

## MASSACHUSETTS ENERGY STAR® APPLIANCE PROGRAM: MARKET PENETRATION TRACKING AND ANALYSIS

June 28, 2006

### 1. Introduction

This document summarizes market penetration tracking and analysis of ENERGY STAR®-labeled appliances from multiple data sources for 2005. The sponsors of the evaluation include Cape Light Compact, Fitchburg Gas and Electric, Massachusetts Electric and Nantucket Electric, NSTAR, and Western Massachusetts Electric. This analysis focuses on four appliances types: clothes washers (CW), dishwashers (DW), refrigerators (RF), and room air conditioners (RAC). This analysis compares and contrasts major findings from annual MPERs conducted by Nexus Market Research, Inc. since 2002. This report is organized as follows:

- Market penetration of ENERGY STAR-labeled appliances reported from national retail chains to D&R International for all four major appliances from 1998 through 2005
- Market penetration of ENERGY STAR-labeled appliances collected by Lockheed Martin Aspen, implementation contractor for the Massachusetts appliance programs from independent retailers in Massachusetts in 2005. In previous years, only clothes washer data had been available from independent retailers in the state.
- A comparison of the market penetration of ENERGY STAR-qualifying appliances among independent and national retailers in Massachusetts.
- Triangulation of various market penetration estimates, using national retailer data, data from independents, and consumer data from a 2004 random digit dial (RDD) survey of 800 Massachusetts residents who had purchased at least one appliance in the year prior to the survey date.<sup>1</sup>

### 2. Summary

Market penetration of ENERGY STAR-compliant clothes washers (CW), refrigerators (RF), dishwashers (DW) and room air conditioners (RAC) has been increasing in Massachusetts, five comparison states, and nationwide from 1998 through 2005. Furthermore, penetration in three states with active ENERGY STAR programs—California, Massachusetts, and Wisconsin—has most often been higher than national penetration; in contrast, three inactive states—Missouri, South Carolina, and Texas—typically have had lower penetration rates than the nation as a whole. However, DW are an exception; market penetration in the inactive states has rivaled and until recently, has sometimes exceeded penetration not only for the nation but for active states as

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<sup>1</sup> Market Progress and Evaluation Report (MPER) for the 2004 Massachusetts ENERGY STAR Appliances Program. Nexus Market Research, RLW Analytics, Inc., Shel Feldman Management Consulting, and Research into Action, Inc. Submitted to Cape Light Compact, Fitchburg Gas and Electric, Massachusetts Electric and Nantucket Electric, NSTAR, and Western Massachusetts Electric May 23, 2005.

well. In addition, for the second consecutive year, there has been a third-quarter drop in RAC sales in Massachusetts, Wisconsin, and the nation; and in 2005, the third-quarter drop occurred in all areas following record second quarter highs. Finally, market events such as changes in NAECA and major ENERGY STAR specifications tend to have sizable but temporary effects on market penetration of all appliance types, with the 2001 RF specification changes representing the most persistent downward impact on penetration.

Historically, independent stores in Massachusetts that were tracked by the implementation contractor<sup>2</sup> reported higher rates of CW market penetration than did the national chains included in the D&R database.<sup>3</sup> Over the past three years, however, national chains have approached and sometimes exceeded the CW market penetration of independent stores.

### 3. National Penetration Data

National retailer-reported data collected by D&R International—market penetration data for the four most commonly promoted ENERGY STAR appliance types—specifically CW, RF, DW and RAC—are presented in this section. The data, collected quarterly from 1998 to 2005,<sup>4</sup> currently represent three of the four national chains selling major appliances. The data we present are reported as sales of ENERGY STAR-qualifying products as a percentage of all units sold.

