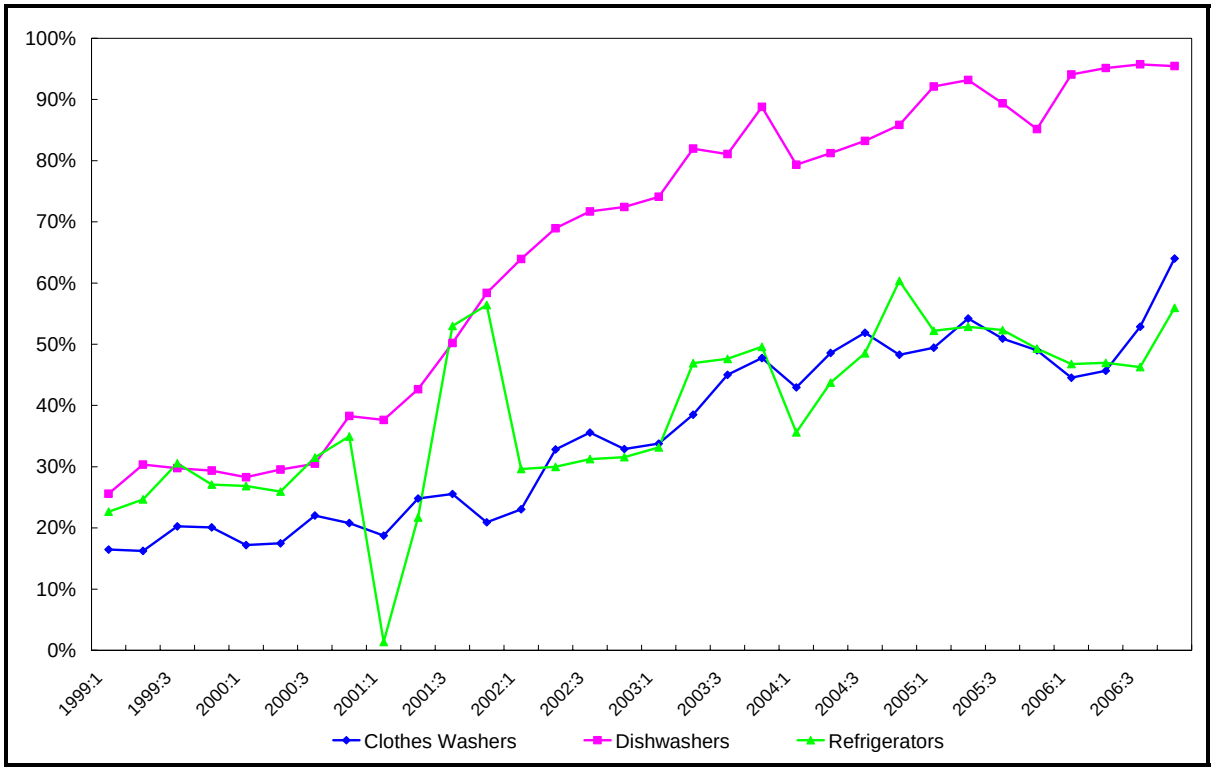
3 Annual RMST reports detailing CFL sales, residential appliance sales, and HVAC sales in California since 2000 can be downloaded from http://www.calmac.org/.

outreach. The share of ENERGY STAR qualifying appliances sold in the state can be a valuable indicator of program success and is used to support the evaluation of the statewide program.

1.2. Highlights

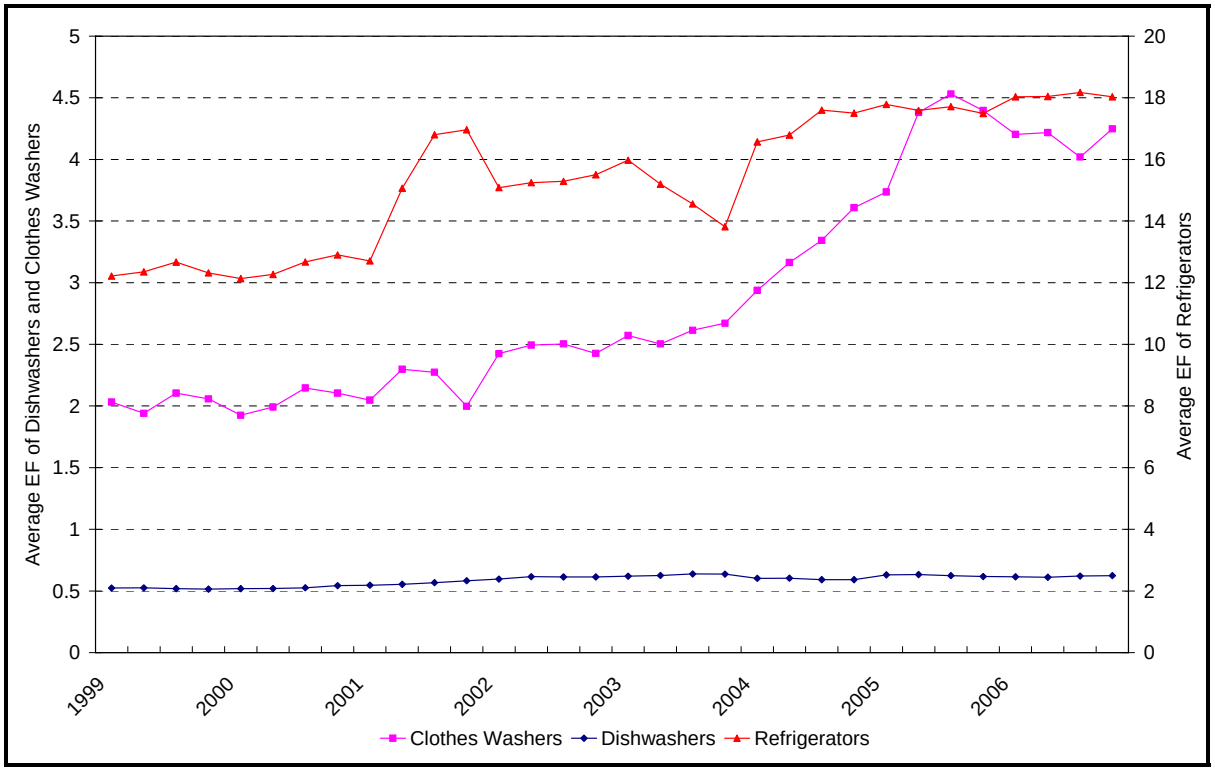
The trends in the market penetration of ENERGY STAR qualified appliances and the average energy efficiency ratings since 1999 reveal some rather notable trends. First, the data reveal distinct reaction of market penetration when the ENERGY STAR standards change. Figure 1-1 shows that each appliance type exhibited an initial dip in ENERGY STAR market share as a result of the ENERGY STAR standards change in the beginning of 2004. As anticipated, shares rebounded quickly (within a few quarters) to levels prior to the change. The data reveal distinct differences in the shares of ENERGY STAR qualified units sold through national chains compared to independent retailers. The percentage of ENERGY STAR sales through independent retailers has generally been greater than the percentage of ENERGY STAR sales through national chains in California.

Figure 1-1: Market Shares of Energy Star Qualified Appliances -— California



Since the inception of the RMST study, the average efficiency levels of clothes washers, dishwashers, and refrigerators have increased. Figure 1-2 presents the average energy factors (EFs) for clothes washers, dishwashers and refrigerators sold by independent appliance retailers from 1999 through 2006. During this period, the average EF for clothes washers increased from 2.0 to 4.2 and the average EF for refrigerators increased from 12.2 to 18.0. Also, the average EF for dishwashers increased from 0.52 in 1999 to 0.62 in 2006 despite a slight decrease in 2004 following a revision in the calculation of dishwasher EF

Figure 1-2: Average EF of Appliances Sold by Independent Retailers in California



1.3. Organization of the Report

The remainder of this report is organized as follows.

- Section 2 details the data collection and analysis methodology for developing the market share and average efficiency estimates.
- Section 3 presents the results for clothes washers.
- Section 4 presents the results for dishwashers.
- Section 5 presents the results for refrigerators.
- Section 6 presents the results for room air conditioners.

2

Data Collection and Analysis

2.1. Overview

The appliance component of the RMST project estimates the share of ENERGY STAR qualified units sold and average efficiency ratings from retailer point-of-sale (POS) data. In general, the appliance retail market is comprised of two retailer types: national chain stores and independently owned retailers, which include regional appliance chains and single storefronts. POS data can be obtained from a representative sample of both retailer types to accurately reflect trends in the appliance market. Since the inception of the RMST project, Itron has obtained sales data from a panel of independent appliance retailers throughout California. Data from national appliance retailers are provided by D&R International, a firm under contract with the U.S. Department of Energy (DOE) to administer the federal ENERGY STAR appliance program.[4]

The remainder of this section provides an overview of California's appliance retail market and describes the data collection and analysis methodologies. Appendix A provides a more technical description of the sales data analysis.

2.2. Summary of California's Appliance Retail Market

The analysis of appliance sales relies on collecting POS data from a representative sample of appliance retailers. Table 2-1 presents estimates of the population of appliance retailers and number of storefronts in California in 2006. The table distinguishes between national chain retailers, independent regional chains and independent retailers with one storefront. All national chain storefronts are assumed to be ENERGY STAR partners. Although trends vary according to appliance type, anecdotal evidence suggests that national chains sell, on average, half of all the appliances sold in California.

[4] www.drintl.com

Table 2-1: Estimate of California Appliance Retailers

	National Chains	Independent Regional Chains	Independent Individual Stores	All Retailers
Companies	6	21	330	357
ENERGY STAR Partners [a]	6	1	0	7
Retail Storefronts	541	85	330	956

a. All national chain storefronts participate in the ENERGY STAR program once the corporate home office has agreed to participate in the program. Individual storefronts do not make the decision regarding participation.

The RMST study distinguishes between national chains in California and independent storefronts because the data source is different for each retailer type. The methodology for obtaining data from each retailer type is briefly explained below.

2.3. National Appliance Retailer Sales Data

D&R tracks sales of ENERGY STAR products by collecting sales data from national chain retailers under a contract to support the ENERGY STAR appliance program. D&R has provided Itron with aggregated sales data by ZIP code from national retail chains for each of the appliance types covered by the RMST project.[5] The extent of the analysis is limited because D&R is not able to provide detailed efficiency characteristics of the units sold. The data provided by D&R includes only the total number of units sold and the total number of ENERGY STAR qualified units sold for each appliance type and by ZIP code.

2.4. Independent and Regional Chain Retailer Point-of-Sale Data

Itron collects POS data from a panel of independent storefronts and regional chains throughout California to represent the trends of appliance sales through the independent retailer channel. The sampling strategy, recruiting strategy, and characteristics of the 2006 retailer panel are described below.

Independent Retailer Sample Frame and Sample Design

Itron developed the sample frame of independent retailers by acquiring a marketing database from USA Data.[6] The database was generated by using the Standard Industrial Classification code for household appliances, and subsequently eliminating second-hand retailers and repair services. This effort produced an independent retailer database containing more than 300

5 Appendix A presents further information on methodology used in weighting the national chain data.

6 USA Data extracts business names from the D&B Wholesale Business List, which is a compilation of information retrieved from yellow pages, credit inquiries, Internet, business registrations, payment experiences, public records, Secretary of State files, credit inquiries and other sources.

store locations. Table 2-2 summarizes the independent retailer sample frame used to recruit independent retailers for the RMST panel.

Table 2-2: Independent Appliance Retailer Sample Frame

	IOU				Total
	PG&E	SCE	SDG&E	Other[a]	
All Areas					
Storefronts	159	87	80	89	415
Percent of Total	38%	21%	19%	22%	100%
PG&E, SCE, and SDG&E Only					
Storefronts	159	87	80		326
Percent of Total	49%	27%	25%		100%

a. "Other" includes the service territories of municipal utilities such as LADWP, SMUD, LMUD, and others.

In addition to the five retailers retained from the 2005 participant panel, Itron also recruited four additional retailers. These nine retailers account for 18 storefronts throughout the state. The retailers in the panel provided data in various formats, including electronic spreadsheets and hard-copy sales reports. Most retailers provided monthly sales data, including appliance type, manufacturer, model number, quantity sold, and date of sale. Table 2-2 provides the sample target for each utility service.

Table 2-3: 2006 Independent Appliance Retailer Sample

	IOU			Total
	PG&E	SCE	Other	
Storefronts	14	3	1	18
Percent of Total	78%	17%	5%	100%

ENERGY STAR Sales by Independent Retailers

Independent retailers have secured a substantial market share in the California appliance market. The results of this study demonstrate that independent retailers generally sell a large proportion of ENERGY STAR appliances. National chain appliance retailers, on the other hand, sell a less significant share of ENERGY STAR appliances. Several factors might explain this disparity. Independent stores typically experience reduced employee turnover and are thus able to provide more information regarding product efficiency. Independent retailers often demonstrate a greater willingness to make special orders, and these stores exhibit marketing strategies that are different from those of the national chains. Instead of engaging in fierce price competition with national chains, independent retailers tend to focus on customer service, a knowledgeable employee base, and the ability to address the

individual needs of a customer. Additionally, independent appliance retailers may serve a specific clientele, which is inclined to purchase more efficient products at higher prices.

In the past, national chain stores' appliance selection was limited in comparison to independent appliance retailers, which typically offered a greater selection to consumers. However, national chains have recently augmented their ENERGY STAR product lines, and the market share of these items has increased in California.

2.5. Summary of 2006 Database Coverage

Table 2-4 summarizes the RMST coverage of units sold in 2006 by appliance type. As shown, the 2006 database includes sales data for an estimated 53% of the total number of clothes washers, 31% of dishwashers, 51% of refrigerators, and 33% of room air conditioners sold in California.

Table 2-4: 2006 Coverage of Units Sold, by Appliance Type

	Appliance Type			
	Clothes Washers	**Dishwashers**	**Refrigerators**	**Room AC**
Estimate of total unit sales[a]	990,000	774,500	1,341,800	502,000
Unit sales in sample	520,567	238,674	685,310	166,549
Percent of unit sales in sample	53%	31%	51%	33%

a. See subsequent sections for comments on estimates of total unit sales for each measure type.

2.6. Analysis Approach

The appliance component of the RMST estimates the market share of ENERGY STAR qualified units and the average efficiency rating of all units sold. The results are presented by retailer type and by utility service area. The average energy factor (EF) is calculated for dishwashers and refrigerators, while the average modified energy factor (MEF) is calculated for clothes washers. Both results are reported on an annual and quarterly basis. A brief description of each approach is presented below, and a more detailed description is provided in Appendix A.

ENERGY STAR Market Share Analysis

The share of ENERGY STAR qualified units sold is estimated through the analysis of sales data obtained from national chains and independent retailers. An appliance is ENERGY STAR qualified if the energy efficiency rating meets the minimum threshold for the

ENERGY STAR program. Increases in the ENERGY STAR minimum threshold have demonstrated a significant impact on market share during the period following the standard revision. For example, when the efficiency standard for ENERGY STAR for refrigerators increased in 2001, the share of ENERGY STAR qualified refrigerators dropped from 35% to 1%.

Energy Factor Analysis

In addition to the ENERGY STAR market share analysis described above, the RMST also tracks the average energy efficiency ratings of appliances sold throughout California. The national chain sales data does not include the energy efficiency ratings or the model numbers of units sold. Because of these limitations, national chain sales have not been included in the energy factor analysis. However, energy factor analysis has been performed for clothes washers, dishwashers, and refrigerators sold through independent market channels.

3

Clothes Washers

3.1. Overview

This chapter presents the results for residential clothes washers and includes the following: total estimated clothes washer unit sales in California (3.2), clothes washer energy efficiency standards (3.3), market share of ENERGY STAR qualified clothes washers sold in California (3.4), a comparison of efficiency ratings of clothes washers sold through national chains and independent retailers (3.5), and average efficiency rating of clothes washers sold through independent retailers (3.6).

3.2. Total Unit Sales

Table 3-1 presents estimated annual unit sales of residential clothes washers in California from 1998 through 2006. Since 1998, clothes washer sales in California have increased every year, with sales approaching one million units in 2006. The Association of Home Appliance Manufacturers (AHAM) provided the data.

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

Year	Units Sold
1998	702,000
1999	721,100
2000	731,500
2001	766,500
2002	819,500
2003	881,500
2004	937,100
2005	960,200
2006	999,000

Source: AHAM

3.3. Clothes Washer Energy Efficiency Standards

Clothes washer efficiency ratings are based on estimated annual energy use (kWh) under "typical conditions" and an average of 392 loads, or cycles, per year. In general, the efficiency ratings for clothes washers are expressed in terms of ft^3/kWh/cycle.

On January 1, 2004, the federal, California, and ENERGY STAR standards changed the performance metric used to evaluate clothes washers. The current standard reflects a switch to a modified energy factor (MEF) performance metric from the previous EF-based standard.[7] The MEF considers the moisture content remaining in clothes after washing to correlate the effectiveness of the washer to the amount of dryer use required or, in other words, the dryer savings.

