

MOTOR MARKET TRANSFORMATION IN A TIME OF UTILITY RESTRUCTURING — THE WISCONSIN STORY

Scott Pigg, Energy Center of Wisconsin, Madison, WI
Ralph Prahl, Public Service Commission of Wisconsin, Madison, WI
Mark Wegener, Hagler Bailly Consulting, Madison, WI

Introduction

Motors use a considerable amount of the electricity consumed by industry, and energy efficiency improvements in these motors have the potential to create substantial savings. In 1993, the Department of Energy estimated that energy efficient motors could save 240 billion kilowatt-hours of electricity annually, and could reduce national electrical demand by 50,000 megawatts by 2010 [DOE, 1993].

Recognizing the energy savings potential of motors, the 1992 Energy Policy Act mandated efficiency standards for many common motor types, set to take effect in October, 1997. Once the standards come into effect, manufacturers will be required to manufacture motors that meet or exceed the standards.

Regulators and planners involved with utility demand side management programs also recognized the savings potential of energy efficient motors, and a number of programs to promote high efficiency motors were created in the early 1990's. One such effort is the Responsible Power Management Program in Wisconsin, which was created with the goals of (1) accelerating the adoption of 3-phase integral horsepower motors that meet the proposed 1997 federal minimum efficiency standards, (2) transforming Wisconsin's electric motors market so that an increasing number of end-users purchase motors that meet or exceed the program's highest qualifying efficiencies, and (3) improving the cost-effectiveness of utility-sponsored motor programs by leveraging distributor efforts.

The RPM program uses two approaches: the Performance Optimization Service (POS) provides companies with the tools and assistance needed to identify and capitalize on equipment system inefficiencies in their facilities, while the High Efficiency Motors (HEM) program uses rebates (now being phased out), informational material, and a "Motor Partners" component, to send clear and consistent messages to manufacturers, distributors and customers about desirable levels of motor efficiency.

This paper examines the HEM component of the RPM program using data from two studies of the Wisconsin motor market and the program's impacts.

Background about RPM

The RPM program began in 1993 under the auspices of the Wisconsin Demand-Side Demonstrations, Inc. It

was designed by a collaborative of the Wisconsin utilities, public groups, and government entities. The program features two major elements: (1) statewide coordination of utility rebate amounts and qualifying efficiencies, and (2) informational and sales tools provided to motor distributors who do business in the state. Utility rebates (which have now mostly been eliminated) have a two-tier design: motors that meet or exceed the upcoming federal standards qualified for Tier 1 rebates. Tier 2 rebates were larger, and were given for motors that substantially exceed the standards. The qualifying efficiency and rebate amount varied by type of motor, horsepower, and speed. Figure 1 shows the qualifying efficiencies for Tier 1 and Tier 2 rebates for a common type of motor, a totally enclosed fan-cooled (TEFC) 1800 rpm motor.

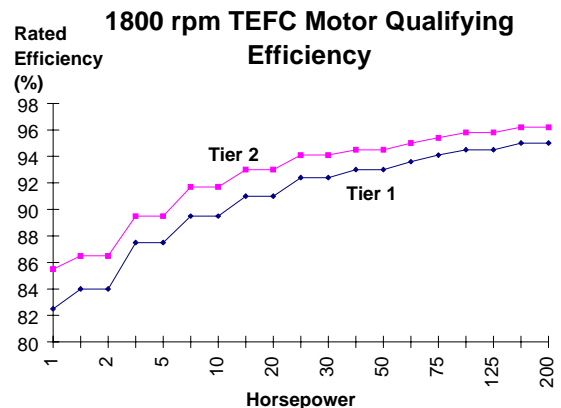


Figure 1. Qualifying efficiencies for an 1800 rpm TEFC motor

A brief history of the program runs from 1993 to 1997:

- 1993 (just prior to the start of RPM): Wisconsin utilities adopt a statewide motor efficiency standard.
- 1993: RPM introduced, featuring a standardized two-tier efficiency structure and eligibility (albeit with different rebate levels for different utilities), unified motor distributor marketing strategy, and a coordinated marketing effort.