The graphs presented below show quarterly market penetration for each appliance type in Massachusetts, the nation, and five comparison states from 1998 to 2005.<sup>5</sup> Of the five other states examined, two—California and Wisconsin—are states with programs that actively promote ENERGY STAR-compliant appliances and that have market penetration rates typically exceeding those of the nation. The other three states—Missouri, South Carolina, and Texas—have limited or no programs that promote ENERGY STAR. Their penetration rates typically fall below those of the nation as a whole.<sup>6</sup>

#### 3.1 Clothes Washers

Market penetration of CW sold at national chains has been increasing nationally since data collection began in 1998 (See Figure 3.1). Furthermore, penetration rates are higher and have increased more in states that actively promote ENERGY STAR appliances. Notably, Massachusetts began promoting efficient CW in 1998, and the effect showed up almost immediately. In addition, compared to other states, Massachusetts has generally had the highest penetration rates since it began promoting CW, but Wisconsin has more recently approached and

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<sup>2</sup> APT served as implementation contractor from 1998 until 2004. Aspen Systems Corporation became the implementation contractor on January 1, 2005.

<sup>3</sup> The market penetration of the other three appliances in independent stores has not been tracked over time. Therefore, we do not have comparable data on the other three appliance types.

<sup>4</sup> RAC data is reported by D&R for only the second and third quarters, due to the seasonal nature of these sales.

<sup>5</sup> The choice of specific comparison states was dictated by an effort to illustrate trends in different regions, with varying levels of ENERGY STAR promotional activity, and that fell above and below national penetration rates. Comparisons to other states are available upon request.

<sup>6</sup> Austin and San Antonio promote CW in Texas, and AmerenUE in Missouri held a pilot RF turn-in program in the St. Louis region in 2003. To our knowledge, South Carolina does not have any active ENERGY STAR appliance promotion programs. For a list of programs throughout the nation, see the 2004 Statistical Analysis (NMR 2005b).

sometimes exceeded Massachusetts's rates. Some noteworthy changes in the trajectories are discussed below.<sup>7</sup>

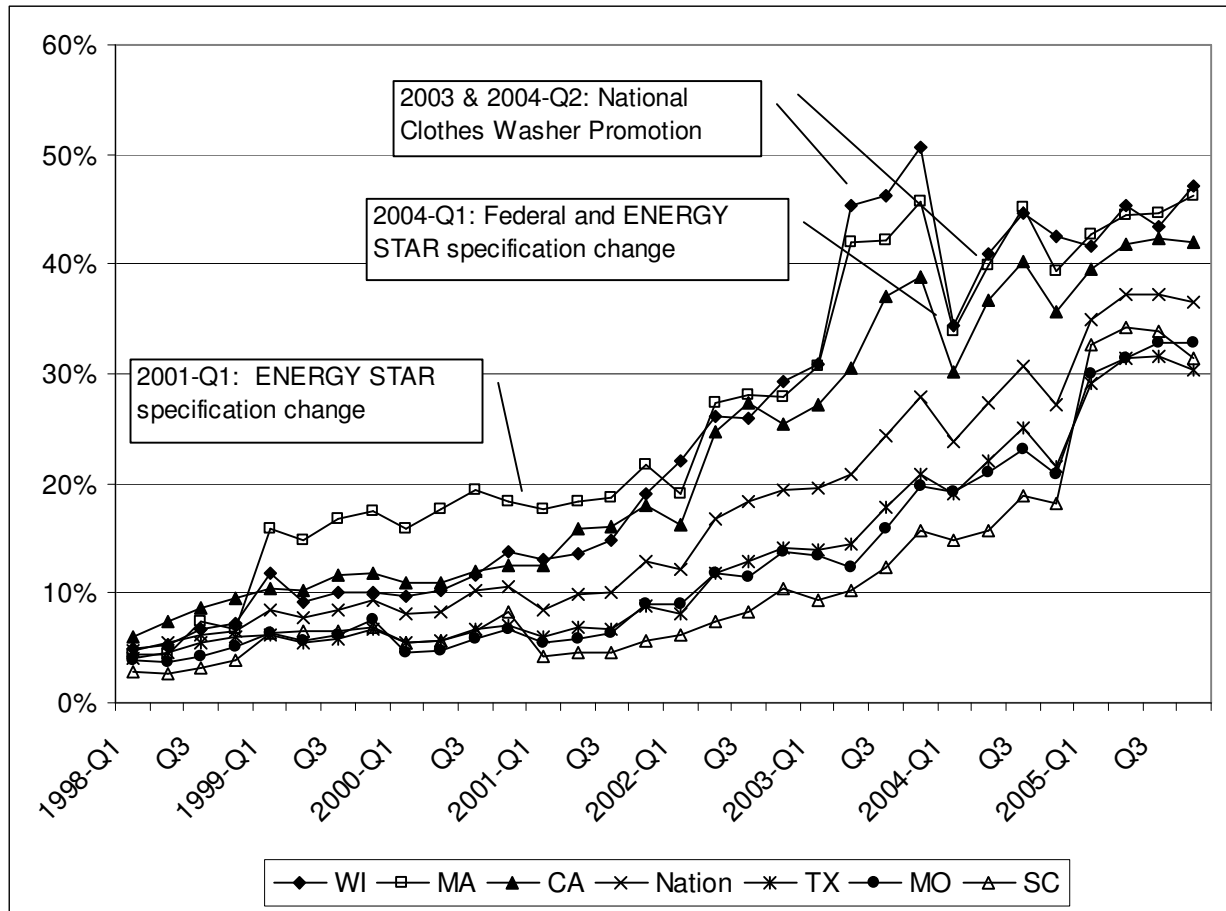
First, federal minimum standards for energy and water efficiency were increased in 2004, and specifications for ENERGY STAR were tightened in both 2001 and 2004. While penetration nationally and in all six comparison states shown seemed to be only slightly affected by the change in ENERGY STAR specifications that occurred in 2001, the joint changes in the federal standard and ENERGY STAR specification of 2004 produced a temporary but large decrease in CW market penetration, particularly in the active states. Massachusetts and Wisconsin continue to have the highest levels of penetration among the comparison states, but recovery to pre-2004 levels in both states has been slower than in the other four states and nationally. In Massachusetts, as well as in other comparison states and nationally, quarterly market penetration levels throughout the year in 2005 have been relatively stable.