The MEF is computed as the capacity in cubic feet (C) divided by the sum of the machine electrical energy for the mechanical action of a cycle (M) and the water heating energy required for a cycle (E) and the energy required for removal of the remaining moisture in the wash load (D).

$$MEF = \frac{C}{M + E + D}$$

where:

C = clothes washer in cubic feet
M = machine electrical energy consumption
E = the hot water energy consumption
D = the energy required for removal of the remaining moisture in the wash load
$(M + E + D)$ = the total clothes washer energy use in kWh per cycle

Federal Energy Use Standard. Under the 2004 federal MEF standard, top-loading clothes washers with a tub capacity of 1.6 cubic feet or greater are required to have an MEF of at least 1.04. The requirements for front-loading units included an unheated rinse option. The switch to use of the MEF was guided, in part, by the Super-Efficient Home Appliance Initiative (SEHA) standards created by the Consortium for Energy Efficiency (CEE). On January 1, 2007, a new federal standard became effective and required all clothes washers to have a minimum MEF of 1.26.

Table 3-2 summarizes the federal, state, and ENERGY STAR standards for clothes washers.

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

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

	January 1, 2001	January 1, 2004	January 1, 2007	July 1, 2009	January 1, 2011
Federal Standard	1.18 EF	1.04 MEF	1.26 MEF	1.26 MEF	1.26 MEF
Percent Improved	N/A	22% over 2001	35% over 2001[8]	N/A	N/A
ENERGY STAR Standard	1.26 MEF (~ 2.50 EF)	1.42 MEF	1.72 MEF	1.8 MEF	2.0 MEF
California Standard	1.18 EF	1.04 MEF	1.26 MEF	1.26 MEF	1.26 MEF

ENERGY STAR Standard. In 2006, the ENERGY STAR criteria required qualified products to have a MEF rating of 1.42 or greater. On January 1, 2007, a new ENERGY STAR standard required that clothes washers possess a MEF of 1.72 or greater and a maximum water factor of 8.0 in order to qualify for the label. The ENERGY STAR program recently announced two future revisions to the qualifying efficiency level. The first, which increases minimum qualifying to 1.8 and reduces the qualifying water factor to 7.5, becomes effective on July 1, 2009. The second revision, which becomes effective on January 1, 2011, states that clothes washers must have an MEF of at least 2.0 and a water factor no greater than 6.0

California IOU Incentive Programs. For the 2006-2008 rebate cycle, each California IOU program has a unique rebate structure based on the tiers established by the CEE. Currently, none of the utilities rebate CEE Tier 1 clothes washers. In the SDG&E service area, rebates are provided by the San Diego County Water Authority for clothes washers that are at least tier 2 (2.0 MEF). PG&E provides a $35 rebate for CEE Tier 2 clothes washers and a $75 rebate for Tier 3 clothes washers (2.2 MEF). SCE does not offer rebates for high-efficiency clothes washers.

3.4. Market Share of ENERGY STAR Qualified Clothes Washers

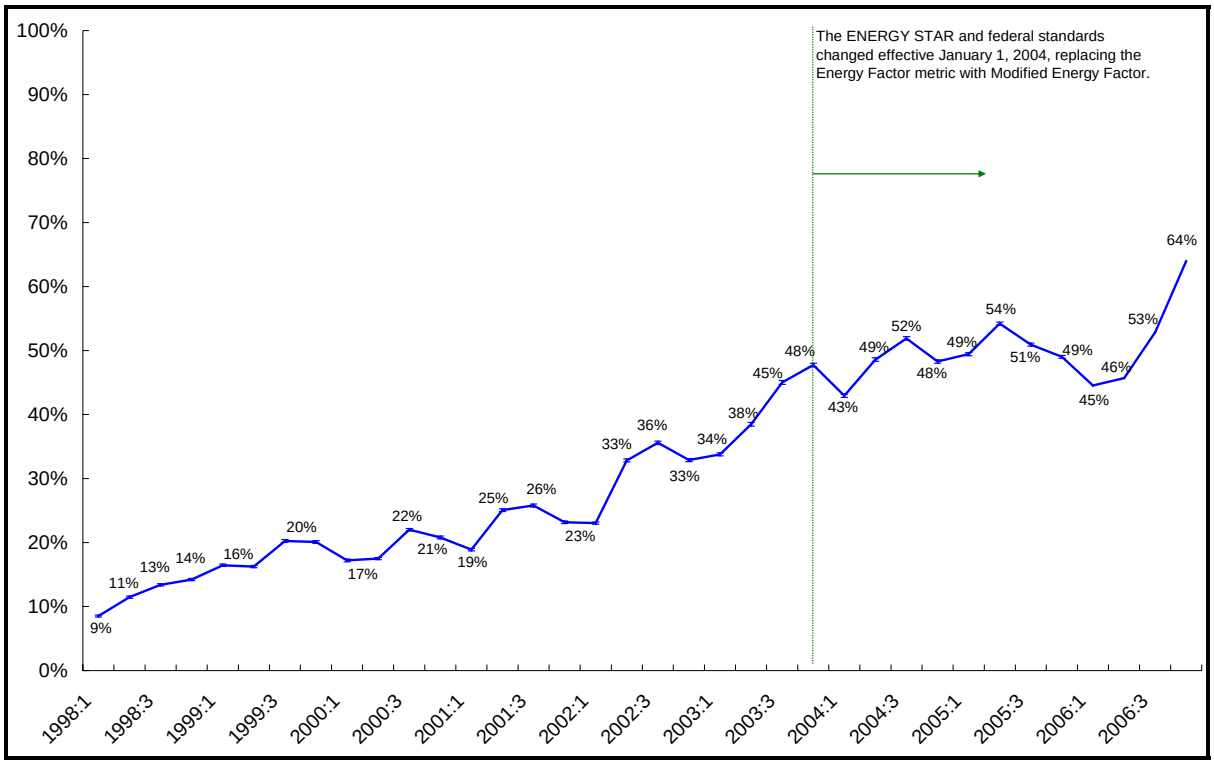
Figure 3-1 and Table 3-3 present the percentage of ENERGY STAR qualified clothes washers sold in California from the first quarter of 1998 through the fourth quarter of 2006.[9] As shown, the market share of ENERGY STAR qualified clothes washers has increased

[8] Department of Energy. *Energy Conservation Program for Consumer Products: Clothes Washer Energy Conservation Standards; Final Rule.* 10 CFR Part 430. Federal Register, Volume 66, no. 9. Docket No. EE-RM-94-403. RIN 1904-AA67. Office of Energy Efficiency and Renewable Energy. Washington, DC. January 2001.

[9] In Figure 3-1 and Table 3-3 and 3-4, data from 1998 reflect national chain data only. As a result, adjustments have been made to estimate 1998 sales and standard errors for 1998 have not been listed.

tremendously during the past six years—from a low of 9% in the first quarter of 1998, to a recent high of 64% in the last quarter of 2006.

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



Error bands for the 90% confidence interval.

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	**12.0%** (-) n = 180,983	**8.5%** (-) n = 44,233	**11.5%** (-) n = 43,366	**13.4%** (-) n = 44,746	**14.2%** (-) n = 48,638
1999	**18.2%** (0.0006) n = 425,528	**16.5%** (0.0011) n = 115,621	**16.2%** (0.0011) n = 107,984	**20.2%** (0.0013) n = 101,691	**20.1%** (0.0013) n = 100,232
2000	**19.3%** (.0006) n 414,505	**17.2%** (.0013) n = 113,966	**17.5%** (.0011) n = 114,385	**22.0%** (.0011) n = 88,754	**20.8%** (.0014) n = 97,400
2001	**23.2%** (0.0006) n = 427,489	**18.9%** (0.0012) n = 109,184	**25.1%** (0.0013) n = 103,324	**25.8%** (0.0014) n = 103,185	**23.2%** (0.0013) n = 111,796
2002	**30.6%** (0.0007) n = 462,069	**23.0%** (0.0011) n = 150,430	**32.8%** (0.0014) n = 108,486	**35.6%** (0.0015) n = 102,046	**32.9%** (0.0015) n = 101,107
2003	**41.5%** (0.0008) n = 345,297	**33.8%** (0.0014) n = 108,379	**38.5%** (0.0018) n = 76,204	**45.0%** (0.0018) n = 76,179	**47.7%** (0.0017) n = 84,535
2004	**47.9%** (0.0008) n = 387,664	**42.9%** (0.0016) n = 96,350	**48.6%** (0.0016) n = 94,907	**51.9%** (0.0016) n = 96,908	**48.3%** (0.0016) n = 99,499
2005	**51.0%** (0.0007) n = 489,388	**49.4%** (0.0014) n = 126,122	**54.2%** (0.0014) n = 123,204	**50.9%** (0.0015) n = 117,267	**49.0%** (0.0014) n = 122,795
2006	**51.5%** (0.0007) n = 520,567	**44.5%** (0.0013) n = 142,957	**45.7%** (0.0014) n = 132,351	**52.9%** (0.0014) n = 123,650	**64.0%** (0.0014) n = 121,609

Standard errors in parentheses.

Table 3-4 reports the percentage of ENERGY STAR qualified clothes washers sold in each utility service area on an annual and quarterly basis. With a 59% market share, the PG&E service territory exhibited the highest average annual percentage of ENERGY STAR clothes washer sales in 2006. ENERGY STAR sales in the SCE service territory and "Other" regions constituted approximately 47% of total clothes washer sales in each territory. Retailers in the SDG&E service area sold the smallest share (44%) of ENERGY STAR clothes washers.

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				
		Annual	Q1	Q2	Q3	Q4
PG&E	1998	**12.7%** (-) n = 83,563	**80.6%** (-) n = 19,916	**13.7%** (-) n = 20,751	**15.3%** (-) n = 20,520	**12.9%** (-) n = 22,376
	1999	**14.7%** (0.0008) n = 165,144	**12.9%** (0.0015) n = 47,436	**13.7%** (0.0017) n = 42,090	**15.6%** (0.0019) n = 37,916	**17.2%** (0.0019) n = 37,702
	2000	**24.3%** (.0011) n = 165,405	**20.4%** (.0019) n = 43,959	**24.0%** (.0020) n = 45,042	**28.1%** (.0023) n = 37,038	**25.0%** (.0022) n = 39,366
	2001	**29.5%** (0.0011) n = 170,360	**23.5%** (0.0020) n = 43,035	**31.1%** (0.0023) n = 40,366	**32.7%** (0.0023) n = 41,868	**30.7%** (0.0022) n = 45,091
	2002	**36.7%** (0.0012) n = 170,593	**30.3%** (0.0020) n = 53,861	**39.8%** (0.0025) n = 39,911	**41.3%** (0.0025) n = 38,456	**37.6%** (0.0025) n = 38,365
	2003	**45.5%** (0.0014) n = 128,897	**39.8%** (0.0024) n = 41,517	**43.3%** (0.0030) n = 28,070	**46.4%** (0.0030) n = 28,465	**54.7%** (0.0028) n = 30,845
	2004	**47.8%** (0.0013) n = 148,696	**39.7%** (0.0025) n = 37,258	**48.2%** (0.0026) n = 36,535	**51.8%** (0.0026) n = 36,965	**51.4%** (0.0026) n = 37,938
	2005	**54.6%** (0.0012) n = 171,534	**53.5%** (0.0024) n = 43,806	**55.9%** (0.0024) n = 42,676	**53.7%** (0.0024) n = 41,723	**55.4%** (0.0024) n = 43,329
	2006	**58.9%** (0.0012) n = 175,987	**51.8%** (0.0023) n = 49,051	**52.7%** (0.0024) n = 43,696	**60.3%** (0.0024) n = 41,930	**71.5%** (0.0022) n = 41,310
SCE	1998	**8.7%** (-) n = 47,708	**7.6%** (-) n = 12,287	**7.2%** (-) n = 11,357	**7.9%** (-) n = 11,693	**12.2%** (-) n = 12,371
	1999	**17.4%** (0.0010) n = 140,863	**15.6%** (0.0018) n = 36,820	**15.4%** (0.0019) n = 35,609	**19.7%** (0.0021) n = 34,829	**19.0%** (0.0021) n = 33,605
	2000	**15.0%** (.0009) n = 136,046	**14.1%** (.0018) n = 38,696	**12.2%** (.0017) n = 38,212	**16.8%** (.0022) n = 27,790	**17.3%** (.0021) n = 31,348
	2001	**19.0%** (0.0010) n = 144,802	**15.9%** (0.0019) n = 37,341	**21.1%** (0.0022) n = 35,457	**21.7%** (0.0022) n = 34,187	**17.6%** (0.0019) n = 37,817
	2002	**28.5%** (0.0011) n = 157,803	**20.5%** (0.0018) n = 51,295	**30.1%** (0.0024) n = 37,933	**32.9%** (0.0025) n = 34,570	**31.9%** (0.0025) n = 34,005
	2003	**39.2%** (0.0014) n = 117,280	**24.8%** (0.0023) n = 36,021	**35.7%** (0.0029) n = 26,493	**44.3%** (0.0031) n = 25,888	**43.9%** (0.0029) n = 28,878
	2004	**42.2%** (0.0014) n = 124,558	**43.5%** (0.0029) n = 29,630	**44.3%** (0.0028) n = 30,740	**43.2%** (0.0028) n = 31,646	**37.5%** (0.0027) n = 32,542
	2005	**48.4%** (0.0012) n = 173,465	**46.4%** (0.0024) n = 45,025	**51.1%** (0.0024) n = 44,148	**49.7%** (0.0025) n = 41,049	**46.5%** (0.0024) n = 43,243
	2006	**47.4%** (0.0011) n = 194,080	**40.9%** (0.0021) n = 52,716	**42.0%** (0.0022) n = 50,137	**48.0%** (0.0023) n = 46,381	**60.3%** (0.0023) n = 44,846

Standard errors in parentheses.

Table 3-4 (cont'd.): Clothes Washer Sales, Percent of ENERGY STAR Qualified Units by Utility Service Area

Utility	Year	Percent of ENERGY STAR Qualified Clothes Washers				
		Annual	Q1	Q2	Q3	Q4
SDG&E	1998	**11.7%** (-) n = 14,582	**10.6%** (-) n = 3,491	**11.7%** (-) n = 3,359	**14.2%** (-) n = 3,413	**10.7%** (-) n = 4,319
	1999	**18.0%** (0.0020) n = 38,302	**18.7%** (0.0039) n = 9,915	**14.7%** (0.0035) n = 9,943	**18.7%** (0.0041) n = 9,229	**20.2%** (0.0042) n = 9,215
	2000	**21.3%** (.0022) n = 35,560	**19.9%** (.0040) n = 9,890	**16.3%** (.0037) n=9,816	**24.4%** (.0050) n = 7,492	**24.7%** (.0047) n = 8,362
	2001	**18.2%** (0.0020) n = 39,016	**14.2%** (0.0035) n = 9,835	**18.7%** (0.0040) n = 9,592	**18.7%** (0.0040) n = 9,621	**21.1%** (0.0041) n = 9,968
	2002	**25.5%** (0.0023) n = 37,314	**16.8%** (0.0036) n = 12,438	**27.3%** (0.0048) n = 8,668	**31.3%** (0.0050) n = 8,513	**31.3%** (0.0053) n = 7,695
	2003	**39.7%** (0.0031) n = 24,164	**33.7%** (0.0052) n = 8,223	**34.2%** (0.0067) n = 5,046	**47.4%** (0.0069) n = 5,181	**46.3%** (0.0066) n = 5,714
	2004	**41.7%** (0.0030) n = 26,475	**35.1%** (0.0059) n = 6,485	**44.1%** (0.0062) n = 6,436	**45.9%** (0.0061) n = 6,756	**41.5%** (0.0060) n = 6,798
	2005	**42.6%** **(**0.0025**)** n = 39,504	**42.0%** **(**0.0049**)** n = 10,169	**42.3%** **(**0.0049**)** n = 10,137	**44.7%** **(**0.0051**)** n = 9,592	**41.5%** **(**0.0050**)** n = 9,606
	2006	**44.3%** **(**0.0024**)** n = 41,720	**37.7%** **(**0.0046**)** n = 11,057	**37.7%** **(**0.0047**)** n = 10,748	**46.0%** **(**0.0050**)** n = 10,084	**57.3%** **(**0.0050**)** n = 9,831
Other	1998	**13.4%** (-) n = 35,130	**7.8** (-) n = 8,539	**10.4%** (-) n = 7,899	**14.4%** (-) n = 9,120	**19.8%** (-) n = 9,572
	1999	**15.7%** (0.0013) n = 81,219	**14.7%** (0.0024) n = 21,450	**14.9%** (0.0025) n = 20,342	**17.7%** (0.0027) n = 19,717	**15.7%** (0.0026) n = 19,710
	2000	**16.2%** (.0013) n = 77,494	**16.0%** (.0025) n = 21,421	**15.1%** (.0025) n = 21,315	**17.5%** (.0030) n = 16,434	**16.4%** (.0027) n = 18,324
	2001	**22.0%** (0.0015) n = 73,311	**18.5%** (0.0028) n = 18,973	**25.0%** (0.0032) n = 17,909	**23.2%** (0.0032) n = 17,509	**21.6%** (0.0030) n = 18,920
	2002	**21.4%** (0.0013) n = 96,359	**14.0%** (0.0019) n = 32,836	**23.3%** (0.0028) n = 21,974	**27.8%** (0.0031) n = 20,507	**24.9%** (0.0030) n = 21,042
	2003	**35.8%** (0.0018) n = 74,956	**27.6%** (0.0030) n = 22,618	**32.1%** (0.0036) n = 16,595	**42.8%** (0.0038) n = 16,645	**42.8%** (0.0036) n = 19,098
	2004	**55.5%** (0.0017) n = 87,935	**47.8%** (0.0033) n = 22,977	**55.0%** (0.0034) n = 21,196	**62.5%** (0.0033) n = 21,541	**56.8%** (0.0033) n = 22,221
	2005	**51.4%** **(**0.0015**)** n = 104,885	**50.5%** **(**0.0030**)** n = 27,122	**59.2%** **(**0.0030**)** n = 26,243	**49.6%** **(**0.0032**)** n = 24,903	**42.6%** **(**0.0030**)** n = 26,617
	2006	**47.4%** **(**0.0015**)** n = 108,780	**40.2%** **(**0.0028**)** n = 30,133	**42.5%** **(**0.0030**)** n = 27,770	**49.4%** **(**0.0031**)** n = 25,255	**58.9%** **(**0.0031**)** n = 25,622