- 1994: Motors Partners component added (described below); rebate levels standardized state-wide.
- 1995: Rebate levels reduced; state-wide standardized rebate application form introduced; some utilities introduce “instant” rebates and distributor incentives.
- 1996: Some utilities eliminate rebates; remaining utilities drop Tier 1 rebates and reduce Tier 2 rebates to 1995 Tier 1 level.
- 1997: nearly all rebates eliminated

Utility data on rebates show that about 5,000 to 6,000 motors were rebated annually from 1993 through 1995. One-half to two-thirds of these motors were rebated at the Tier 2 level; the remainder were at the Tier 1 level.

The informational tools are partly designed to introduce distributors to the features and benefits of energy efficient motors, but their primary purpose is to serve as sales tools for distributors to promote the benefits of energy efficient motors to their customers. The program offers the following tools and services:

- MotoRater (1994) and MotoRater Plus (1996), a slide rule for evaluating the cost effectiveness of high efficiency motors
- program brochures and case studies 1994)
- MotoReader, a quarterly newsletter
- MotorFacts payback calculation sheets
- an 800 number for distributors or customers to call in with questions (1994) MotorMaster database (computer database of available motors)

The program also tries to build distributor and customer awareness of the program by sponsoring annual breakfast meetings with distributors, making presentations at trade shows and professional meetings, and advertising in trade journals.

The RPM program’s marketing strategy is focused on distributors. Marketing to end-users is the responsibility of the local utility. At the beginning of the program, WSDS developed a comprehensive list of motor distributors serving Wisconsin end-users. WSDS and the Energy Center of Wisconsin (the Center) have since added other distributors and interested parties to this list, which now contains approximately 1,200 names. This list serves as the program mailing list. A package of the program tools are distributed semi-annually to all distributors on the list.

Other than advertising, the only aspect of the program that directly addresses customers is the Motor Partners component. To participate, companies purchasing motors pledge to install high-efficiency motors. In turn, these customers receive the MotorMaster database and public recognition.

Evaluation efforts

The RPM program was conceived as a collaborative demonstration project; evaluation was therefore planned into the effort from the beginning. There have been two separate but related efforts to understand the motor market in Wisconsin and evaluate the program. The first, conducted by WSDS (Meadows et al., 1995), was conducted in 1993 and 1994. That effort sought to characterize the motor market in Wisconsin, as well as explore changes in distributor, manufacturer, and end-user knowledge and behaviors, changes in sales, stocking practices, pricing, distribution strategies, motor repair and rewinding frequency, and changes in other variables related to market behavior.

The WSDS effort included on-site interviews with distributors (n=63), telephone surveys with rebate program participants (n=109) and non-participants (n=105), and interviews with manufacturers.

The second evaluation effort was conducted by the Center in the Fall of 1996. The emphasis of this evaluation was to look at the efficacy of the informational and sales tools and the Motor Partner component of the program. It also sought to re-visit some of the market transformation indicators from the first evaluation. The Center evaluation used telephone surveys with distributors (n=64), two focus groups with distributors, and interviews with Motor Partner participants (n=15).

This paper will focus on results that came from the distributor surveys from both evaluations. These distributors were probability sampled (stratified on size) from program listing of all distributors in the state and distributors in other states who do business in Wisconsin.

Results

The nature of the motor market in Wisconsin

The first evaluation characterized the motor market in Wisconsin as a diverse one, with at least 15 manufacturers and more than 300 distributors supplying motors to the market. Not surprisingly, the distributor market is highly skewed, with a few large distributors controlling much of the market, while many smaller distributors compete for a small piece of the pie. In fact, as Figure 2 shows, the distribution of distributor size approximates a classic 80/20 log-normal distribution, in which the largest 20% of firms control 80% of the market.