The national spring CW promotions that occurred in 2003 and 2004 are associated with large increases in market penetration. Known respectively as Double Your Savings (2003) and ENERGY STAR Rewards (2004), these two promotions provided customers with substantial CW rebates paid jointly by manufacturers and individual program sponsors. Using a strategy that had been successful for individual programs (e.g., Wisconsin's Focus on Energy), ENERGY STAR contractors and CEE developed a partnership among manufacturers and almost all existing program sponsors—and some new sponsors as well—from both the electricity and water efficiency communities. As Figure 3.1 shows, the promotions boosted penetration greatly in the active states. Interestingly, penetration also increased during the promotional periods in the inactive states, perhaps because manufacturers shipped and promoted more ENERGY STAR-compliant CW, and national retailers stocked and promoted them more in all states, not just active ones.

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<sup>7</sup> Lower penetration in the first quarter of 2002 likely reflects economic uncertainty in the wake of the stock market declines that followed the terrorist attacks of 9/11, accounting scandals in major US corporations, and the impending war in Iraq.

**Figure 3.1: Quarterly Clothes Washer Penetration, 1998 to 2005**  
(as reported by D&R International)



### 3.2 Room Air Conditioners

Similar to CW, market penetration of ENERGY STAR-compliant RAC has been increasing nationally and in all six states since 1998.<sup>8</sup> (See Figure 3.2) While showing steady but modest increases from 1998 to 2000, RAC penetration accelerated in all states and the nation after the initial decline that followed specification changes in the fourth quarter of 2000.