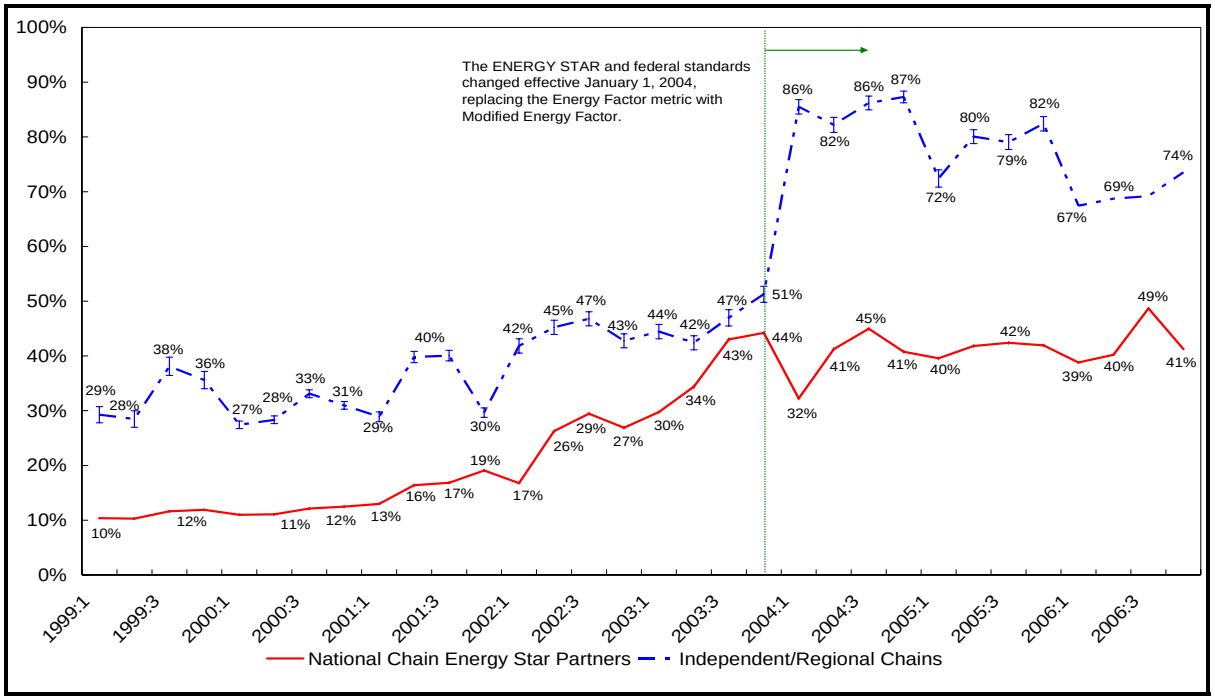
Standard errors in parentheses.
"Other" includes municipal utilities, including LADWP, SMUD, and others.

3.5. Analysis by Retailer Type

Market Share of ENERGY STAR Qualified Clothes Washers

In Figure 3-2 and Table 3-5, the share of ENERGY STAR qualified clothes washers sold through national chains is compared with the share sold by independent stores and regional chains. Independent retailers typically sell a large percentage of ENERGY STAR qualified clothes washers while national chains sell a smaller percentage. From 1999 through 2003, the share sold through national chains more than quadrupled, growing from 10% in the first quarter of 1999 to 44% by the last quarter of 2003. Following a brief drop-off in early 2004, the share increased and then settled in the 40% range. During the same period, the independent appliance retailers experienced rapid growth in market share, reaching a height of 87% in the last quarter of 2004.[10] Since that time, the share of ENERGY STAR qualified clothes washers has fluctuated between 67% and 82%.

Figure 3-2: Clothes Washer Sales, Percent of ENERGY STAR-Qualified Units by Retailer Type



Error bands for the 90% confidence interval.

[10] During the period following an increase in a qualifying energy use rating, a drop in the share of qualifying units sold is expected, as exhibited by the decrease in the share of units sold through national chains. The reason for the noticeable difference in the share of qualified units between national chains and independent retailers is not known.

Table 3-5: Clothes Washer Sales, Percent of ENERGY STAR Qualified Units by Retailer Type

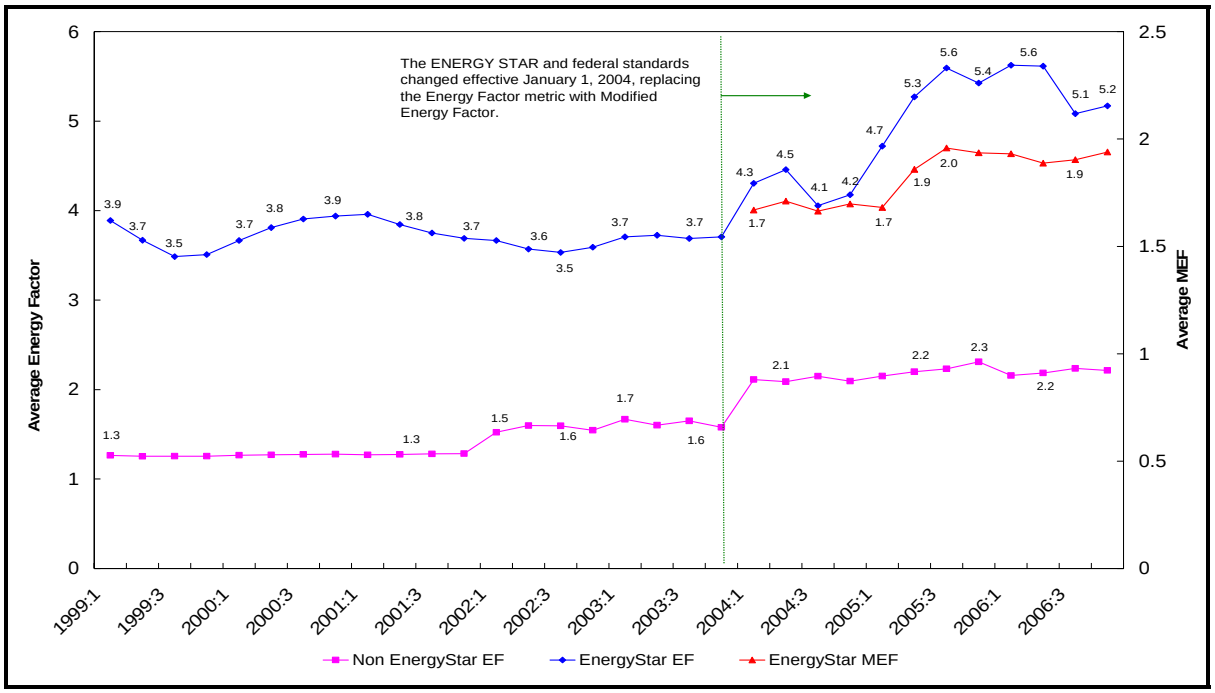
Year	Retailer Type	Q1	Q2	Q3	Q4
1999	National Chain	**10.4%** (0.0009) n =113,050	**10.3%** (0.0009) n =105,551	**11.6%** (0.0010) n =99,385	**11.9%** (0.0010) n =97,766
	Independent/Regional Chain	**29.3%** (0.0090) n =2,571	**28.5%** (0.0091) n =2,433	**38.1%** (0.0101) n =2,306	**35.6%** (0.0096) n =2,466
2000	National Chain	**11.0%** (0.0010) n =102,845	**11.1%** (0.0010) n =103,399	**12.1%** (0.0012) n =76,422	**12.5%** (0.0011) n =85,304
	Independent/Regional Chain	**27.4%** (0.0042) n =11,121	**28.3%** (0.0043) n =10,986	**33.1%** (0.0042) n =12,332	**31.0%** (0.0042) n =12,096
2001	National Chain	**13.0%** (0.0011) n = 102,255	**16.4%** (0.0012) n = 96,959	**16.8%** (0.0012) n = 96,088	**19.1%** (0.0012) n = 104,159
	Independent/Regional Chain	**28.9%** (0.0054) n = 6,929	**39.8%** (0.0061) n = 6,365	**40.1%** (0.0058) n = 7,097	**29.7%** (0.0052) n = 7,637
2002	National Chain	**16.8%** (0.0010) n = 146,565	**26.3%** (0.0014) n = 104,567	**29.5%** (0.0015) n = 97,998	**26.9%** (0.0014) n = 96,899
	Independent/Regional Chain	**41.8%** (0.0079) n = 3,865	**45.2%** (0.0080) n = 3,919	**46.8%** (0.0078) n = 4,048	**42.8%** (0.0076) n = 4,208
2003	National Chain	**29.7%** (0.0014) n = 104,513	**34.4%** (0.0018) n = 72,203	**43.0%** (0.0018) n = 73,121	**44.2%** (0.0015) n = 94,403
	Independent/Regional Chain	**44.4%** (0.0080) n = 3,866	**42.4%** (0.0078) n = 4,001	**47.0%** (0.0090) n = 3,058	**51.3%** (0.0088) n = 3,204
2004	National Chain	**32.2%** (0.0015) n = 94,403	**41.2%** (0.0016) n = 92,813	**45.0%** (0.0016) n = 94,840	**40.8%** (0.0016) n = 96,842
	Independent/Regional Chain	**85.5%** (0.0080) n = 1,947	**82.2%** (0.0084) n = 2,094	**86.2%** (0.0076) n = 2,068	**87.3%** (0.0065) n = 2,657
2005	National Chain	**39.5%** (0.0014) n = 123,921	**41.8%** (0.0014) n = 120,502	**42.4%** (0.0015) n = 114,801	**41.9%** (0.0014) n = 120,557
	Independent/Regional Chain	**72.4%** (0.0095) n = 2,201	**80.1%** (0.0077) n = 2,702	**79.1%** (0.0082) n = 2,466	**82.4%** (0.0080) n = 2,238
2006	National Chain	**38.8%** (0.0013) n = 139,861	**40.2%** (0.0014) n = 129,360	**48.7%** (0.0014) n = 120,374	**61.2%** (0.0014) n = 118,256
	Independent/Regional Chain	**67.4%** (0.0084) n = 3,096	**68.7%** (0.0085) n = 2,991	**69.2%** (0.0081) n = 3,276	**73.5%** (0.0076) n = 3,353

Standard errors in parentheses.

Energy Factor and Modified Energy Factor Analysis

Figure 3-3 illustrates the average EF trends of ENERGY STAR and non-ENERGY STAR clothes washers sold through independent retailers in California. As shown, the average EF of non-ENERGY STAR units was constant at 1.3 from 1999 through early 2002, after which the average rating gradually increased to about 2.2, where it has remained. The federal minimum EF was 1.18 until January 2004, when the new standard of 1.04 MEF became effective. The minimum ENERGY STAR rating was 2.5 EF until January 2004, when the new minimum became 1.42 MEF. As shown in Figure 3-1, the average EF and MEF of ENERGY STAR qualified units have risen since the 2004 standards change.

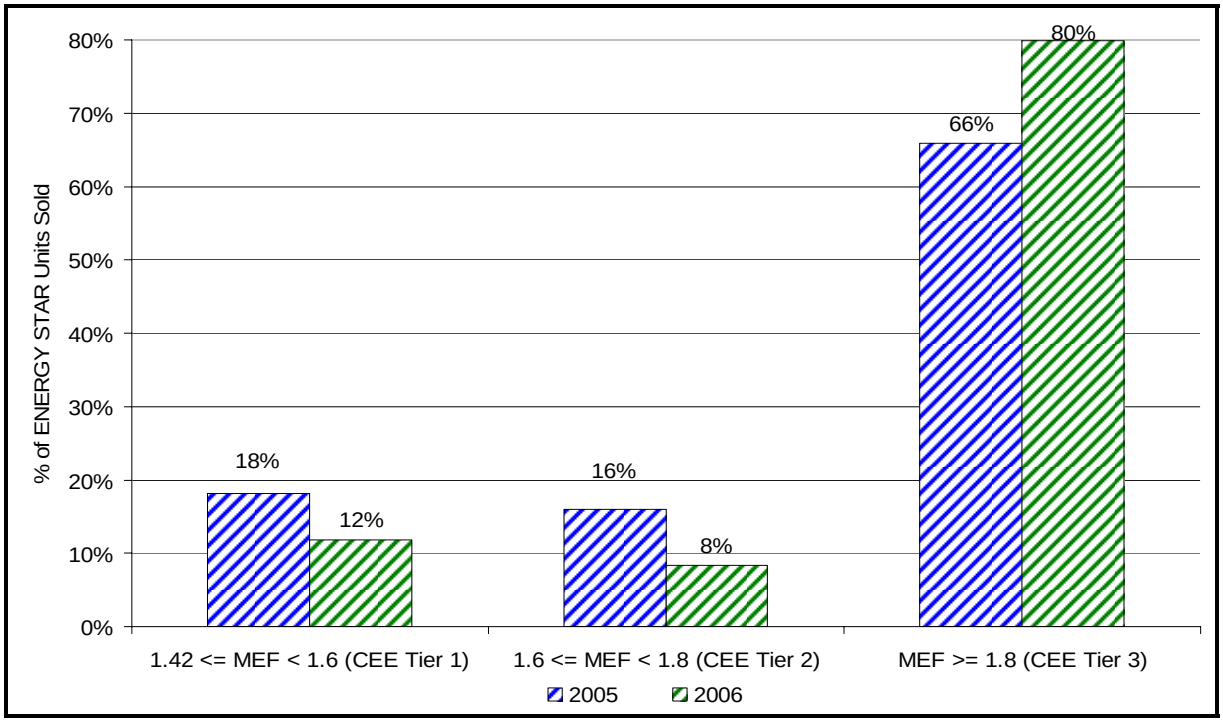
Figure 3-3: Average EF and MEF for Clothes Washers Sold By Independent Appliance Retailers



Average EFs and MEFs for independent retailer data only

Figure 3-4 presents the distribution of ENERGY STAR qualified clothes washer sales for independent retailers by tier, as designated by the CEE. The percentages represent the portion of total ENERGY STAR qualified clothes washers for each CEE tier. Tier 1 clothes washers, with a MEF of at least 1.42 but less than 1.6, accounted for 12% of total ENERGY STAR units sold by independent retailers. Approximately 8% of all ENERGY STAR units sold by independent retailers are considered Tier 2 with a MEF of at least 1.6 but less than 1.8. The majority (80%) of ENERGY STAR clothes washers sold by independent retailers were Tier 3 with a MEF of at least 1.8.

Figure 3-4: Distribution of ENERGY STAR Qualified Clothes Washer Sales by CEE Tier



None of the California IOUs currently rebate CEE Tier 1. The IOU's have differing incentive structures for CEE Tiers 2 and 3 based on building type and decision type.

4

Dishwashers

4.1. Overview

This section presents the results of the dishwasher sales analysis and includes the following: total estimated dishwasher unit sales (4.2), efficiency standards (4.3), market share of ENERGY STAR qualified units (4.4), and ENERGY STAR sales by retailer type (4.5).

4.2. Total Unit Sales

Table 4-1 presents the estimated annual unit sales of dishwashers. These figures are important to the development of market shares in this report. Since 1998, total dishwasher sales had increased each year until declining by 5% in 2006.

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

Year	Units Sold
1998	509,000
1999	566,800
2000	579,100
2001	595,800
2002	660,300
2003	716,200
2004	790,800
2005	818,400
2006	774,500

Source: AHAM

4.3. Dishwasher Energy Efficiency Standards

Dishwasher efficiency ratings are based on estimated annual energy use (kWh) under "typical conditions" and an average of 215 loads, or cycles, per year.