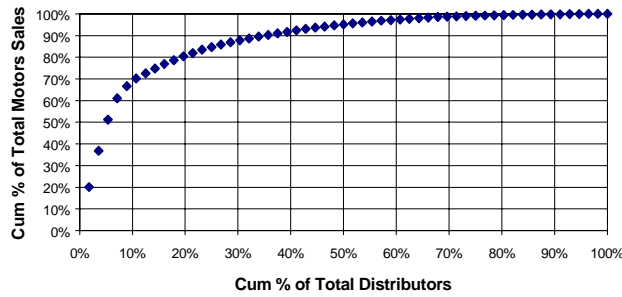


Figure 2. Total motor sales by distributor, from 1996 distributor survey (n=64)

It appears that about half of all distributor sales go to original equipment manufacturers (OEM's) in Wisconsin to be built into equipment that is shipped all over the country. The vast majority of the remaining motors are sold to customers who put them to use in their facilities. A small fraction of distributor sales are to other distributors and to contractors.

It is not possible to draw a neat boundary around the state in terms of motor sales: some Wisconsin distributors sell motors to distributors in neighboring states, and some nearby out-of-state distributors ship motors into Wisconsin. Both studies tried to account for this by including some out-of-state distributors, and by asking distributors to estimate the percentage of new motor sales that go to Wisconsin customers.

Efficient motor market share

The bottom-line indicator for the success of the RPM program is its impact on sales of energy efficient motors. Unfortunately, obtaining hard data on motor sales has proven to be very difficult: national level and manufacturer data cannot be disaggregated to yield numbers for Wisconsin, and Wisconsin distributors have proven reluctant to provide hard sales data.

However, distributors have been willing to provide casual estimates of the percent of their motor sales that are energy efficient in different horsepower classes.^a They were also willing to estimate the percent of their total motor sales in these horsepower classes, as well as provide rough estimates of: (1) their total sales, (2) the percentage

^a The term "energy efficient" has been somewhat loosely used in the two evaluations. Surveys in the first evaluation asked distributors about "premium efficiency motors" but did not attempt to provide a strict definition. The survey used in the second evaluation used the term "energy efficient", and included the statement "by energy efficient I mean motors that meet or exceed the efficiency levels specified by the NEMA standard, which is defined in NEMA Table 12-10." Distributors were then asked if they were familiar with that standard: 90% said "yes." Also, the first survey asked distributors about Tier 1 and Tier 2 motors separately. Because it was later felt that the distributors could not reliably distinguish between these, the second round of surveys asked only about high efficiency motors in general.

of their sales that are for new, 3-phase motors, (3) the percent of new 3-phase motor sales to Wisconsin customers. Multiplied together, these last three factors provide a rough estimate of the dollar sales of new, 3-phase motors to Wisconsin customers, which we used as a rough weighting factor. It is worth noting that the market share estimates presented here include sales to OEMs, which are thought to make up about half of the Wisconsin motor market, and are almost never high efficiency motors.

The results suggest that the market share for energy efficient motors increased from 1993 to 1995, but has suffered a decline since then, as Table 1 shows.

Table 1, Energy efficient motor market share in Wisconsin

Year		Market Share of Energy Efficient Motors
1993	year of program introduction	36%
1994	standard rebate levels introduced	(no data)
1995	rebate levels reduced	50%
1996	Tier 1 rebates withdrawn; Tier 2 withdrawn in some areas, reduced in all others	41%

(weighted by estimated Wisconsin new motor sales volume)

The decline from 1995 to 1996 is consistent across all horsepower classes, as Figure 3 shows. And the overall trend is also mirrored in the 22 distributors that were surveyed under both evaluations (Figure 4).

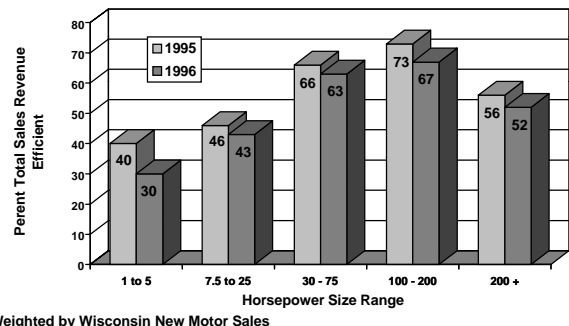
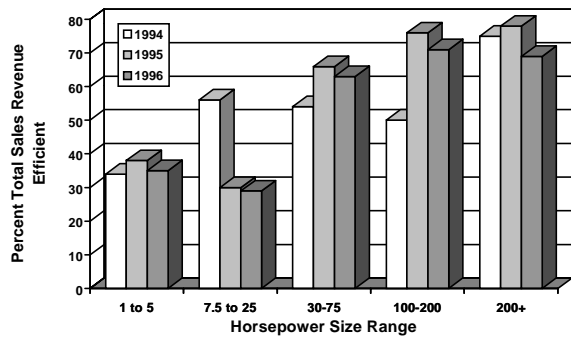