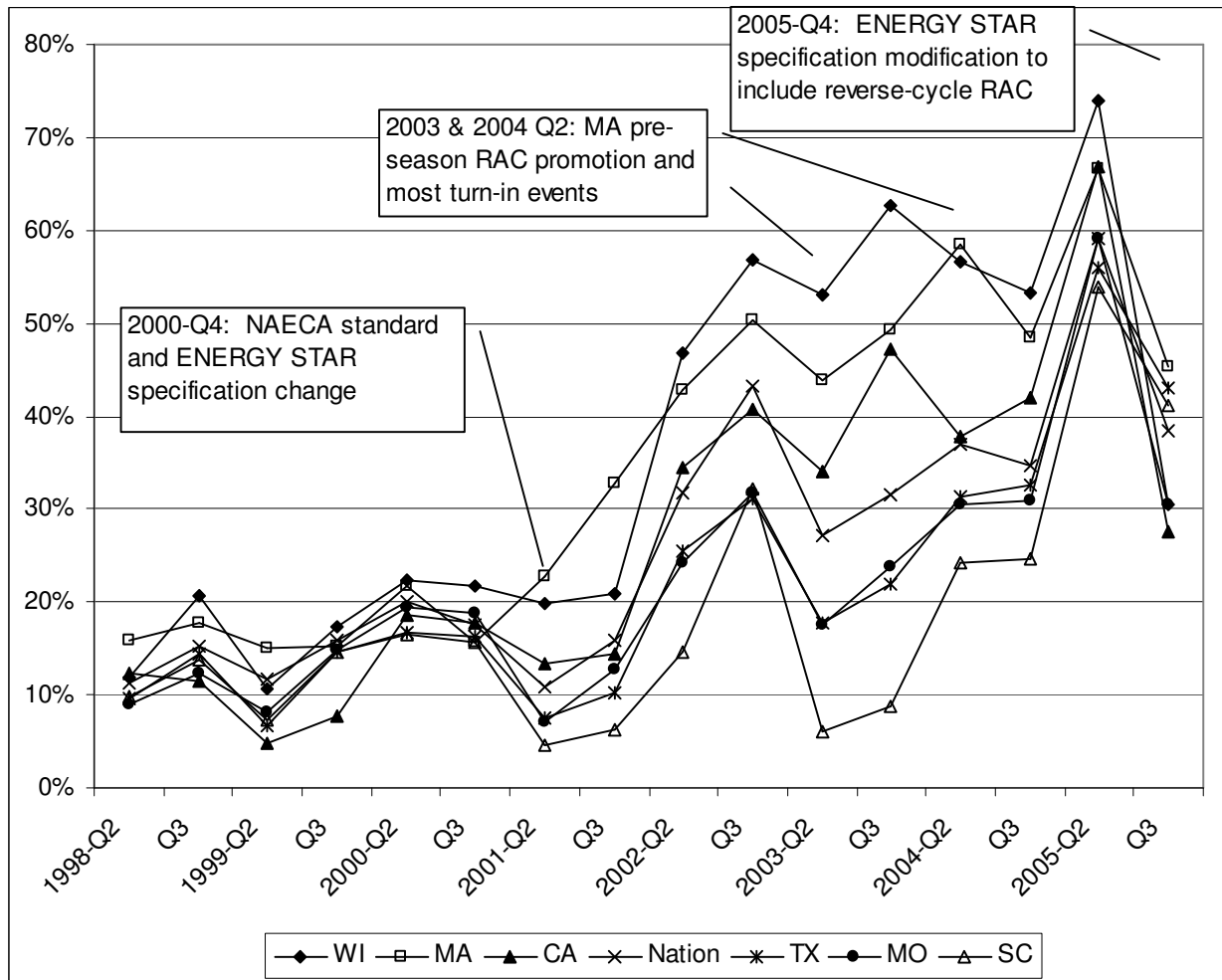
In nearly all years and states, as well as nationally, third quarter market penetration of RAC typically exceeded that of the second quarter.<sup>9</sup> In contrast, 2004 market penetration in Massachusetts (and Wisconsin and the nation as well) followed a different pattern: penetration in the third quarter was lower than in the second quarter. In 2005, following record second quarter highs in Massachusetts, the nation, and all comparison states, third quarter market penetration of ENERGY STAR-qualified RAC models dipped again.

<sup>8</sup> Again, due to their seasonal nature, very few RAC are sold during the fall or winter. Therefore, D&R releases RAC penetration data only for the second and third quarters (spring and summer)

<sup>9</sup>See the RAC Memo (Hoefgen *et al.* 2004) and Retailer Survey (Ledyard *et al.*), Appendix I 2004 MPER, for studies addressing the issue of why third quarter penetration may be higher.