The EF for dishwashers is calculated as follows:

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

Federal Energy Use Standard. The current federal efficiency standard for dishwashers went into effect in 1994 and establishes a minimum EF no less than 0.46. On June 17, 2002, the U.S. Department of Energy (DOE) revised the number of *average cycles per year* used in the dishwasher EF calculation from 322 cycles to 264 cycles. Another revision took effect on February 24, 2004, when the number of cycles used for the dishwasher EF equation was further reduced to 215 cycles. Due to the downward revision of *average cycles per year*, the average EF of dishwashers decreased even though actual efficiency remained the same. In order to maintain the same efficiency relative to the federal energy standard, dishwashers were required to become more efficient.

Because manufacturers were unable to accurately test these soil-sensing dishwashers, a new test procedure became effective on September 29, 2003.[11] The DOE decided that the EF for these models should be determined by a weighted average of results from tests at three different soil levels (light, medium, and heavy). The result of each test would be weighted according to the average frequency in which consumers wash heavy, medium, and light loads. The test procedure for non-soil-sensing dishwashers would continue to require only one test using a load of clean dishes.

Legislation by Congress and DOE proposes a tentative agreement to impose more stringent federal standard for dishwashers. If the legislation is adopted, the minimum federal standard for dishwashers would increase to 0.62 EF in 2010.[12]

ENERGY STAR Standard. The ENERGY STAR qualification threshold for dishwashers became from January 1, 2001 through December 31, 2006 was based on the SEHA program from the CEE.[13] After January 1, 2001, dishwashers were required exceed the minimum EF of 0.58 in order to qualify for ENERGY STAR status. The most recent revision occurred on January 1, 2007, when the minimum qualifying EF of ENERGY STAR dishwashers increased to 0.65. A current proposal, if approved would increase the qualifying EF to 0.68 in 2009.[12]

California Standard. In January 2002, the CEC amended its appliance efficiency regulations to reflect the increase in the federal energy use standards for several appliances.

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11 http://www.eere.energy.gov/buildings/appliance_standards/residential/pdfs/dishwasher_test_procedure.pdf

12 http://www.cuwcc.org/uploads/committee/steering/Appliance_FINAL_Agreement_07-05-02.pdf

13 Consortium for Energy Efficiency. Super Efficient Home Appliance Initiative: Dishwashers. http://www.cee1.org/resid/seha/dishw/dishw-main.php3

However, as with the federal standard, the actual dishwasher standard EF for California was not modified during those proceedings.

Table 4-2 presents the current energy efficiency standards and the ENERGY STAR specification for dishwashers. All standard-sized dishwashers must possess an EF of at least 0.46.[14] There are no planned increases to the federal or California standards in the near future.

Table 4-2: Comparison of Dishwasher Energy Efficiency Standards

	2001 Standard	2007 Standard
Federal Standard	0.46	0.46
ENERGY STAR Standard	0.58	0.65
California Standard	0.46	0.46

California IOU Incentive Programs. Until the new ENERGY STAR standard became effective in 2007, some California IOUs offered rebates for dishwashers having an EF of 0.62 or greater. This efficiency threshold was chosen as a midpoint between the previous ENERGY STAR standard of 0.58 EF and the 2007 ENERGY STAR standard of 0.65 EF shown in Table 4-2. For the 2006-2008 rebate cycle, SDG&E offers a rebate of $30 for dishwashers with an EF of at least 0.65. PG&E currently offers a $30 rebate for dishwashers with an EF of 0.65 to 0.67 and a $50 rebate for dishwashers with an EF of 0.68 or greater.

4.4. Market Share of ENERGY STAR Qualified Dishwashers

Figure 4-1 and Table 4-3 present the market share of ENERGY STAR qualified dishwashers sold in California during from 1998 to 2006.[15] During this period, the market share of ENERGY STAR qualified dishwashers has grown significantly due to the increased availability of qualifying models and the large share sold by independent retailers. During the second half of 2006, the share of ENERGY STAR dishwasher sales reached a record high of 96%.

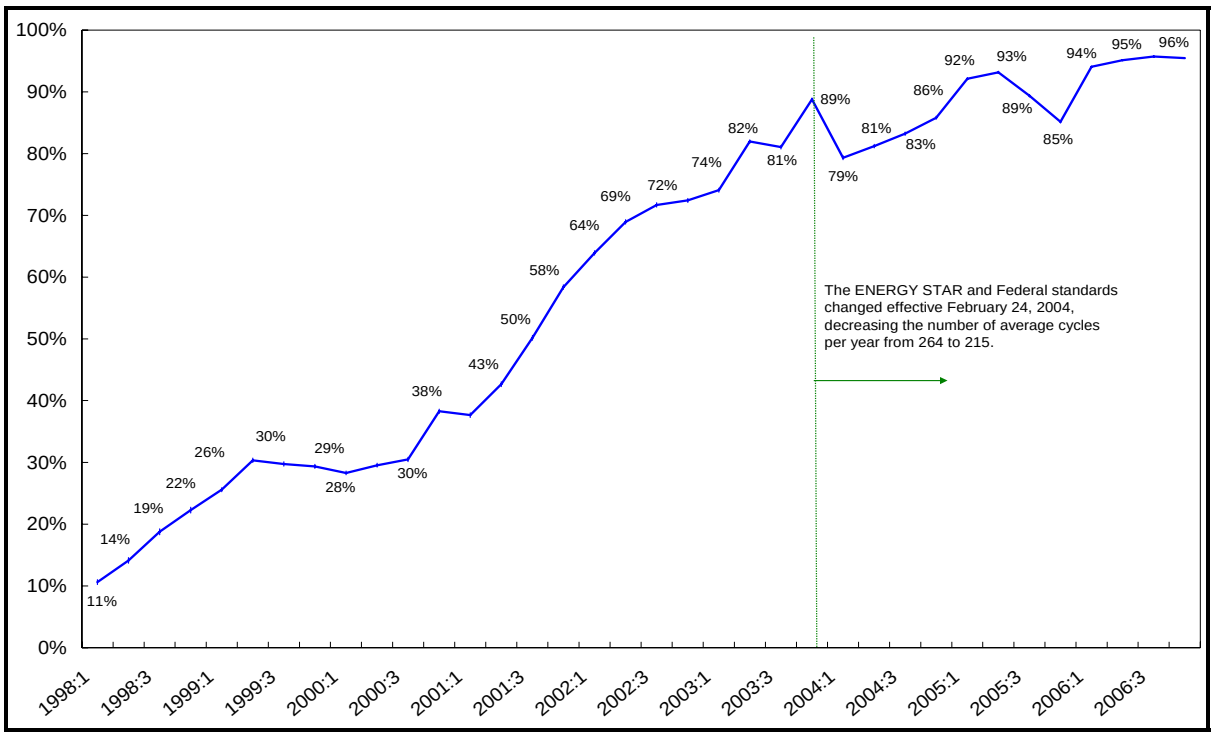
Even though the method of EF calculation changed in mid-2002, the market share of ENERGY STAR qualified units continued to increase throughout that year. One reason for this result is that dishwasher manufacturers voluntarily increased model efficiency prior to

[14] In this report, compact dishwashers were not eligible for an ENERGY STAR specification. However, the new 2007 ENERGY STAR standard allowed compact dishwashers with an EF greater than 0.88 to qualify. Compact dishwashers are defined as having a capacity less than eight place settings and six serving pieces.

[15] In Figure 4-1, Table 4-3, and Table 4-4, data from 1998 reflect national chain sales only. Because of this and the adjustments made to better estimate 1998 results, standard errors are not listed.

the January 1, 2001 ENERGY STAR revision.[16, 17] Because ENERGY STAR serves as the platform for many, manufacturers likely sought to prevent a decrease in the availability of models that met the ENERGY STAR standard.

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



Error bands for the 90% confidence interval.

16 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.

17 The adjustment required to improve dishwasher efficiency does not require radical modification of 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

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	**16.9%** (-) n = 66,161	**10.7%** (-) n = 15,478	**14.2%** (-) n = 15,012	**18.9%** (-) n = 16,775	**22.4%** (-) n = 18,896
1999	**28.8%** (0.001) n = 194,979	**25.6%** (0.0019) n = 47,633	**30.3%** (0.0021) n = 47,098	**29.7%** (0.0021) n = 46,689	**29.4%** (0.002) n = 53,559
2000	**31.6%** (.0010) n = 214,069	**28.3%** (.0018) n = 60,727	**29.5%** (.0019) n = 56,656	**30.5%** (.0022) n = 44,899	**38.3%** (.0021) n = 51,787
2001	**47.7%** (0.0012) n = 184,187	**37.7%** (0.0023) n = 44,730	**42.7%** (0.0024) n = 42,940	**50.2%** (0.0024) n = 44,784	**58.4%** (0.0022) n = 51,733
2002	**69.2%** (0.0011) n = 192,032	**63.9%** (0.0022) n = 47,405	**69.0%** (0.0021) n = 47,971	**71.7%** (0.0021) n = 45,298	**72.4%** (0.0020) n = 51,358
2003	**82.1%** (0.0009) n = 197,813	**74.1%** (0.0020) n = 48,553	**82.0%** (0.0017) n = 49,761	**81.1%** (0.0018) n = 46,281	**88.8%** (0.0014) n = 53,218
2004	**82.3%** (0.0009) n = 196,134	**79.3%** (0.0019) n = 44,782	**81.2%** (0.0018) n = 47,601	**83.2%** (0.0017) n = 49,378	**85.8%** (0.0015) n = 54,373
2005	**90.2%** (0.0006) n = 259,752	**92.1%** (0.0011) n = 63,921	**93.2%** (0.0010) n = 65,389	**89.4%** (0.0012) n = 63,882	**85.2%** (0.0014) n = 66,560
2006	**95.1%** (0.0004) n = 238,674	**94.1%** (0.0009) n = 65,013	**95.1%** (0.0009) n = 59,082	**95.7%** (0.0008) n = 56,793	**95.5%** (0.0009) n = 57,786

Standard errors in parentheses.

Table 4-4 reports the percentage of ENERGY STAR compliant dishwashers sold quarterly in each utility service area from 1998 to 2006. With an annual average market share near 97%, PG&E and "Other" service territories exhibited the highest percentage of ENERGY STAR dishwasher sales in 2006. SCE and SDG&E service territories reported slightly lower percentages, 92% and 90%, respectively.

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

Utility	Year	Percent of ENERGY STAR Qualified Dishwashers				
		Annual	**Q1**	**Q2**	**Q3**	**Q4**
PG&E	1998	**12.0%** (-) n = 24,900	**7.6%** (-) n = 5,671	**10.8%** (-) n = 5,626	**13.5%** (-) n = 6,522	**15.1%** (-) n = 7,081
	1999	**16.2%** (0.0014) n = 69,128	**11.6%** (0.0024) n = 17,005	**13.3%** (0.0026) n = 16,425	**18.1%** (0.003) n = 16,172	**21.1%** (0.0029) n = 19,526
	2000	**30.7%** (0.0015) n = 94,925	**28.3%** (0.0028) n = 25,748	**28.9%** (0.0029) n = 24,730	**31.6%** (0.0032) n = 20,976	**34.4%** (0.0031) n = 23,471
	2001	**53.1%** (0.0017) n = 91,396	**43.0%** (0.0033) n = 22,532	**50.8%** (0.0034) n = 21,389	**57.8%** (0.0033) n = 22,475	**60.2%** (0.0031) n = 25,000
	2002	**73.7%** (0.0015) n = 85,869	**67.9%** (0.0032) n = 21,314	**73.8%** (0.0030) n = 21,844	**76.9%** (0.0029) n = 20,540	**75.6%** (0.0029) n = 22,171
	2003	**86.1%** (0.0012) n = 82,079	**85.1%** (0.0024) n = 21,318	**86.0%** (0.0024) n = 21,398	**82.7%** (0.0028) n = 18,310	**90.9%** (0.0020) n = 21,053
	2004	**85.2%** (0.0013) n = 77,772	**81.4%** (0.0029) n = 18,159	**83.0%** (0.0027) n = 18,818	**86.2%** (0.0025) n = 19,336	**89.5%** (0.0021) n = 21,459
	2005	**91.4%** (0.0009) n = 93,617	**94.2%** (0.0015) n = 22,815	**94.5%** (0.0015) n = 23,497	**92.1%** (0.0018) n = 23,101	**85.3%** (0.0023) n = 24,204
	2006	**97.3%** (0.0006) n = 85,176	**97.0%** (0.0011) n = 23,296	**97.4%** (0.0011) n = 20,813	**97.1%** (0.0012) n = 20,338	**97.8%** (0.0010) n = 20,729
SCE	1998	**20.4%** (-) n = 20,197	**12.0%** (-) n = 4,893	**15.4%** (-) n = 4,596	**22.1%** (-) n = 4,940	**30.2%** (-) n = 5,768
	1999	**29.6%** (0.0017) n = 68,633	**26.2%** (0.0034) n = 16,560	**32.5%** (0.0036) n = 17,027	**30.8%** (0.0036) n = 16,882	**28.9%** (0.0034) n = 18,164
	2000	**32.2%** (0.0018) n = 65,649	**28.5%** (0.0032) n = 19,451	**30.4%** (0.0035) n = 17,358	**30.0%** (0.0040) n = 13,271	**39.9%** (0.0039) n = 15,669
	2001	**47.5%** (0.0022) n = 51,430	**34.6%** (0.0043) n = 12,227	**37.3%** (0.0044) n = 11,849	**49.1%** (0.0045) n = 12,273	**63.2%** (0.0039) n = 15,081
	2002	**72.6%** (0.0018) n = 60,392	**67.1%** (0.0038) n = 14,981	**71.5%** (0.0037) n = 14,823	**74.1%** (0.0037) n = 13,954	**78.6%** (0.0032) n = 16,634
	2003	**83.4%** (0.0014) n = 66,365	**47.8%** (0.0040) n = 15,417	**83.6%** (0.0029) n = 16,371	**84.9%** (0.0028) n = 16,233	**89.8%** (0.0022) n = 18,344
	2004	**82.1%** (0.0015) n = 67,530	**82.1%** (0.0032) n = 14,600	**80.2%** (0.0031) n = 16,650	**78.9%** (0.0031) n = 17,204	**87.4%** (0.0024) n = 19,076
	2005	**87.8%** (0.0011) n = 91,953	**88.5%** (0.0021) n = 22,761	**91.7%** (0.0018) n = 23,387	**85.8%** (0.0023) n = 22,746	**84.1%** (0.0024) n = 23,059
	2006	**92.3%** (0.0009) n = 84,959	**88.8%** (0.0021) n = 22,765	**92.5%** (0.0018) n = 21,420	**94.2%** (0.0016) n = 20,225	**93.1%** (0.0018) n = 20,549

Standard errors in parentheses.