Figure 3. Percentage of Total Wisconsin Motor Sales Revenue from Energy Efficient Motors (by HP range), full 1996 sample (n=53)



Weighted by Wisconsin New Motor Sales

Figure 4. Percentage of Total Wisconsin Motor Sales Revenue from Energy-Efficient Motors by HP size range -- 1993-1996, distributors included in both evaluation samples (n=22).

Further investigation shows that the source of the change appears to be rooted more in the small to medium size distributors, rather than among the large distributors. We looked at what the five largest distributors (in terms of estimated new motor sales revenues in Wisconsin) reported for the percent of sales that are energy efficient in 1995 and 1996 compared to what the remaining 45 distributors who provided this information said. (The five largest distributors represent about 70% of our sample's total estimated new motor sales in Wisconsin.) Some enlightening facts emerge:

- With one exception, none of the large distributors reported *any* change in the percent of sales that are energy efficient in any horsepower class. The exception is the second largest distributor, which reported that the percent of their 1-5 Hp motor sales that were energy efficient dropped from 50% in 1995 to 20% in 1996. (However, as we discuss below, the reported sales data contradicts what these distributors said about sales of high efficiency motors in general.)
- Among the remaining distributors, about 2/3 of the distributors reported no change in energy efficient sales in all horsepower classes. And the distributors who did report a change tended to be equally divided among those who claimed an increase versus those who claimed a decrease.
- The biggest difference among the small and medium size distributors emerges in the magnitude of the reported change. Reported decreases were larger on average as reported increases. When weighted by the proportion of sales in each horsepower class, the overall average reported decrease was a 25 percentage

point drop, compared to an average increase of 15 percentage points.

The reader should bear in mind that there is considerable uncertainty in the above estimates due to their nature and the highly skewed nature of the market, which puts a great deal of weight on the responses of a few large distributors. In fact, error propagation analysis shows that a 10% uncertainty in the parameters that lead to the weighting factor (Wisconsin new motor sales) alone would introduce a 5 percentage point uncertainty in the overall market penetration of high efficiency motors.

Data gathered in the first evaluation suggested that the program was having a larger impact among smaller distributors than among the large distributors. The results from the second evaluation suggest that the reduction and elimination of rebates may be most strongly expressed in energy efficient motor sales among the smaller distributors.

About a third of the distributors in the 1996 survey reported that none of their customers were still eligible for a rebate (due to some utilities eliminating their rebate programs in 1996), and many reported a drop in the percentage of customers who were still eligible. When we asked "have you noticed any change in the 3-phase motor buying habits of the customers in Wisconsin who are no longer eligible for rebates, 27 (42%) said "yes."^b Of these, most (16) said that their customers were buying fewer energy efficient motors. It is noteworthy that the large distributors were *more* likely to claim that they had noticed a change than were the smaller distributors. Four of the five largest distributors said that they had noticed a change, while only 36% of the remaining 50 distributors said they had noticed a change. These responses by large distributors contradict the estimates they gave us for 1995 and 1996, which showed almost no change in the market share of high efficiency motors.

When asked specifically "has the reduction of elimination of customer rebates affected your sales of energy efficient motors?" 52% claimed a decrease in such sales (the remainder claimed no effect on sales—and some provided answers that contradicted their answers to the "buying habits" question. All five of the large distributors who answered the question reported decreased motor sales due to changes in rebates.

Distributor sales staff were asked if they had noticed a difference since last year in the number of customers specifically requesting energy-efficient motors: their response were almost evenly divided among *increase* (37%), *decrease* (30%), and *no change* 33%.