In November 2005, the ENERGY STAR RAC specification was expanded to include reverse-cycle (heat pump) units. The market for heat pump RACs is small; the EPA estimates it to be about 1% of total RAC shipments.<sup>10</sup> Heat pump RACs have a reverse cycle that allows them to be used for space heating in addition to cooling; most also have back-up electric resistance heaters and are expected to be marketed mostly in the Northeast and Upper Midwest.<sup>11</sup> The small number of heat pump RACs without back-up electric resistance heaters are typically shipped to Southern states.<sup>12</sup>

**Figure 3.2: Second and Third Quarter Room Air Conditioner Penetration, 1998 to 2005 (as reported by D&R International)**



<sup>10</sup> U.S. Environmental Protection Agency. Criteria Expansion Analysis: *Proposed Expansion of the ENERGY STAR Room Air Conditioner Criteria to Include Reverse Cycle (Heat Pump) Room Air Conditioners*, May 5, 2005. ([www.energystar.gov/ia/partners/prod\\_development/revisions/downloads/RAC\\_Expansion\\_Analysis.pdf](http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/RAC_Expansion_Analysis.pdf)), June 21, 2006.

<sup>11</sup> General Electric Consumer & Industrial. Comments to Expansion of ENERGY STAR Room Air Conditioner Criteria to Include Reverse Cycle (Heat Pump) Room Air Conditioners. Letter dated May 16, 2005. ([www.energystar.gov/ia/partners/prod\\_development/revisions/downloads/roomac/GE\\_RAC\\_Comments.pdf](http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/roomac/GE_RAC_Comments.pdf)), June 21, 2006.

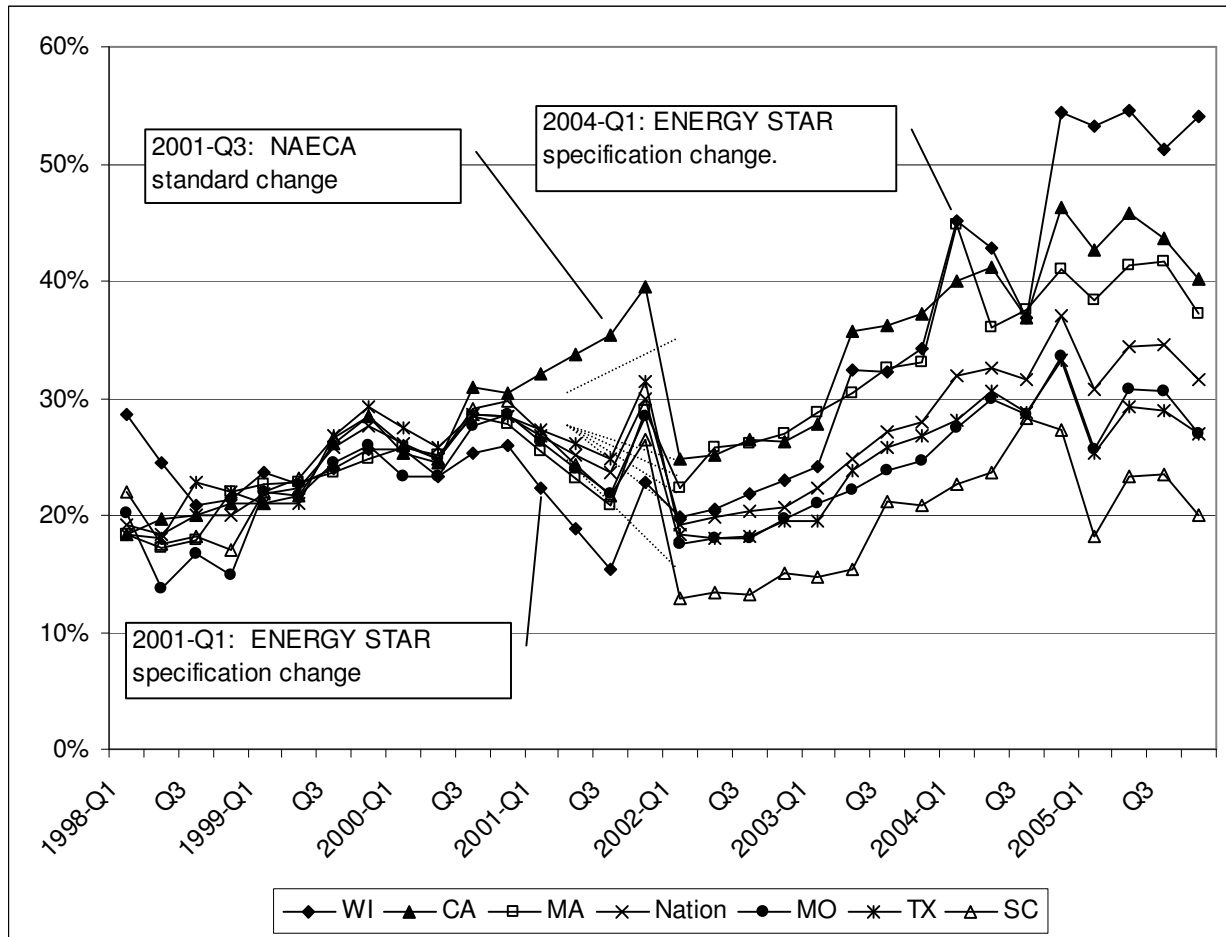
<sup>12</sup> U.S. EPA. Criteria Expansion Analysis, May 5, 2005.