Table 4-4 (cont'd.): Dishwasher Sales, Percent of ENERGY STAR Qualified Units by Utility Service Area

Utility	Year	Percent of ENERGY STAR Qualified Dishwashers				
		Annual	Q1	Q2	Q3	Q4
SDG&E	1998	**15.4%** (-) n = 6,510	**12.0%** (-) n = 1,466	**14.3%** (-) n = 1,487	**17.6%** (-) n = 1,724	**17.3%** (-) n = 1,833
	1999	**30.0%** (0.0032) n = 20,564	**29.3%** (0.0064) n = 4,995	**31.2%** (0.0066) n = 4,868	**29.2%** (0.0065) n = 4,872	**30.6%** (0.006) n = 5,829
	2000	**36.3%** (0.0035) n = 18,996	**30.7%** (0.0061) n = 5,674	**32.5%** (0.0066) n = 5,070	**33.4%** (0.0076) n = 3,831	**47.8%** (0.0075) n = 4,421
	2001	**25.6%** (0.0036) n = 14,803	**20.7%** (0.0068) n = 3,596	**24.3%** (0.0073) n = 3,485	**25.1%** (0.0073) n = 3,493	**31.0%** (0.0071) n = 4,229
	2002	**31.1%** (0.0040) n = 13,357	**27.4%** (0.0077) n = 3,318	**31.7%** (0.0081) n = 3,330	**34.9%** (0.0084) n = 3,185	**30.7%** (0.0078) n = 3,524
	2003	**58.0%** (0.0043) n = 13,358	**43.8%** (0.0085) n = 3,396	**51.2%** (0.0089) n = 3,148	**52.9%** (0.0089) n = 3,115	**81.2%** (0.0064) n = 3,699
	2004	**90.4%** (0.0026) n = 12,934	**82.6%** (0.0070) n = 2,902	**88.3%** (0.0057) n = 3,130	**90.9%** (0.0049) n = 3,390	**98.0%** (0.0024) n = 3,512
	2005	**81.1%** (0.0027) n = 21,121	**81.7%** (0.0054) n = 5,145	**81.7%** (0.0053) n = 5,387	**82.8%** (0.0052) n = 5,235	**78.2%** (0.0056) n = 5,354
	2006	**90.4%** (0.0021) n = 19,009	**90.0%** (0.0042) n = 5,130	**90.1%** (0.0043) n = 4,745	**91.2%** (0.0042) n = 4,630	**90.4%** (0.0044) n = 4,504
Other	1998	**12.9%** (-) n = 14,554	**8.2%** (-) n = 3,448	**11.8%** (-) n = 3,303	**14.8%** (-) n = 3,589	**16.2%** (-) n = 4,214
	1999	**27.7%** (0.0023) n = 36,654	**24.1%** (0.0045) n = 9,073	**27.9%** (0.0048) n = 8,778	**28.3%** (0.0048) n = 8,763	**29.4%** (0.0045) n = 10,040
	2000	**29.7%** (0.0025) n = 34,399	**26.5%** (0.0044) n = 9,854	**27.4%** (0.0046) n = 9,898	**27.2%** (0.0054) n = 6,821	**37.8%** (0.0053) n = 8,226
	2001	**39.2%** (0.0030) n = 26,558	**34.5%** (0.0060) n = 6,375	**38.9%** (0.0062) n = 6,217	**38.1%** (0.0060) n = 6,543	**45.0%** (0.0058) n = 7,423
	2002	**33.1%** (0.0026) n = 32,414	**29.5%** (0.0052) n = 7,792	**34.0%** (0.0053) n = 7,974	**35.6%** (0.0055) n = 7,619	**33.2%** (0.0050) n = 9,029
	2003	**60.0%** (0.0026) n = 36,011	**51.0%** (0.0054) n = 8,422	**52.8%** (0.0053) n = 8,844	**57.3%** (0.0053) n = 8,623	**76.1%** (0.0042) n = 10,122
	2004	**77.8%** (0.0021) n = 37,898	**72.4%** (0.0047) n = 9,121	**79.3%** (0.0043) n = 9,003	**83.2%** (0.0038) n = 9,448	**77.2%** (0.0041) n = 10,326
	2005	**93.8%** (0.0010) n = 53,061	**95.5%** (0.0018) n = 13,200	**95.2%** (0.0019) n = 13,118	**92.5%** (0.0023) n = 12,800	**88.8%** (0.0027) n = 13,943
	2006	**96.9%** (0.0008) n = 49,530	**97.2%** (0.0014) n = 13,822	**96.8%** (0.0016) n = 12,104	**96.8%** (0.0016) n = 11,600	**96.7%** (0.0016) n = 12,004

Standard errors in parentheses.
"Other" includes areas served by municipal utilities such as LADWP, LMUD, PP&L, SMUD, and others.

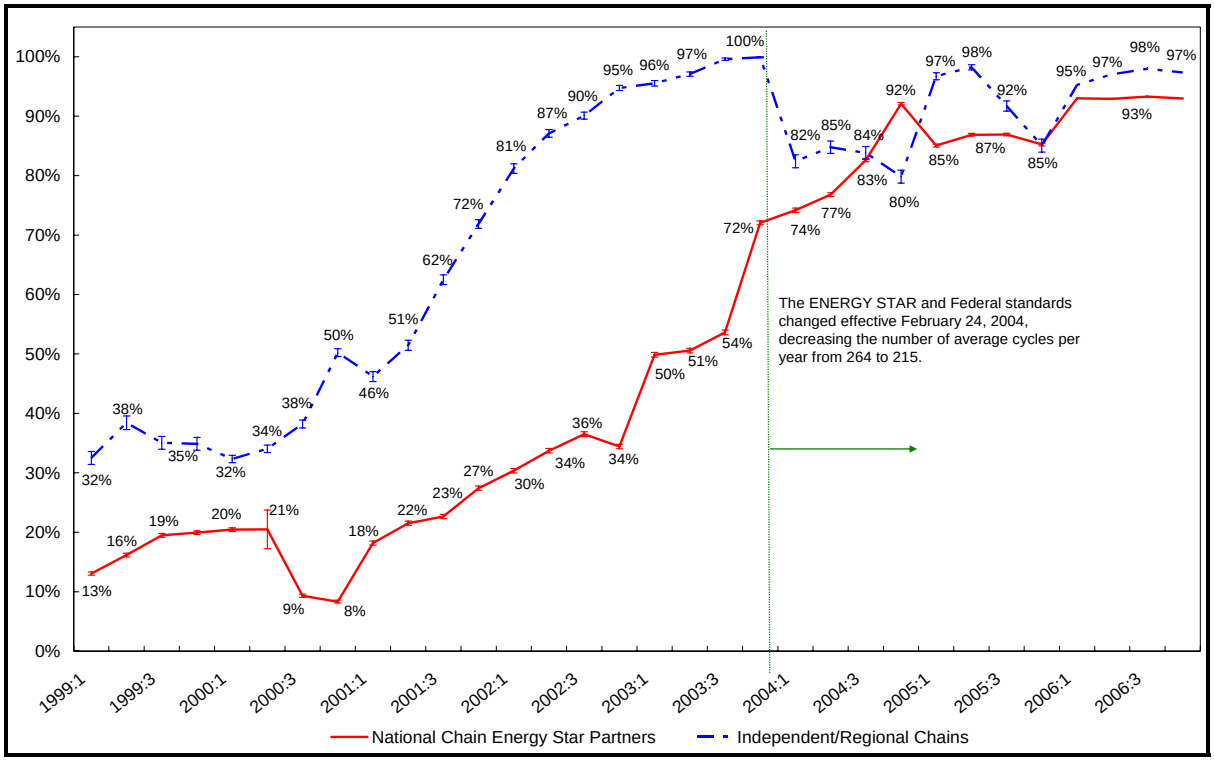
4.5. Analysis by Retailer Type

Market Share of ENERGY STAR Qualified Dishwashers

In Figure 4-2 and Table 4-5, the share of ENERGY STAR qualified dishwashers sold by national chains is compared with the share sold by independently owned stores and regional chains. Independent retailers have sold a greater percentage of qualifying appliances in almost every quarter since 1998. After the number of average cycles per year was revised in February 2004, national chains exhibited an increased share of ENERGY STAR qualified dishwashers from 72% to 93%. During the same period, the percentage of qualified dishwashers sold by independent retailers and regional chains fluctuated between 80% and 98%.

From 1999 to 2003, independent appliance retailers exhibited a remarkable gain in the percentage of ENERGY STAR dishwashers sold, increasing from 32% to 100%. The prevalence of high efficiency dishwashers coincided with the federal standard changes discussed in section 4.3. As high efficiency models were produced in anticipation of revised energy use standards, the EF of dishwashers often met or exceeded the ENERGY STAR threshold. Thus, the proportion of available models that met ENERGY STAR qualifications grew significantly, reaching nearly 100% among independent retailers by the end of 2003. However, once the energy use standards became established, the share of ENERGY STAR qualified dishwashers fluctuated between 80% and 98% for all retailers in 2005 and 2006.

Figure 4-2: 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 Retailer Type

Year	Retailer Type	Q1	Q2	Q3	Q4
1999	National Chain	**13.1%** (0.0014) n = 69,128	**16.2%** (0.0018) n = 42,227	**19.5%** (0.0019) n = 41,425	**19.9%** (0.0018) n = 48,184
	Independent/Regional Chain	**32.5%** (0.0066) n = 5,067	**38.4%** (0.0069) n = 4,871	**35.1%** (0.0066) n = 5,264	**34.9%** (0.0065) n = 5,375
2000	National Chain	**20.5%** (0.0019) n = 45,309	**20.5%** (0.0020) n = 41,854	**9.3%** (0.0017) n = 30,180	**8.3%** (0.0015) n = 35,928
	Independent/Regional Chain	**32.3%** (0.0038) n = 15,418	**34.1%** (0.0039) n = 14,802	**38.2%** (0.0040) n = 14,719	**50.2%** (0.0040) n = 15,859
2001	National Chain	**18.2%** (0.0021) n = 35,045	**24.5%** (0.0022) n = 33,560	**22.7%** (0.0022) n = 35,237	**27.4%** (0.0022) n = 41,079
	Independent/Regional Chain	**46.2%** (0.0051) n = 9,685	**51.5%** (0.0052) n = 9,380	**62.5%** (0.0050) n = 9,547	**71.9%** (0.0044) n = 10,654
2002	National Chain	**30.4%** (0.0027) n = 41,160	**33.7%** (0.0023) n = 40,640	**36.5%** (0.0025) n = 38,225	**34.4%** (0.0023) n = 44,304
	Independent/Regional Chain	**81.2%** (0.0049) n = 6,245	**87.1%** (0.0039) n = 7,331	**90.1%** (0.0036) n = 7,073	**94.7%** (0.0027) n = 7,054
2003	National Chain	**49.9%** (0.0024) n = 42,754	**50.6%** (0.0024) n = 43,700	**53.6%** (0.0024) n = 43,605	**72.1%** (0.0020) n = 50,186
	Independent/Regional Chain	**95.5%** (0.0027) n = 5,799	**97.1%** (0.0022) n = 6,061	**99.6%** (0.0013) n = 2,676	**99.9%** (0.0006) n = 3,032
2004	National Chain	**74.2%** (0.0021) n = 41,468	**76.8%** (0.0020) n = 44,415	**82.6%** (0.0018) n = 46,251	**92.1%** (0.0012) n = 50,772
	Independent/Regional Chain	**82.4%** (0.0066) n = 3,314	**84.8%** (0.0064) n = 3,186	**83.8%** (0.0066) n = 3,127	**79.8%** (0.0067) n = 3,601
2005	National Chain	**85.0%** (0.0014) n = 61,450	**86.9%** (0.0013) n = 62,793	**86.9%** (0.0014) n = 61,064	**85.2%** (0.0014) n = 63,695
	Independent/Regional Chain	**96.7%** (0.0036) n = 2,471	**98.2%** (0.0026) n = 2,596	**91.7%** (0.0052) n = 2,818	**85.1%** (0.0067) n = 2,865
2006	National Chain	**93.0%** (0.0010) n = 61,953	**92.9%** (0.0011) n = 56,088	**93.3%** (0.0011) n = 53,907	**93.0%** (0.0011) n = 54,578
	Independent/Regional Chain	**95.2%** (0.0039) n = 3,060	**97.1%** (0.0031) n = 2,994	**98.0%** (0.0026) n = 2,886	**97.3%** (0.0028) n = 3,208

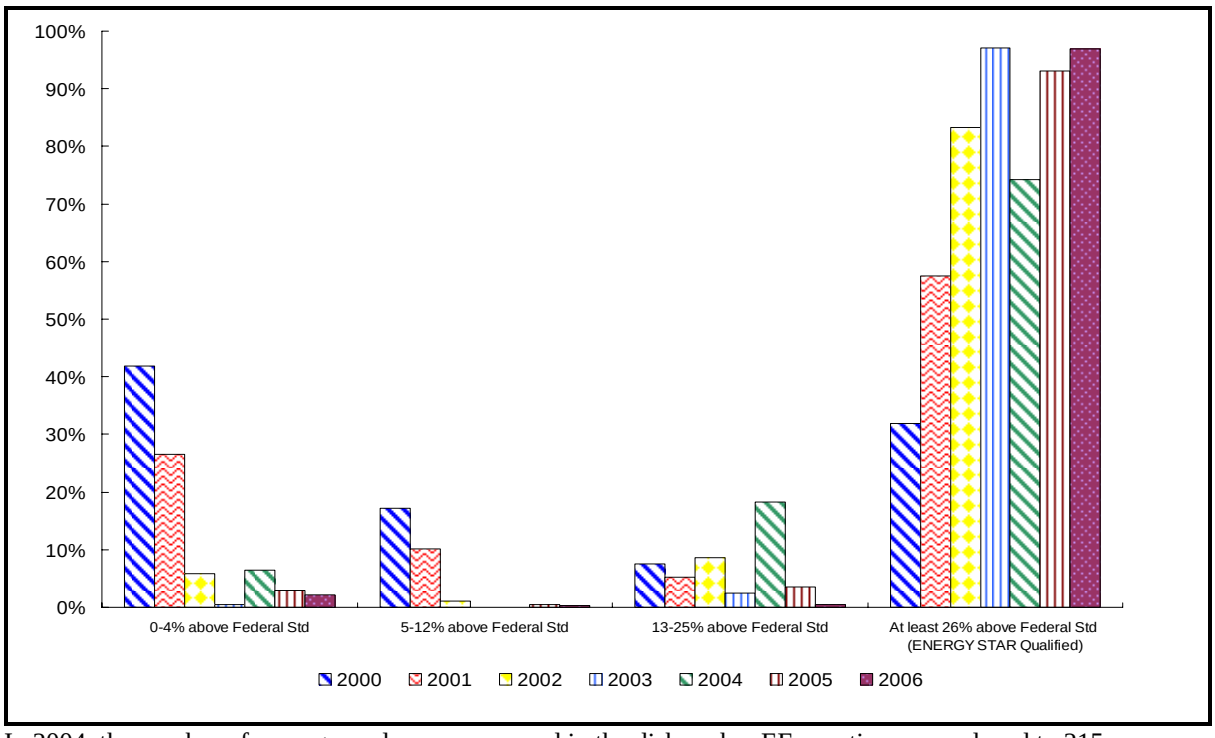
Standard errors in parentheses.

Energy Factor Analysis

Figure 4-3 illustrates the share of ENERGY STAR qualified dishwashers sold by independent appliance retailers in California. In 2000, total sales were split fairly evenly between non ENERGY STAR dishwashers and ENERGY STAR dishwashers, which at the time were at least 13% above federal standard. When the ENERGY STAR specification changed in 2001, 57% of units sold met the ENERGY STAR qualifications. Despite a reduction in the number of cycles used to calculate the EF, the percentage of ENERGY STAR qualified units sold by independent retailers continued to increase in 2002. In 2003, nearly all the dishwashers sold by independent retailers qualified for the ENERGY STAR label. After a decrease in 2004, the percentage of the ENERGY STAR units sold rebounded and reached almost 97% in 2006.

The data provided by independent retailers was descriptive enough to permit the grouping of dishwasher sales by efficiency levels. The ENERGY STAR threshold was 13% above the federal standard in 2000 and became 25% above the federal standard in 2001. When the DOE reduced the number of average annual cycles used in the EF calculation for units manufactured after July 1, 2002, a lower EF rating resulted for all dishwashers. This allowed the DOE to enforce higher efficiency levels without modifying the federal standard EF rating for dishwashers.

Figure 4-3: Percent of Dishwasher Sales through Independent Retailers by Efficiency Level



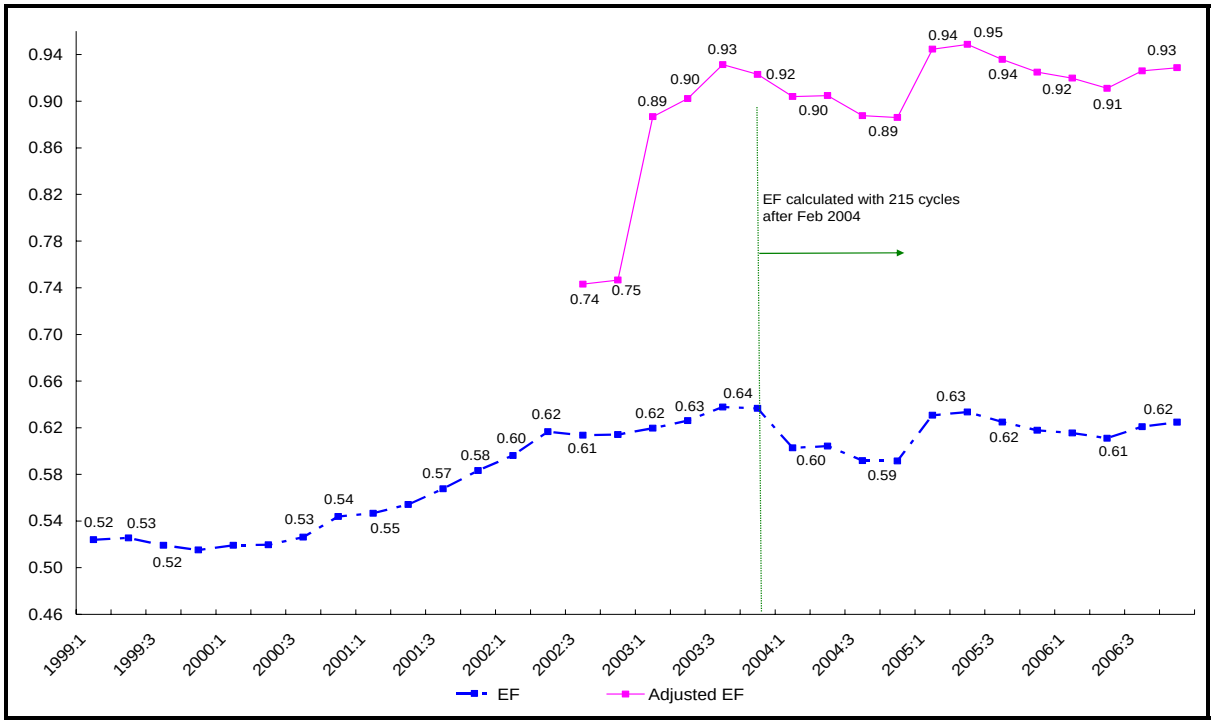
In 2004, the number of average cycles per year used in the dishwasher EF equation was reduced to 215.