The 28 respondents who observed an increase in the number of requests for energy efficient motors as opposed

^b Distributors may not have correctly perceived which customers were not eligible for rebates, as it depends on which utility service territory the customer resides in.

to standard efficiency motors cited customer awareness as the main reason for the increase (12). Six respondents cited sales staff awareness, four cited increased sales efforts; and two cited federal standards.

All of the 23 distributors noticing a decrease in requests for energy-efficient motors cited changes in rebate availability as the reason for the decrease. Two of these distributors also cited performance problems as another reason.

Overall, the data suggest some erosion in the market share for energy efficient motors has occurred, and that distributors attribute this at least partly to the reduction and elimination in some areas of utility rebates. However, the off-the-cuff nature of the quantitative data prevent any accurate determination of the magnitude of the change, and contradictory responses to different elements of the survey add some doubt to the picture.

Distributor efforts to promote high efficiency motors

In both evaluations, distributors were asked how often they recommend energy efficient motors. As Figure 5 shows, while a core group of about a third of distributors always recommend energy efficient motors, the fraction of distributors who say they almost always recommend them has increased, while those who say they sometimes increase them has declined.

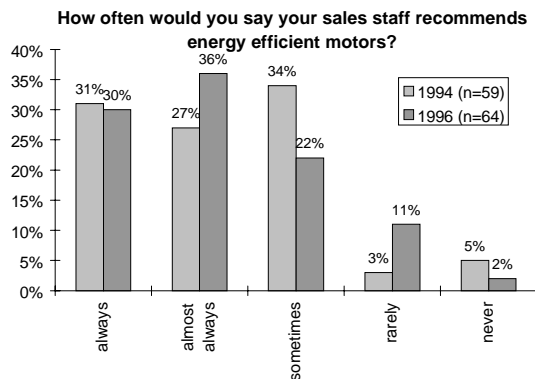


Figure 5. Frequency with which energy efficient motors are recommended

When asked in the 1996 survey, 45% of the distributors surveyed claimed they increased the amount of effort they have expended to promote or sell energy-efficient motors since the beginning of the year. Thirty-four percent said they had decreased that effort, and 20% report no change in effort.

Significantly, distributors whose customers were still eligible for rebates increased their sales efforts to promote efficient motors more often than distributors whose customers were not still eligible. Similarly, distributors in non-rebate territory reported a decrease in promotional efforts for efficient motors as compared with rebate-territory distributors (see Figure 6).

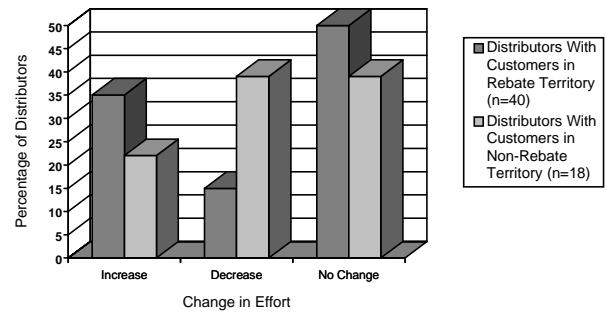


Figure 6. Change in Efficient Motor Sales Effort for Distributors in Rebate /Non-Rebate Territory

Among the 22 distributors who increased their promotional efforts for energy efficient motors in the past year, several reasons were given. The most common was the proposed 1997 federal minimum motor efficiency standards (6 responses). Several others pointed out that their stock is made up mainly of efficient motors (4 responses).

Among the 13 distributors who have decreased efficient motor sales efforts, the most frequent explanation was the loss of rebates (6 respondents). A few also cited the high cost of energy-efficient motors.

Manufacturer efforts to promote energy efficient motors

In the 1996 survey, we asked distributors “have you noticed any changes this year compared to last year in the availability or manufacturer’s promotion of energy efficient motors?” Most distributors (70%) did not notice a change. Of the 19 that did notice a change, the most common was that manufacturers are promoting energy efficient motors more in 1996 (20%) and making these motors more available to distributors. However, a few others mentioned an increased lead time needed for efficient motors.