### 3.3 Refrigerators

The trends in RF market penetration are interesting and somewhat unexpected. (See Figure 3.3) Before the 2001 NAECA and ENERGY STAR specification changes, few differences existed in RF market penetration among the six states. However, the 2001 specification changes represented a significant change in the market as few available models met the new criteria. Penetration dropped to nearly the starting levels of 1998 at the end of 2001 in all six states and the nation. Rates have only recently recovered from this low point. In contrast, the market seemed better prepared for the specification changes of 2004. Initially high penetration rates in 2004 (perhaps due to the selling off of older stock that met the earlier specifications), were followed by lower levels in the second and third quarters. However, penetration jumped in most states again in the fourth quarter of 2004. In 2005, penetration of ENERGY STAR-qualified RF in Massachusetts, the nation, and all comparison states dropped slightly in the first quarter and recovered mid-year, only to drop slightly again in all areas but Wisconsin in the fourth quarter.

California, Massachusetts, and Wisconsin alternately have demonstrated the highest market penetration over the seven years, with Wisconsin now having the highest penetration. It should be noted that RF market penetration in Massachusetts is comparable to that found in California and until this year, Wisconsin, despite the fact that both of these states offer sizable RF rebates to households and Massachusetts does not.

**Figure 3.3: Quarterly Market Penetration of Refrigerators, 1998 to 2005**  
(as reported by D&R International)



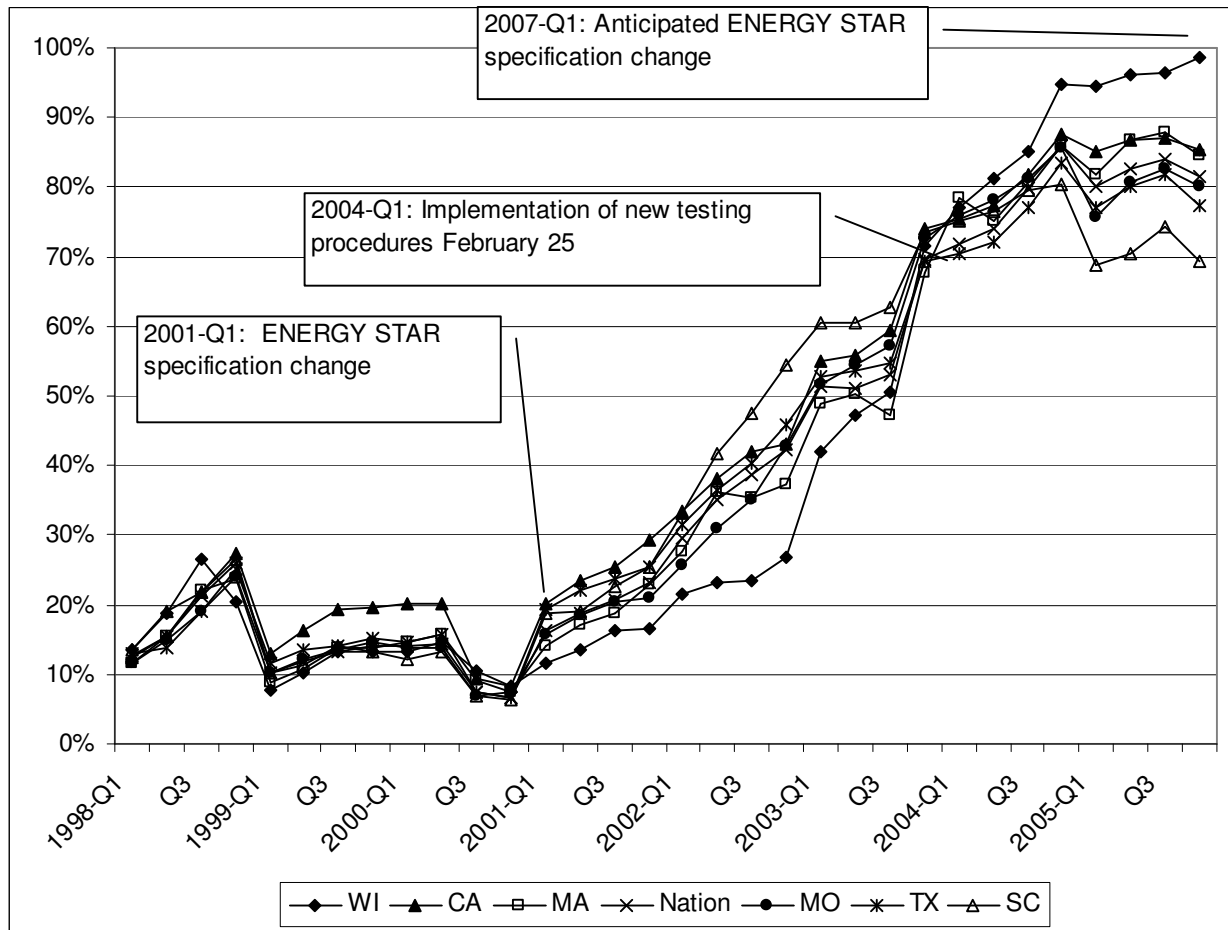