Figure 4-4 illustrates the average EF of dishwashers sold by independent appliance retailers throughout California from 1999 through 2006. After a period of almost no change, the average EF began to increase in the last quarter of 2000 and continued to rise through the fourth quarter of 2003, except for a slight drop in the third and fourth quarters of 2002. Throughout 2005 and 2006, the average EF fluctuated between 0.61 and 0.63.

As explained previously, the increase in the share of ENERGY STAR qualified dishwashers sold by independent appliance retailers in California is most likely a result of manufacturers modifying their products in anticipation of a reduction in the average annual cycles used in the EF calculation. This response may also explain the dramatic growth in average EF throughout 2001 and the first two quarters of 2002. The announced reduction in the number of average annual cycles may have influenced manufacturers to produce more efficient dishwashers in advance of the new standard.

For dishwashers sold after July 1, 2002, Itron calculated the EF using the revised specification of 264 cycles per year. For this reason, the average EF did not increase even though dishwashers had become more efficient. As shown in Figure 4-4, the average EF of dishwashers sold by independents actually fell after the second half of 2002 despite the efficiency increase mandated by the new ENERGY STAR specification. After February 2004, average EF decreased again as the average cycles per year was reduced to 215. These adjustments in EF calculation may lead to misleading results when comparing average efficiency over several years. For a better comparison, Figure 4-4 includes a line labeled "Adjusted EF," which represents the EF as calculated with 322 average annual cycles for all years. Regardless of the revisions made to the calculation of EF, most dishwasher models currently offered by independent appliance retailers are ENERGY STAR qualified.

Figure 4-4: Average Energy Factor of Dishwashers Sold by Independent Appliance Retailers



5

Refrigerators

5.1. Overview

This section presents the results of the refrigerator analysis and includes total refrigerator unit sales (5.2), efficiency standards (5.3), market share of ENERGY STAR qualified units (5.4), ENERGY STAR sales by retailer type (5.5).

5.2. Total Unit Sales

Table 5-1 presents the estimated unit sales of refrigerators over the past several years. These figures were essential to the development of market shares in this report. Total refrigerator sales in California have increased every year since the RMST study began in 1998. However, growth has slowed to less than 1% in each of the past two years. The estimates were provided by AHAM.

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

Year	Units Sold
1998	949,400
1999	975,700
2000	1,025,300
2001	1,150,600
2002	1,199,100
2003	1,234,600
2004	1,332,800
2005	1,333,100
2006	1,341,800

Source: AHAM

5.3. Refrigerator Energy 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). The *adjusted volume* is the sum of the

fresh food compartment volume in cubic feet, and the product of an adjustment factor and the net freezer compartment volume.[18] The EF for refrigerators is calculated as:

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

Federal Energy Use Standard. Federal energy use standards for refrigerators changed on July 1, 2001.[19] The reduction of energy use reductions ranged from 27% to 32%, depending on configuration. Six months prior to the standards change, AHAM's *Directory of Certified Refrigerators and Freezers* contained 1,217 refrigerator/freezer models with the automatic defrost option, although only 25 of these models already met the new standard. During the first half of 2001, manufacturers were preparing for the new energy use standards, which led to a reduction of 25% in the average energy consumption of refrigerators.

ENERGY STAR Standard. The ENERGY STAR standard, effective on January 1, 2001, required refrigerators to consume 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. In January 2002, the CEC's appliance efficiency regulations were amended to match the increase in the federal energy use standards.

In 2001, only full-sized refrigerator-freezers were eligible for ENERGY STAR. Full-size automatic-defrost refrigerator-freezers were required to be 10% more efficient than the federal standard in order to qualify for ENERGY STAR. However, on January 1, 2003, the ENERGY STAR criteria for refrigerators were expanded to include all sizes and configurations of refrigerators and freezers. Several products, which were previously ineligible, became ENERGY STAR qualified, including:

- Manual defrost refrigerators,
- Partial automatic defrost refrigerators, and
- Single-door refrigerators.[20]

All refrigerators with a volume of 7.75 ft^3 or greater were required to exceed the minimum federal standard by at least 10% in order to qualify for ENERGY STAR.

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[18] Adjusted volume takes into account the differing temperatures between the refrigerator and freezer compartments with the following calculation: *adjusted volume = fresh volume* + (1.63 x *freezer volume*).

[19] The 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.

[20] On January 1, 2003, the ENERGY STAR criteria were also expanded to include freezers and compact refrigerators and freezers. However, these product categories are outside of the scope of work of the study; thus, these changes will not be addressed by this report.

It should be noted, however, that expansion of the ENERGY STAR criteria on January 1, 2003 to include previously ineligible categories of refrigerators did not impact the analysis method of this study. The current analysis method evaluates products that *could* qualify for the ENERGY STAR label rather than products that actually bear the ENERGY STAR label. These products have been tracked on an ongoing basis and have been analyzed under the qualifying criteria used for standard full-size automatic-defrost refrigerator-freezers (10% above federal standard).

Additionally, on January 1, 2004, the ENERGY STAR criteria for full-size refrigerators was modified to require all full-sized models to exceed the minimum federal standard by at least 15% to qualify for the ENERGY STAR label. The ENERGY STAR criteria for full-size freezers and compact refrigerators and freezers did not change at that time.

Upcoming Standard Increases

Currently, research is being conducted to determine when new federal standards should take effect for refrigerators and what those standards should be. Current legislation seeks to determine new efficiency standards the end of 2010. If approved, these changes would become effective in 2014.[21]

California IOU Incentive Programs. For the 2006-2008 rebate period, each California IOU program has a unique rebate structure. In 2006, SCE offered a $50 rebate and SDG&E offered a $25 rebate for the purchase an ENERGY STAR qualified refrigerator.

Table 5-2 summarizes the federal, state, and ENERGY STAR standards for refrigerators through 2005.

[21] http://www.cuwcc.org/uploads/committee/steering/Appliance_FINAL_Agreement_07-05-02.pdf

Table 5-2: Refrigerator Energy Use Standards

	Federal Standard		ENERGY STAR Criteria			
	January 1, 1993	**July 1, 2001**	**January 1, 1997**	**January 1, 2001**	**January 1, 2003**	**January 1, 2004**
Refrigerators and refrigerator-freezers, manual defrost	13.5*AV+299.0	8.82*AV+248.4	N/A	N/A	10% less energy than the 2001 federal standard	15% less energy than the 2001 federal standard
Refrigerator-freezers, partial automatic defrost	10.4*AV+398.0	8.82*AV+248.4				
Refrigerator-freezers, automatic defrost, top mount without TTD	16.0*AV+355.0	9.80*AV+276.0	20% less energy than the 1993 federal standard	10% less energy than the 2001 federal standard		
Refrigerator-freezers, automatic defrost, side mount without TTD	11.8*AV+501.0	4.91*AV+507.5				
Refrigerator-freezers, automatic defrost, bottom mount without TTD	16.5*AV+367.0	4.60*AV+459.0				
Refrigerator-freezers, automatic defrost, top mount with TTD	17.6*AV+391.0	10.20*AV+356.0				
Refrigerator-freezers, automatic defrost, side mount with TTD	16.3*AV+527.0	10.10*AV+406.0				
Upright freezers, manual defrost	10.3*AV+264.0	7.55*AV+258.3	N/A	N/A		10% less energy than the 2001 federal standard
Upright freezers, automatic defrost	14.9*AV+391.0	12.43*AV+326.1				
Chest freezers and all other freezers except compact freezers	11.0*AV+160.0	9.88*AV+143.7				
Compact refrigerators and refrigerator-freezers, manual defrost	13.5*AV+299.0	10.70*AV+299.0			20% less energy than the 2001 federal standard	20% less energy than the 2001 federal standard
Compact refrigerator-freezers, partial automatic defrost	10.4*AV+398.0	7.00*AV+398.0				
Compact refrigerator-freezers, automatic defrost with top-mounted freezer and compact all-refrigerators, automatic defrost	16.0*AV+355.0	12.70*AV+355.0				
Compact refrigerator-freezers, automatic defrost with side-mounted freezer	11.8*AV+501.0	7.60*AV+501.0				
Compact refrigerator-freezers, automatic defrost with bottom-mounted freezer	16.5*AV+367.0	13.10*AV+367.0				
Compact upright freezers, manual defrost	10.3*AV+264.0	9.78*AV+250.8				
Compact upright freezers, automatic defrost	14.9*AV+391.0	11.40*AV+391.0				
Compact chest freezers	11.0*AV+160.0	10.45*AV+152.0				
CALIFORNIA STANDARDS	Identical to the federal standard					

TTD = through-the-door ice dispenser.
For refrigerators, AV = Adjusted Volume = Fresh Volume + (1.63*Freezer Volume).
Compact refrigerators, refrigerator-freezers, and freezers are products with a total volume of less than 7.75 ft^3 and 36 inches or less in height.

5.4. Market Share of ENERGY STAR Qualified Refrigerators

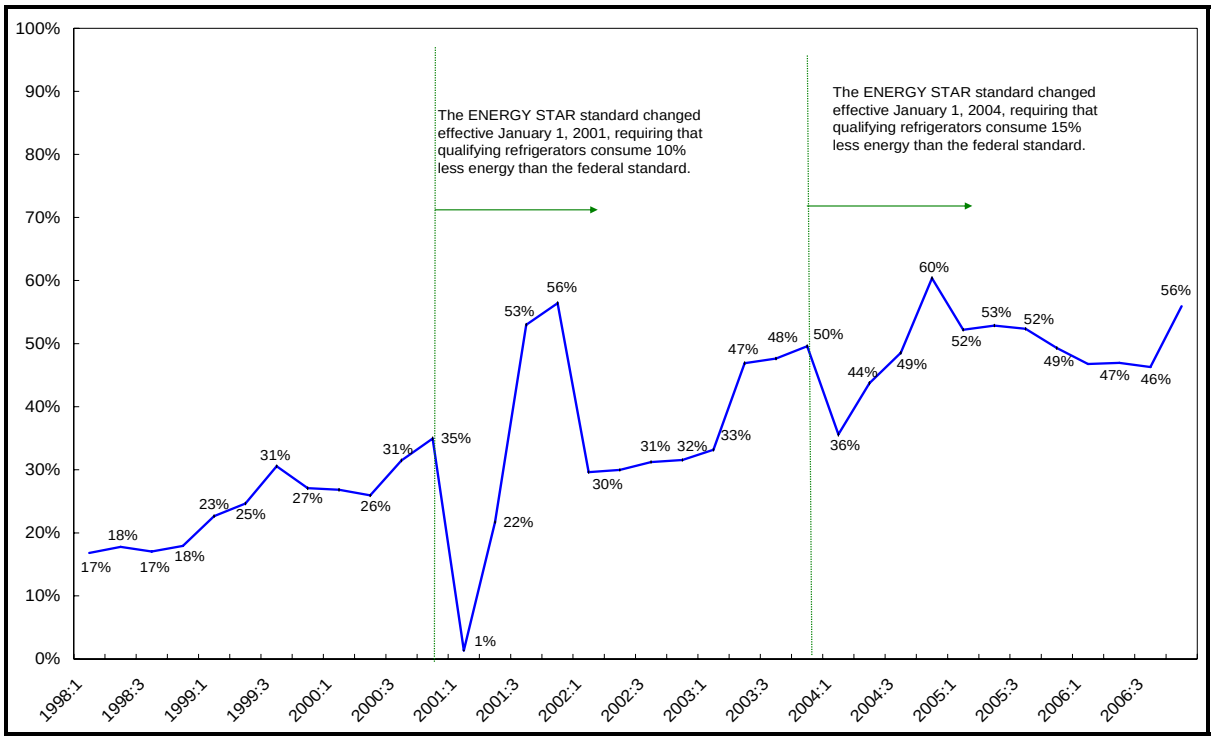
Figure 5-1 and Table 5-3 present the percentage of ENERGY STAR qualified refrigerators sold in California during the first quarter of 1998 through the fourth quarter of 2006.[22] The percent of ENERGY STAR refrigerators increased gradually from 1999 to 2000. In January 2001, a revision to the ENERGY STAR specification stated that qualifying refrigerators were required to use 10% less energy than allowed by the upcoming July 1, 2001 federal energy use standard. An abrupt drop in market share to almost 0% immediately occurred due to the scarcity of refrigerators that met the newly increased ENERGY STAR specification. The growth in share during the next two quarters resulted from manufacturers preparing for the federal standard change. As part of this preparation, ENERGY STAR qualified refrigerator units became available and market share rebounded.

In addition to the increasing availability of ENERGY STAR qualified refrigerators, utility incentive programs also may have affected market share in 2001. The peaks seen in the third and fourth quarters of 2001 correlate with the incentives offered from July 1 to December 31 encouraging consumers to purchase ENERGY STAR qualified refrigerators. The subsequent decrease in ENERGY STAR share in 2002 could be a result of the absence of utility incentives.

In 2003, the share of ENERGY STAR qualified refrigerators increased, partly due to efforts of manufacturers to meet the 2004 ENERGY STAR revisions and partly due to an increased ENERGY STAR share among national chain retailers. Since Itron does not maintain a direct relationship with the national chain retailers, the specific cause of the increase in national chain retailer share is unknown. The drop in the ENERGY STAR qualified sales in the first quarter of 2004 is likely a result of the increase in the ENERGY STAR qualifying threshold. As expected, shares rebounded rather quickly to 60% by the end of 2004. From 2005 to 2006, the ENERGY STAR share of refrigerators decreased steadily to 46% but increased to 56% in the fourth quarter or 2006.

[22] In Figure 5-1, Table 5-3, and Table 5-4, data from 1998 represent national chain sales only.

Figure 5-1: Refrigerator Sales, Percent of ENERGY STAR Qualified Units



Error bands for the 90% confidence interval.

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	**17.4%** (-) n = 230,171	**16.8%** (-) n = 46,004	**17.8%** (-) n = 55,309	**17.0%** (-) n = 76,525	**17.9%** (-) n = 52,333
1999	**26.5%** (0.0006) n = 473,882	**22.7%** (0.0013) n = 110,181	**24.7%** (0.0012) n = 121,250	**30.6%** (0.0013) n = 130,514	**27.1%** (0.0013) n = 111,937
2000	**29.8%** (0.0007) n = 490,296	**26.8%** (0.0013) n = 115,865	**25.9%** (0.0012) n = 145,173	**31.5%** (0.0013) n = 122,865	**34.9%** (0.0015) n = 106,393
2001	**35.4%** (0.0007) n = 522,010	**0.0%** (0.0004) n = 104,765	**21.7%** (0.0010) n = 146,412	**53.0%** (0.0013) n = 148,463	**56.4%** (0.0014) n = 122,370
2002	**30.6%** (0.0006) n = 694,594	**29.6%** (0.0012) n = 155,115	**30.0.%** (0.0011) n = 181,401	**31.2%** (0.0010) n = 198,236	**31.6%** (0.0012) n = 159,842
2003	**44.4%** (0.0007) n = 581,712	**33.2%** (0.011) n = 170,947	**46.9%** (0.0014) n = 128,821	**47.6%** (0.0013) n = 157,519	**49.6%** (0.0014) n = 124,425
2004	**47.1%** (0.0008) n = 436,826	**35.6%** (0.0016) n = 91,394	**43.7%** (0.0015) n = 114,903	**48.5%** (0.0014) n = 131,115	**60.4%** (0.0016) n = 99,414
2005	**51.8%** (0.0006) n = 683,768	**52.2%** (0.0013) n = 149,259	**52.9%** (0.0012) n = 180,323	**52.3%** (0.0011) n = 192,646	**49.3%** (0.0012) n = 161,540
2006	**48.5%** (0.0006) n = 685,310	**46.8%** (0.0012) n = 159,436	**47.0%** (0.0011) n = 190,558	**46.3%** (0.0011) n = 206,522	**55.9%** (0.0014) n = 128,794

Standard errors in parentheses.

Table 5-4 presents the percentage of ENERGY STAR qualified units by utility area in California. The share of ENERGY STAR refrigerators sold in 2006 through retailers in the PG&E service territory was 60%. In the "Other" service territories, ENERGY STAR qualified refrigerators accounted for 44% of the unit sales. The SCE and SDG&E service territories reported the lowest proportion of ENERGY STAR qualified refrigerator sales, at 41% and 40%, respectively.