Effects of the forthcoming national standards

When asked specifically, most (73%) of the 19 distributors who noticed a change from last year in this area attributed it to the upcoming federal efficiency standards. The first evaluation found that upwards of 85% of distributors were aware of these standards at that time (1994). However, the customer surveys in 1994 showed that only about 15% of customers were aware of the upcoming standards. The interviews with 15 corporate partners in 1996 suggest that most customers are still unaware of these standards.

When distributors who reported a change in sales effort were asked specifically if the upcoming federal standards had an effect on their efforts, 22 of the 35 said yes. (Note: as discussed above, only six distributors volunteered this information unprompted).

Motor rewinds

Motor rewind practices are important to track, because they represent an alternative to purchasing a new

(possible energy efficient) motor when an existing motor fails. The conclusion from the first evaluation was that utility rebates hurt the rewind business, because the rebates made buying a new motor more attractive relative to rewinding (i.e., repairing) an old motor. When asked in the 1994 survey "compared to last year, has the number of motors you rewind changed?" 55% of the distributors said yes, and three-quarters of these distributors said that they were rewinding fewer motors.

This sentiment also emerged in the focus groups that we conducted in 1996. Most focus group participants felt that the rebate program caused a serious decline in the motor repair business, as the following quotes illustrate:

"The rewinding department would like to see the rebates go away. All the rewinds dropped because people were buying energy efficient motors.... By the time you get done with the rebuild, [the electric utility] throws on the \$200 rebate, which one are you going to pay for? A brand new motor, high efficient with a rebate, as opposed to one that has been rewound. And so far they aren't recognizing rewinds as high efficient."

"We started out as a repair shop and the rebates just about killed us. We had to go out and find a whole new market to stay in business the first year. There was no repair under 40 HP."

"The only thing rebates did was killed our mid-sized motors for rewind. Customers say 'Huh, rewind it? What? If I can get \$400 back, no rewind.' We make more money selling a rewind than on a new one anyway. So, now, cutting out the rebates will be good for the rewind. We will just see more repair business."

Distributors in the focus groups agreed that the rewind business has a higher profit margin than new equipment sales, and many thought that if rebates were discontinued their rewind business would be boosted. This is particularly true of smaller distributors who derive a larger fraction of their revenue from rewinds compared to new motor sales. Presumably distributor eagerness to move back into the rewind market will cut into the market for new high efficiency motors.

Availability of energy efficient motors and stocking practices

The 1994 survey showed a clear increase (from 1993) in the percentage of stock that was comprised of energy efficient motors in all but the largest motor sizes. For example, among 7.5 to 25 Hp motors, energy efficient motors increased from 38% to 56% of stock.. The 1996 survey did not ask about stocking *per se*, but it did ask distributors

had added or dropped any motor lines: there were few reported changes.

Regardless of stocking, the available data indicate that obtaining an energy efficient motor in a reasonable amount of time is rarely a problem in Wisconsin.

The role of RPM's information tools

The surveys and focus groups that we conducted in 1996 suggest that the information and sales tools provided by the program play a minor role in decision making about motor purchases at this point. Overall, distributors ranked the value of the tools at about a 4 on a scale of 1 to 10 in usefulness. The responses ranges from a 1 (not at all useful) to 10 (extremely useful), indicating that the tools are useful in some situations but not others.

In fact, the focus groups revealed two different kinds of sales situations. The first is a long-term established account with a large firm (such as a paper mill), in which there is time to discuss the customers needs and options. Sales in this situation tend to be for larger motors. The second is a fast-paced highly competitive situation in which there is no time for anything beyond a quick price quote. In this situation, distributors are sometimes dealing with a purchasing agent who may know little about the technical merits of motors. The following quotes illustrate this situation:

"[In purchasing], they order by catalogue number because they know that's what they ordered the last time somebody asked them for this product. So that's all they know. You can say 'I can supply you that, but how would you like the high efficiency, save some money.' And if they have time that day to listen to you about it, you pass it on. But if they don't have time that day, you had better catch them a different day."