### 3.4 Dishwashers

ENERGY STAR-qualifying DW show a trend of increasing market penetration over time among all six states and the nation. (See Figure 3.4) Furthermore, there are few differences in penetration among the six states and up until 2004, inactive states have often had penetration rates as high or higher than active states. The similarity in the trends for active and inactive states likely reflects the high number of ENERGY STAR-qualifying DW models on the market. In 2005, national ENERGY STAR penetration remained higher than 80%, and in Wisconsin penetration approached 100%.

In January 2007, a new ENERGY STAR DW specification is scheduled to become effective; how this will impact manufacturing decisions, the availability of new ENERGY STAR-qualified models, and resulting penetration is unknown. Prior to the 2001 ENERGY STAR specification change, market penetration levels dropped. This decline may have reflected changes in stocking practices by retailers and products made available by manufacturers in anticipation of the 2001 specification change. The specification change itself seems to have had little effect on market penetration in 2001. Likewise, the 2004 change in testing procedures may explain the slightly

higher penetration levels in active states, but penetration increased nationwide and, except in South Carolina, in inactive states too.

**Figure 3.4: Quarterly Market Penetration of Dishwashers, 1998 to 2005**  
(as reported by D&R International)



#### 4. Triangulation of Estimates of Market Penetration

Table 4.1 summarizes current estimates of market penetration based on numerous studies. The table also includes estimates of the overall percentage of all CW, DW, RAC, and RF sold at various types of retail stores in Massachusetts. These data were then used to create overall estimates of market penetration for each appliance.