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

Utility	Year	Percent of ENERGY STAR Qualified Refrigerators				
		Annual	Q1	Q2	Q3	Q4
PG&E	1998	**17.4%** (-) n = 90,493	**17.9%** (-) n = 19,547	**19.1%** (-) n = 21,576	**16.3%** (-) n = 28,722	**16.5%** (-) n = 20,648
	1999	**28.4%** (0.0011) n = 157,639	**23.4%** (0.0021) n = 38,313	**24.6%** (0.0021) n = 40,307	**31.5%** (0.0023) n = 41,424	**34.4%** (0.0025) n = 37,595
	2000	**35.0%** (0.0011) n = 179,113	**34.3%** (0.0023) n = 42,475	**31.1%** (0.0020) n = 52,914	**34.6%** (0.0023) n = 43,030	**40.6%** (0.0024) n = 40,694
	2001	**35.5%** (0.0011) n = 206,711	**0.0%** (0.0006) n = 43,728	**26.8%** (0.0018) n = 58,424	**54.6%** (0.0021) n = 57,738	**53.9%** (0.0023) n = 46,821
	2002	**37.3%** (0.0010) n = 252,536	**35.9%** (0.0020) n = 57,267	**37.8%** (0.0019) n = 66,242	**38.5%** (0.0018) n = 70,350	**36.7%** (0.0020) n = 58,677
	2003	**46.0%** (0.0011) n = 211,498	**37.7%** (0.0019) n = 63,250	**49.0%** (0.0023) n = 48,387	**49.9%** (0.0021) n = 54,846	**49.3%** (0.0024) n = 45,015
	2004	**54.4%** (0.0013) n = 155,935	**42.1%** (0.0027) n = 33,323	**51.5%** (0.0025) n = 40,786	**53.9%** (0.0023) n = 45,775	**68.0%** (0.0025) n = 36,051
	2005	**61.2%** (0.0011) n = 204,995	**57.3%** (0.0024) n = 44,207	**61.2%** (0.0021) n = 54,083	**63.3%** (0.0020) n = 58,300	**61.9%** (0.0022) n = 48,405
	2006	**59.8%** (0.0011) n = 198,896	**58.2%** (0.0023) n = 47,771	**58.1%** (0.0021) n = 54,480	**58.3%** (0.0020) n = 58,316	**66.0%** (0.0024) n = 38,329
SCE	1998	**16.2%** (-) n = 69,987	**14.2%** (-) n = 13,179	**15.8%** (-) n = 17,023	**16.3%** (-) n = 24,049	**18.1%** (-) n = 15,736
	1999	**25.4%** (0.0011) n = 168,527	**21.5%** (0.0021) n = 37,392	**23.7%** (0.0020) n = 43,460	**30.4%** (0.0021) n = 48,231	**24.6%** (0.0022) n = 39,444
	2000	**24.6%** (0.0011) n = 165,926	**20.0%** (0.0020) n = 39,486	**20.4%** (0.0018) n = 49,416	**28.0%** (0.0022) n = 42,985	**29.1%** (0.0024) n = 34,039
	2001	**42.8%** (0.0012) n = 174,894	**0.0%** (0.0006) n = 32,063	**20.4%** (0.0018) n = 49,836	**63.7%** (0.0021) n = 50,445	**68.1%** (0.0023) n = 42,550
	2002	**26.4%** (0.0009) n = 231,730	**25.9%** (0.0019) n = 51,988	**24.3%** (0.0017) n = 60,352	**26.6%** (0.0017) n = 67,547	**29.2%** (0.0020) n = 51,843
	2003	**45.0%** (0.0011) n = 195,784	**28.7%** (0.0019) n = 56,672	**45.5%** (0.0024) n = 42,524	**47.1%** (0.0021) n = 54,812	**51.5%** (0.0024) n = 41,776
	2004	**36.1%** (0.0013) n = 147,609	**27.3%** (0.0026) n = 29,646	**35.1%** (0.0024) n = 39,156	**38.2%** (0.0023) n = 45,130	**46.5%** (0.0027) n = 33,677
	2005	**42.8%** (0.0010) n = 267,188	**42.8%** (0.0020) n = 58,622	**44.8%** (0.0019) n = 70,205	**44.1%** (0.0018) n = 75,099	**38.5%** (0.0019) n = 63,262
	2006	**40.6%** (0.0009) n = 279,948	**38.3%** (0.0019) n = 63,815	**39.6%** (0.0017) n = 78,386	**38.7%** (0.0017) n = 85,828	**48.1%** (0.0022) n = 51,919

Standard errors in parentheses.

Table 5-4 (cont'd.): Refrigerator Sales, Percent of ENERGY STAR Qualified Units by Utility Service Area

Utility	Year	Percent of ENERGY STAR Qualified Refrigerators				
		Annual	Q1	Q2	Q3	Q4
SDG&E	1998	**23.1%** (-) n = 17,969	**25.4%** (-) n = 2,980	**21.1%** (-) n = 4,484	**22.8%** (-) n = 6,434	**24.0%** (-) n = 4,071
	1999	**29.8%** (0.0023) n = 39,695	**28.5%** (0.0046) n = 9,483	**29.0%** (0.0045) n = 10,237	**32.2%** (0.0046) n = 10,417	**29.0%** (0.0046) n = 9,558
	2000	**37.4%** (0.0024) n = 39,102	**29.5%** (0.0048) n = 9,036	**30.0%** (0.0044) n = 10,749	**42.0%** (0.0047) n = 10,671	**44.7%** (0.0053) n = 8,646
	2001	**29.0%** (0.0022) n = 43,135	**0.0%** (0.0010) n = 9,221	**23.3%** (0.0039) n = 11,829	**40.2%** (0.0045) n = 12,045	**48.1%** (0.0050) n = 10,040
	2002	**29.1%** (0.0020) n = 53,498	**27.4%** (0.0077) n = 3,318	**31.7%** (0.0080) n = 3,330	**34.9%** (0.0084) n = 3,185	**30.7%** (0.0078) n = 3,524
	2003	**40.2%** (0.0025) n = 38,187	**31.2%** (0.0041) n = 12,718	**46.8%** (0.0058) n = 7,360	**43.8%** (0.0050) n = 9,994	**43.9%** (0.0055) n = 8,115
	2004	**53.2%** (0.0031) n = 26,079	**53.9%** (0.0068) n = 5,368	**53.8%** (0.0061) n = 6,717	**43.9%** **(**0.0056) n = 7,930	**63.7%** (0.0062) n = 6,064
	2005	**44.3%** (0.0022) n = 52,984	**42.6%** (0.0045) n = 11,996	**47.3%** (0.0042) n = 14,021	**46.1%** (0.0041) n = 14,477	**40.5%** (0.0044) n = 12,490
	2006	**39.8%** (0.0021) n = 52,214	**40.4%** (0.0045) n = 11,875	**37.8%** (0.0040) n = 14,436	**37.3%** (0.0038) n = 15,983	**46.0%** (0.0050) n = 9,920
Other	1998	**13.9%** (-) n = 51,722	**13.0%** (-) n = 10,298	**13.9%** (-) n = 12,226	**13.9%** (-) n = 17,320	**14.7%** (-) n = 11,878
	1999	**21.7%** (0.0013) n = 108,021	**18.6%** (0.0025) n = 24,993	**20.1%** (0.0024) n = 27,246	**22.8%** (0.0024) n = 30,442	**24.7%** (0.0027) n = 25,340
	2000	**25.0%** (0.0013) n = 106,155	**22.7%** (0.0026) n = 24,868	**23.2%** (0.0024) n = 32,094	**26.6%** (0.0027) n = 26,179	**27.9%** (0.0029) n = 23,014
	2001	**19.0%** (0.0013) n = 97,270	**0.0%** (0.0008) n = 19,753	**12.0%** (0.0020) n = 26,323	**26.2%** (0.0026) n = 28,235	**33.4%** (0.0031) n = 22,959
	2002	**24.9%** (0.0011) n = 156,830	**23.3%** (0.0023) n = 33,661	**23.8%** (0.0021) n = 41,022	**26.2%** (0.0021) n = 44,999	**25.8%** (0.0023) n = 37,148
	2003	**40.2%** (0.0013) n = 136,243	**28.0%** (0.0023) n = 38,307	**44.5%** (0.0028) n = 30,550	**45.1%** (0.0026) n = 37,867	**45.4%** (0.0029) n = 29,519
	2004	**50.5%** (0.0015) n = 107,203	**38.3%** (0.0032) n = 23,057	**43.7%** (0.0030) n = 28,244	**53.3%** (0.0028) n = 32,280	**64.4%** (0.0031) n = 23,622
	2005	**52.6%** (0.0013) n = 158,601	**61.0%** (0.0026) n = 34,434	**54.7%** (0.0024) n = 42,014	**48.1%** (0.0024) n = 44,770	**45.4%** (0.0026) n = 37,383
	2006	**44.4%** (0.0013) n = 154,252	**42.4%** (0.0026) n = 35,975	**43.3%** (0.0024) n = 43,256	**41.7%** (0.0023) n = 46,395	**52.6%** (0.0030) n = 28,626

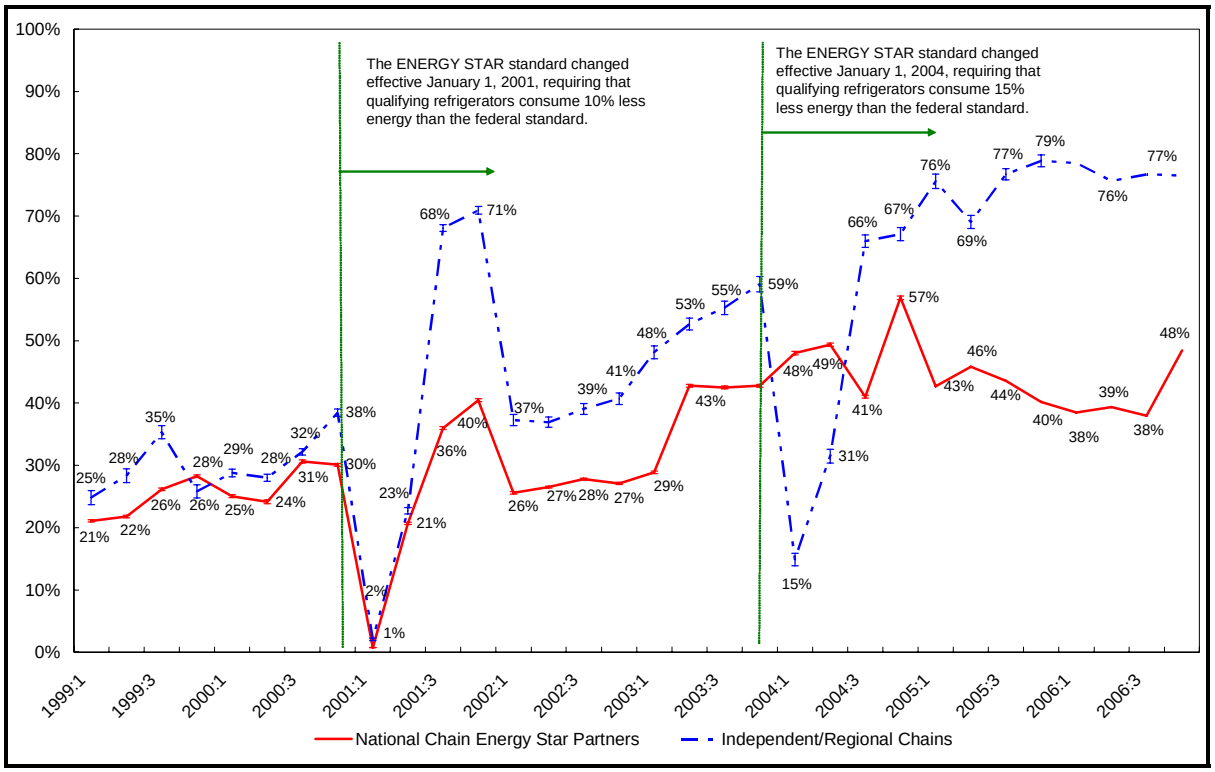
Standard errors in parentheses.
The "Other" category encompasses areas served by municipal utilities such as LADWP, LMUD, PP&L, SMUD, and others.

5.5. Analysis by Retailer Type

Market Share of ENERGY STAR Qualified Refrigerators

Figure 5-2 and Table 5-5 compares the share of ENERGY STAR qualified refrigerators sold by national chains and the share sold by independent retailers. With the exception of the fourth quarter of 1999 and the first half of 2004, the share sold by the national chains is less than the share sold by the independent appliance retailers in California.[23] The decrease in share in 2001 is a result of the factors discussed in section 5.4. Figure 5-2 illustrates large gap between the percentage of ENERGY STAR units sold by independent retailers and the percentage sold by national chains. With the exception of resurgence in the fourth quarter of 2006, the share of ENERGY STAR qualified units sold by national chains has hovered near or below 40% since 2005. The share of ENERGY STAR qualified refrigerators sold by independent retailers and regional chains has stabilized near 77%.

Figure 5-2: Refrigerator Sales, Percent of ENERGY STAR Qualified Units by Retailer Type



Error bands for the 90% confidence interval.

[23] 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 Retailer Type

Year	Retailer Type	Q1	Q2	Q3	Q4
1999	National Chain	**21.1%** (0.0012) n = 106,212	**21.8%** (0.0012) n = 116,872	**26.2%** (0.0012) n = 124,803	**28.2%** (0.0014) n = 107,273
	Independent/Regional Chain	**24.8%** (0.0069) n = 3,969	**28.3%** (0.0068) n = 4,378	**35.31** (0.0063) n = 5,711	**25.8%** (0.0064) n = 4,664
2000	National Chain	**25.0%** (0.0014) n = 100,864	**24.1%** (0.0012) n = 127,557	**30.6%** (0.0014) n = 101,910	**30.1%** (0.0015) n = 87,641
	Independent/Regional Chain	**28.8%** (0.0037) n = 15,001	**28.0%** (0.0034) n = 17,616	**32.1%** (0.0032) n = 20,955	**38.4%** (0.0036) n = 18,752
2001	National Chain	**25.0%** (0.0014) n = 100,864	**24.1%** (0.0012) n = 127,557	**30.6%** (0.0014) n = 101,910	**30.1%** (0.0015) n = 87,641
	Independent/Regional Chain	**28.8%** (0.0037) n = 15,001	**28.0%** (0.0034) n = 17,616	**32.1%** (0.0032) n = 20,955	**38.4%** (0.0036) n = 18,752
2002	National Chain	**25.6%** (0.0011) n = 147,043	**26.5%** (0.0011) n = 172,062	**27.8%** (0.0010) n = 189,973	**27.1%** (0.0011) n = 152,300
	Independent/Regional Chain	**37.3%** (0.0054) n = 8,072	**36.9%** (0.0050) n = 9,339	**39.1%** (0.0054) n = 8,263	**40.7%** (0.0057) n = 7,542
2003	National Chain	**28.9%** (0.0011) n = 164,613	**42.8%** (0.0014) n = 121,735	**42.5%** (0.0013) n = 151,690	**42.8%** (0.0014) n = 120,044
	Independent/Regional Chain	**48.1%** (0.0063) n = 6,334	**52.7%** (0.0098) n = 7,086	**55.3%** (0.0065) n = 5,829	**59.1%** (0.0122) n = 4,381
2004	National Chain	**48.0%** (0.0017) n = 88,026	**49.4%** (0.0015) n = 110,220	**41.0%** (0.0014) n = 125,258	**56.9%** (0.0016) n = 93,970
	Independent/Regional Chain	**14.9%** (0.0061) n = 3,368	**31.5%** (0.0068) n = 4,683	**66.0%** (0.0062) n = 5,857	**67.1%** (0.0064) n = 5,444
2005	National Chain	**42.7%** (0.0013) n = 145,499	**45.8%** (0.0012) n = 175,189	**43.6%** (0.0011) n = 186,636	**40.2%** (0.0012) n = 156,316
	Independent/Regional Chain	**75.6%** (0.0070) n = 3,760	**69.0%** (0.0065) n = 5,134	**76.7%** (0.0055) n = 6,010	**78.9%** (0.0057) n = 5,224
2006	National Chain	**38.5%** (0.0012) n = 154,959	**39.4%** (0.0011) n = 185,262	**37.9%** (0.0011) n = 200,624	**48.4%** (0.0014) n = 123,861
	Independent/Regional Chain	**78.5%** (0.0061) n = 4,477	**75.6%** (0.0059) n = 5,296	**76.7%** (0.0055) n = 5,898	**76.5%** (0.0060) n = 4,933

Standard errors in parentheses.

Energy Factor Analysis

The EF analysis presents the distribution of refrigerator sales through independent or regional retail segments by efficiency categories and average EF. The data used in this analysis is limited to the point-of-sale data obtained by a panel of independent appliance retailers. The EF analysis is a more accurate measure of efficiency trends than the market share of ENERGY STAR qualified units because ENERGY STAR specifications change periodically, making it more difficult to compare results over time.

Figure 5-3 presents the percentage of refrigerator sales by independent appliance retailers by efficiency level. Results for 2001 are presented semi-annually, where "2001:1" refers to the first six months of the year, and "2001:2" refers to the latter six months of the year. During the first half of 2001, most refrigerators sold by independent retailers did not meet ENERGY STAR criteria. During the second half of the year, however, a larger proportion 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. In 2005 and 2006, all the refrigerators sold by independent retailers met the federal standard, with the majority of units being at least 10% above the federal standard. However, since the more stringent ENERGY STAR standard was set in 2004, very few refrigerators have been sold with an efficiency level 20% above the federal standard.