"These new purchasing agents, they go back to the boss and say 'I called several places that wanted \$500, I was able to get it for \$200.' That's the big merit. They say at the end of the month 'Because of me you saved \$2000 or \$10,000.'"

"What I have seen with inside people, they want the phone to go away. There are lines ringing and lines on hold. Customers don't like to hold, so they want to satisfy their [customer's] need as soon as possible. With the downsizing of our sales force, we don't have time for a sales pitch on the phone."

These situations are closely aligned with the traditional operations of inside and outside sales. It appears that the program's tools are more useful in the setting of the relationship building that occurs with outside sales,

compared to the more hectic commodity market environment of inside sales.

Discussion

The two evaluations of the Wisconsin motors market suggest that there was a change in the market for energy efficient motors that coincided with the efforts of the program. Moreover, there is evidence that the market for energy efficient motors has regressed somewhat in the wake of reducing and eliminating utility rebates.

It is important to put these findings in context, in terms of the quality of the data, the overall environment for energy efficiency programs, and the objective we are seeking to achieve.

First, we do not have by any means a precise measure of the market and its changes. The data from the distributor surveys are casual estimates for the most part, and only attain a measure of reliability when many distributors report a similar trend or change. Yet the market is highly skewed, so the responses of a few large distributors carry much more weight than those of the majority of smaller distributors.

Moreover, the fact that responses to some parts of the survey were sometimes inconsistent with responses given in other areas creates uncertainty. Overall, while the distributor surveys generate a great deal of numerical results, in the end we can draw only the broadest qualitative conclusions.

In retrospect, the evaluations should have included some detailed data gathering from large distributors (such as depth interviews) to ensure better consistency in the data and to better understand the forces at work behind the numbers for these important firms.

But if we accept a qualitative finding of regression in the motors market, there are still competing factors that attenuate or amplify its significance. On the one hand, it is entirely logical to expect that there should be some regression in sales of energy efficient motors in the face of the reduction and elimination of rebates: motors are put into a wide variety of uses, some of which are only operated intermittently. There are bound to be some situations for which it makes sense to install a high efficiency motor only if the price is discounted through a rebate. Without rebates, customers will presumably switch back to a standard efficiency motor.

Would this effect alone account for the change in market share that we observed between 1995 and 1996? Unfortunately, we do not have the data for Wisconsin that would allow us to calculate what fraction of motors would fall into this situation, nor do we have a good quantitative measure of the extent of the regression.

On the other hand, the regression that we observed was in the face of only a partial withdrawal of incentives in the market. Rebates were eliminated only in some areas, and only on some types of motors. If the regression in the

market is in fact due to the rebates, then we would presumably observe a larger effect in response to a complete withdrawal of incentives.

Also, the change that we observed also occurred within a year of the implementation of national standards that will require all motors to at least meet the efficiency levels for which utilities in Wisconsin were previously offering financial incentives. Unless manufacturers and distributors were dumping old motors on the market in 1996 in anticipation of the standards (which is unlikely, because the standards relate to the *manufacture*, not sale of motors), then it would seem that if there is any advance impact of the standards on the market it be towards increasing promotion of energy efficient motors that will meet the new standards (which we did observe).

Indeed, some might argue that the increase in energy efficient motor sales that we observed between 1993 and 1995 had more to do with the approaching national standards than with any effects of RPM. However, such argument would then need to explain the decline in energy efficient sales seen in 1996 on the eve of implementation of the standards.

Separating the influence of the rebates from the information and sales tools is also difficult. Distributors tended to attribute the rebates with jump-starting the market for energy efficient motors in Wisconsin, and discounted the value of the information and tools provided by the program. However, we asked them about these tools after they had been in the field for several years. It may be that they played a more important role earlier in the promotion effort.

When the new standards come into play later in 1997, they will render moot issues surrounding Tier 1 motors. There will still be room to promote Tier 2 motors, which historically have accounted for over half of the utility rebates, but the program approach is likely to be different, given that the incremental cost of an upgrade will be higher.

Overall, it seems reasonable to conclude that the RPM program did noticeably accelerate the market for high efficiency motors in the several years prior to the standards.

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