The estimates are based on data from D&R, the implementation contractor for the Massachusetts program, data collected in the 2004 RDD survey (NMR 2005a), and on-site visits and phone calls to hardware and grocery, drugstores, and grocery stores, and internet research on hardware stores and discount and warehouse stores (i.e., Wal-Mart, Sam’s Club, BJ’s, and Costco). Each of these data sources involves some degree of bias, including:

1. The D&R data represent three out of the four national chains selling major appliances. The fourth chain is a large and growing chain representing 4% (for CW) and 17% (for RAC) of total appliance sales in Massachusetts.
2. Lockheed Martin Aspen, the implementation contractor for the Massachusetts program, surveyed independent retailers in the state. Lockheed Martin Aspen requests monthly sales data from approximately 155 retailers each month; they estimate that on average, 25% of retailers have responded. Prior to 2005, the former implementation contractor collected only CW sales penetration data from independent retailers
3. The 2004 RDD survey is based on a random sample of appliance purchasers in 2004. While the random sample limits bias, we could only verify if 44 of 165 DW and 91 of 405 RF purchased by respondents were ENERGY STAR models or non-ENERGY STAR models. Therefore, the ENERGY STAR status of most models remained unknown.
4. Estimates of RAC penetration in discount, warehouse, grocery, drug, and hardware stores were based on internet searches, phone calls, and on-site visits to a handful of stores. The stores were not randomly selected but represented a convenience sample (i.e., the best available with limited effort). Likewise, those visited on-site were located only in Jamaica Plain and Cambridge, with an additional store called in Springfield. Not all stores visited had yet received their shipments of RAC.

Table 4.1 summarizes the penetration of ENERGY STAR-qualifying appliance sales from chain stores, independent stores, and for RAC, other types of stores. The table also presents estimates for the share of total volume for chains and independents for each type of appliance. Finally, Table 4.1 shows the estimated total penetration of ENERGY STAR-qualified appliances in Massachusetts. Compared to 2004, RAC market penetration has increased from 43% to 55%; CW has increased from 40% to 50%; RF has increased from 32% to 46%; and DW has decreased from 89% to 83%.

Key differences between the estimates produced in 2004 and 2005 are as follows:

1. In 2005, D&R national chain data were used to estimate total chain penetration of ENERGY-STAR-qualified products for all appliance types. In 2004, D&R data were used for only CW and RAC; the 2004 RDD survey data were used to estimate RF and DW market shares.
2. In 2005, independent sales penetration data came from Lockheed Martin Aspen for all appliance types. In 2004, the former implementation contractor collected only CW data, so the 2004 RDD survey data were used to estimate RF and DW. Due to the fact that no estimate of RAC penetration at independent stores was available in 2004, it was estimated using the ratio of independent retailer to national retailer CW market penetration.

**Table 4.1: 2005 Market Penetration Estimates in Massachusetts**

		CW	RAC	RF	DW
1	National Chain Penetration in Massachusetts <sup>a</sup>	44%	62%	40%	85%
2	National Chain % of All Units Sold <sup>b</sup>	66%	61%	69%	64%
3	Independent Penetration <sup>c</sup>	60%	73%	61%	79%
4	Independent % of All Units Sold <sup>b</sup>	34%	17%	31%	36
5	Discount, Warehouse, Grocery, Drug store RAC Penetration <sup>d</sup>		25%		
6	Discount, Warehouse, Grocery, Drug stores RAC % of All Units Sold <sup>b</sup>		22%		
7	<b>Estimated Total Penetration<sup>e</sup></b>	<b>50%</b>	<b>55%</b>	<b>46%</b>	<b>83%</b>

<sup>a</sup> D&R 2005 ENERGY STAR Qualified Appliance Retail Sales Data (2006)

<sup>b</sup> NMR (2005) 2004 RDD survey included in 2004 MPER.

<sup>c</sup> Program implementation contractor

<sup>d</sup> On-site visits in Jamaica Plain area of Boston and web searches April 1 through April 4

<sup>e</sup> Computed for each appliance by multiplying the market penetration and percentage of all units sold from each store type and then summing the results across store types. CW, DW, and RF Penetration = (Line 1 x Line 2) + (Line 3 x Line 4). RAC Penetration = = (Line 1 x Line 2) + (Line 3 x Line 4) + (Line 5 x Line 6).