Figure 5-3: Percent of Independent Refrigerator Sales by Efficiency Level

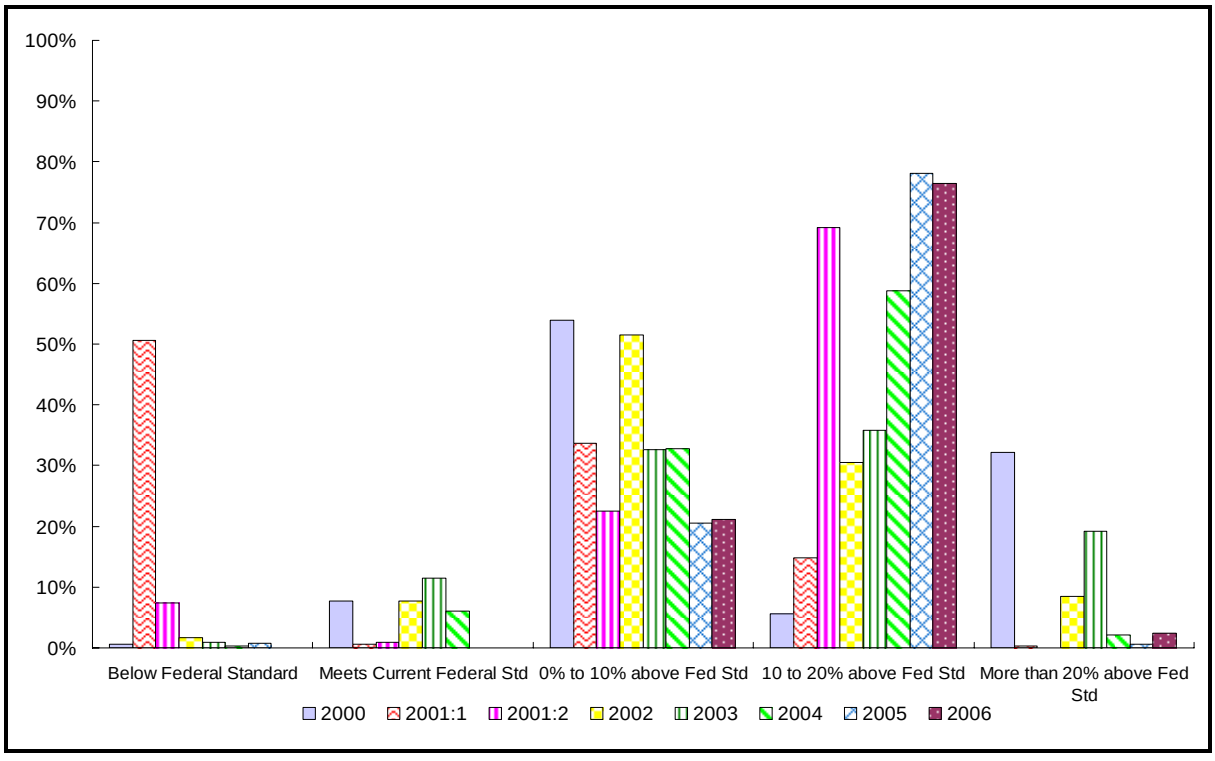
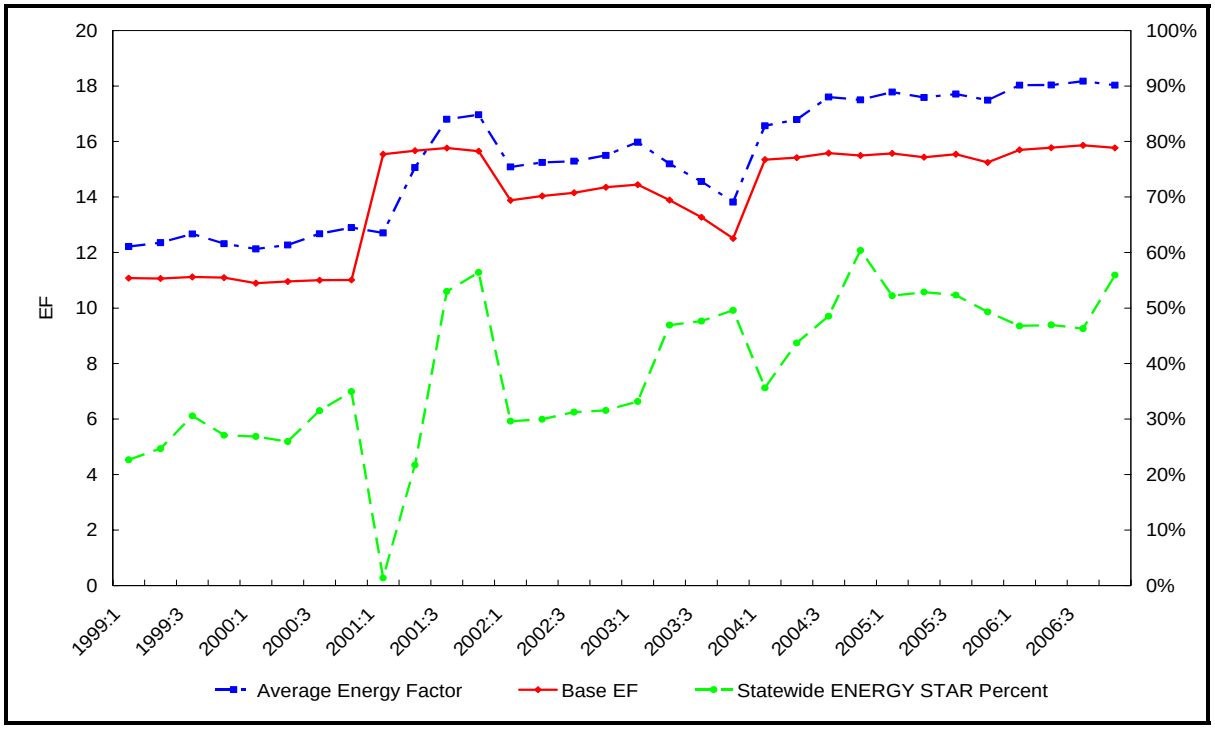


Figure 5-4 illustrates the average EF of refrigerators sold through independent appliance retailers in California from 1999 through 2006. The figure also shows the trend of the *Base EF*, which reflects revisions in the ENERGY STAR standard.[24] The *Base EF* differs from the actual federal because during the first two quarters of 2001, the ENERGY STAR efficiency threshold was based on the new federal standard, which did not actually take effect until July 1, 2001. Figure 5-4 shows that the average EF and the Base EF increased in 2004, and the two factors have remained steady through the end of 2006.

Figure 5-4 also demonstrates the relationship between the market share for ENERGY STAR qualified refrigerators and the average EF rating. The scarcity of ENERGY STAR qualified units in the first quarter of 2001 was largely a result of the July 1, 2001 federal standard increase. Despite this drop in ENERGY STAR share, the average efficiency rating increased, as one would expect. During 2005 and 2006, the percentage of ENERGY STAR qualified refrigerators sold statewide has stabilized near the 50% mark.

Figure 5-4: Comparison and Correlation of Independent Retailer Energy Factor Averages and ENERGY STAR Percentage Share for Refrigerators



[24] Base EF is the average EF for refrigerator models sold by independent retailers, calculated with the appropriate federal standard for that time against which the ENERGY STAR standard was measured. In 1999, 2000, the second half of 2001, 2002, and 2003, 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.

6

Room Air Conditioners

6.1. Overview

This section presents the results of the refrigerator analysis and includes total room air conditioner unit sales, efficiency standards, market share of ENERGY STAR qualified units, and ENERGY STAR sales by retailer type.

6.2. Total Unit Sales

Itron obtained manufacturer shipment data from AHAM to estimate total room air conditioner unit sales. These figures are presented in Table 6-1. Despite a slight decrease in 2006, the number of units shipped into California has more than doubled since 1998.

It should be noted that most room air conditioning units are typically sold during the second and third quarter of the year when weather conditions drive sales. Due to the seasonal nature of room air conditioners, sales statistics vary dramatically from one quarter to the next quarter. The results in this report are presented annually in order to present a more meaningful analysis.

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

Year	Units Sold
1998	231,100
1999	278,600
2000	279,600
2001	409,200
2002	316,200
2003	515,900
2004	664,100
2005	538,600
2006	502,000

Source: AHAM

6.3. Room Air Conditioner Energy 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.

Federal Energy Use Standard. Federal energy efficiency standards for room air conditioners were updated on October 1, 2000. The former standards had been in effect since January 1, 1990.

ENERGY STAR Standard. To qualify for the ENERGY STAR label, room air conditioners must exceed the federal standard by at least 10%. On October 1, 2003, the ENERGY STAR criteria for room air conditioners were expanded to include units without louvered sides, commonly referred to as "built in" or "through-the-wall" units and the casement product classes. Units with reverse cycle were still excluded from ENERGY STAR qualification. However, since room air conditioner sales are seasonal, the impact of these changes upon 2003 results is likely to have been relatively minor since the new standard was effective only during the fourth quarter, which typically exhibits very low room air conditioner sales.

California Standard. In January 2002, the CEC amended its appliance efficiency regulations to reflect and equal the increase in the 2000 federal energy use standards.

California IOU Incentive Programs. For the 2006-2008 rebate period, all three major California utilities offer a $50 rebate towards the purchase of an ENERGY STAR qualified room air conditioner.

Table 6-2 summarizes the federal, state, and ENERGY STAR standards for room air conditioners by room air conditioner configuration and size.

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

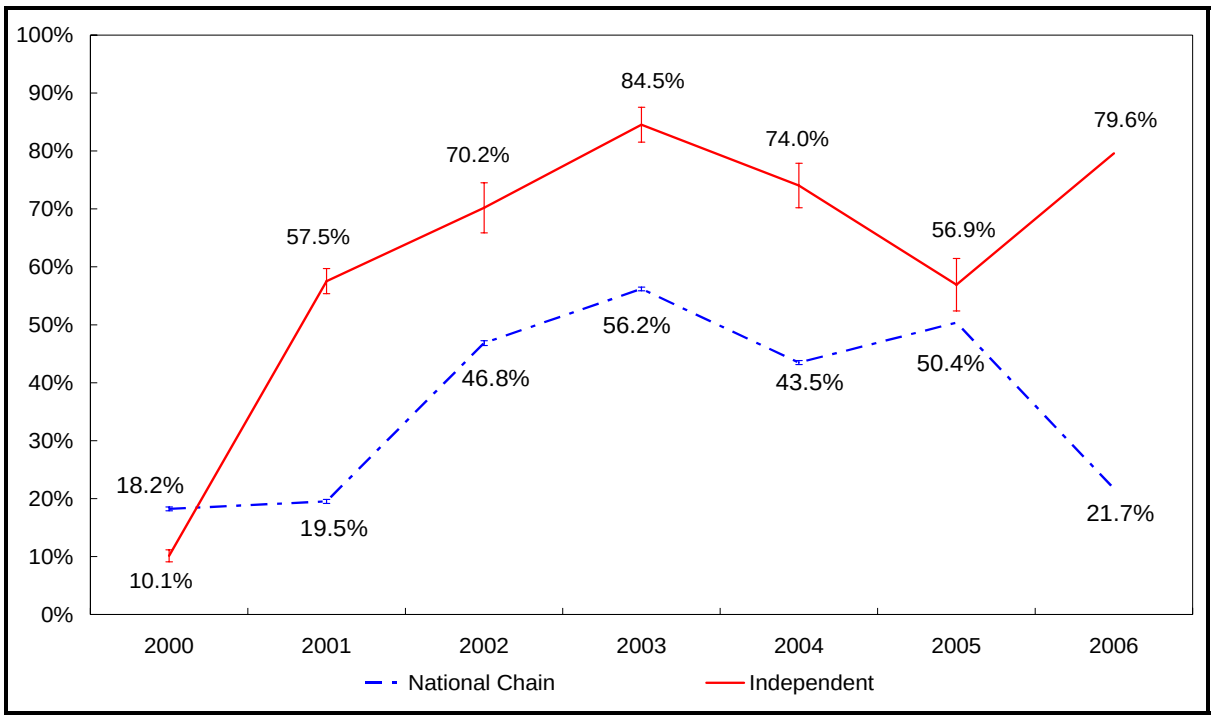
Btuh	Configuration	Federal Standard		ENERGY STAR[a, b]	California Standards[c]
		January 1, 1990	October 1, 2000	October 1, 2003	January 1, 2002
< 6,000	Without reverse cycle and with louvered sides	8.0	9.7	10.7	9.7
	Without reverse cycle and without louvered sides	8.0	9.0	9.9	9.0
6,000 – 7,999	Without 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	9.9	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	9.4	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	9.4	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	9.6	8.7
	Casement slider	*	9.5	10.5	9.5

a. ENERGY STAR standards apply to Btu rating categories only.
b. Prior to October 1, 2003, room air conditioners were required to exceed federal standards by at least 15% to qualify for the ENERGY STAR label.
c. Standards for previous years discussed in further detail in previous reports.

6.4. Analysis by Retailer Type

Figure 6-1 and Table 6-3 present the market share of ENERGY STAR room air conditioners sold through independent retailers and for national chains. As shown, a large percentage of the inventory sold by independent retailers is ENERGY STAR qualified. National chains, on the other hand, sell a relatively small percentage of ENERGY STAR qualified room air conditioners. In 2005, independent retailers and national chains sold a nearly equal percentage of ENERGY STAR units. However, in 2006 the gap widened again as 80% of independent retailer room air conditioner sales were ENERGY STAR qualified, while only 22% of units sold through national chains were ENERGY STAR qualified.

Figure 6-1: Room Air Conditioner Sales, Annual Percent of ENERGY STAR Qualified Units, by Retailer Type



Error bands for the 90% confidence interval.

Table 6-3: Room Air Conditioner ENERGY STAR Sales, by Retailer Type

Year/Quarter	Retailer Type	
	National Chains	Independent and Regional Chains
2000	**11.6%** (0.0005) n = 41,138	**10.1%** (0.0063) n = 2,314
2001	**16.3%** (0.0006) n = 33,669	**30.1%** (0.0122) n = 1,408
2002	**46.8%** (0.0025) n = 39,202	**70.2%** (0.0263) n = 302
2003	**56.2%** (0.0020) n = 62,215	**84.5%** (0.018) n = 388
2004	**43.5%** (0.0020) n = 58,738	**74.0%** (0.0233) n = 353
2005	**50.4%** (0.0014) n = 128,755	**56.9%** (0.0275) n = 325
2006	**21.7%** (0.0010) n = 165,827	**79.6%** (0.0150) n = 722

Standard errors in parentheses.

Table 6-4 presents market shares of ENERGY STAR room air conditioners sold in the national chain appliance store segment by utility. The market shares are somewhat uniform across utilities, but national chain retailers in the "Other" service areas sold the greatest share of ENERGY STAR qualified room air conditioners at 26%, while national chain retailers in the SDG&E service area sold the smallest share at 17%. The share of ENERGY STAR qualified room air conditioner sales in the PG&E and SCE service territories were 21% and 20%, respectively. Sales of room air conditioners sold through independent retailers were not included in this study due to insufficient data.

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

Year	PG&E	SCE	SDG&E	Other
1998	**6.4%** (0.0033) n = 5,641	**5.9%** (0.0030) n = 6,119	**4.5%** (0.0077) n = 728	**8.0%** (0.0033) n = 6,613
1999	**6.0%** (0.0042) n = 3,209	**6.5%** (0.0041) n = 3,580	**6.3%** (0.0152) n = 254	**6.7%** (0.0039) n = 4,134
2000	**18.9%** (0.0032) n = 15,074	**18.3%** (0.0036) n = 11,636	**15.8%** (0.0083) n = 1,927	**17.7%** (0.0035) n = 11,611
2001	**24.5%** (0.0041) n = 10,906	**17.1%** (0.0037) n = 10,346	**18.9%** (0.0105) n = 1,402	**16.9%** (0.0036) n = 10,950
2002	**48.6%** (0.0046) n = 11,811	**44.8%** (0.0045) n = 12,028	**43.6%** (0.0126) n = 1,558	**47.5%** (0.0042) n = 13,818
2003	**50.4%** (0.0040) n = 16,008	**58.1%** (0.0034) n = 21,630	**52.2%** (0.0093) n = 2,915	**58.9%** (0.0033) n = 21,738
2004	**41.4%** (0.0043) n = 12,826	**43.2%** (0.0033) n = 23,133	**39.3%** (0.0078) n = 3,966	**46.1%** (0.0036) n = 18,813
2005	**47.6%** (0.0030) n = 28,480	**52.3%** (0.0021) n = 54,463	**44.6%** (0.0056) n = 7,827	**50.9%** (0.0026) n = 37,985
2006	**21.1%** (0.0022) n = 34,905	**20.3%** (0.0015) n = 71,065	**17.1%** (0.0031) n = 14,757	**26.0%** (0.0021) n = 45,100

Standard errors in parentheses.
"Other" includes areas served by municipal utilities such as LADWP, SMUD, and others.