A ONE-TIME OPPORTUNITY TO EXPAND THE MARKET FOR PREMIUM EFFICIENCY MOTORS

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A mid-Atlantic utility conducted a detailed research study on their motors market. The study showed that their motor loads come mostly from motors under 50 horsepower, and predominantly from industry. The proportion of premium-efficiency motor sales is very low relative to other areas which, unlike this utility's service territory, have a history of rebate programs. Most sales in this utility's territory are for replacement motors.

Manufacturers are planning to create new lines of motors which meet the 1997 federal minimum motor-efficiency manufacturing standard, but are less efficient than premium motors. Few of these motors are on the market yet. The mandatory federal efficiency standard creates a unique, one-time situation where premium-efficiency motors will be a better-established and more familiar product among customers and vendors than less efficient motors.

The utility has begun a motors rebate and technical assistance program which is intended to use this one-time opportunity to significantly expand the market for premium motors. Rebates are tied to the new Consortium for Energy Efficiency motor standards to ensure a common message to manufacturers among utilities. While the majority of premium motors available locally already meet the standard, this will encourage manufacturers to bring the rest of their offerings in line.

Like many motors programs, this program will offer rebates, marketing, and technical assistance. However, the program design calls for a short-term (three year), very intense effort, including a rebate set at 100% of incremental cost, a short-term vendor bonus, and intensive marketing to large customers. Additionally, the large savings per motor in 1997 (when the baseline is inefficient standard motors) will justify a more generous payment in the first year.

Many other U.S. utility motor rebate programs have offered less generous incentives and used less intensive marketing, but have had only marginal impacts on markets (often 20-30%), or have taken many years to have an impact. This program will test the theory that it is better to strike hard at the right moment than to gnaw at the edges of a market for many years.

While the program was designed for one utility, the overall approach would be more effective at working with vendors and customers if utilities joined together to sponsor a similar program with common terms and single redemption centers. This may be an option in the coming months.

INTRODUCTION

A mid-Atlantic utility serves roughly two-thirds of New Jersey's electric loads, including a large portion of the industrial load in the state. This utility's primary tool for acquiring energy efficiency resources has been a program called *the Standard Offer*, which provides a predetermined payment stream for each verified kWh saved over many years. A 1995 review of potential lost-opportunity conservation markets showed that this vehicle was not likely to have a significant impact on the markets for new and replacement motors, because the scale of savings from a typical transaction (one or a few motors) could not justify the costs of performance contracting and savings measurement.

As a consequence, the utility has developed a specialized program for assuring the efficiency of replacement and new motors. Since 1995, the utility, its collaborative partners, and its technical consultants have begun to look toward market transformation as an attractive approach for energy savings resource acquisition. In response, the motors program was designed with the intent of permanently influencing standard practice, with respect to the choice of replacement and new motors, toward highly-efficient motors.

KEY INFLUENCES ON PROGRAM DESIGN

The program design resulted from the market environment, utility environment, national regulatory context, and the opportunities created by allies at the national level. While the local market is the most important of these factors, it is addressed last here because the other factors set the context for discussing market conditions.

Utility Environment

In designing the program, the utility's consultants reviewed prior experience and evaluations of other U.S. and Canadian motors programs, as well as published market research by the Federal Government[1] and other utilities.[2] In addition, motor specialists with BPA, ACEEE, the Northwest Energy Efficiency Alliance, Inc., Wisconsin Center for Demand-Side Management, New England Electric, Northeast Utilities, among others, were consulted.

The utility environment in New Jersey also influenced program design. While other utilities in the state are interested in energy efficiency programs for motors, there was, at the time of program design, no clear impetus for coordinated efforts. This has changed, and the energy-efficient motors program may change in response, as discussed below. However, the initial program was designed to be operated for, and by, a single utility covering roughly two-thirds of New Jersey's motor sales.

The host utility has one of the most aggressive all-sector, energy efficiency programs in the country, but believes that it is strategically crucial for the utility to operate these programs with minimal staffing. Thus, the program needed to operate largely through the actions of contractors.

National Regulatory Context

They key regulatory factor is the *Federal Motor Manufacture Standards* which will be in place in Fall 1997, under the federal *Energy Policy Act of 1992 (EPACT)*. These standards for motor manufacture and import will result in significant increases in the minimum efficiency of general purpose, squirrel-cage polyphase motors, between 1 and 200 Horsepowers, of NEMA design A and B.[3] Minimum motor efficiencies under *EPACT* are shown in Table 1.

Most standard motors offered by manufacturers do not meet this efficiency criteria, but many of their highest-efficiency (or, in market parlance, premium) motors exceed the standard significantly. While manufacturers plan to produce more-efficient-than-standard, but less-efficient-than-premium motors which meet the standard (which we call *EPACT* motors), these motors will have less of an operating and marketing track record than the premium motors already being sold. This may create a one-time opportunity to persuade customers who now buy low-efficiency standard motors to "step past" the new *EPACT* motor lines to the more-established and more-efficient premium lines.

National Level Allies and Their Efforts

The program was designed to link with key partners at the national level in promoting energy efficiency. A significant factor was the availability of marketing, as well as motor selection materials and promotion, from the federal *Motor Challenge* program.

Additionally, the Consortium for Energy Efficiency, a national alliance of utilities, government entities, and energy-efficiency advocates, has established consensus among many utilities, government agencies, and advocates regarding a set of efficiency standards for use in motor-efficiency programs. These standards (shown as the

program-qualifying levels in Table 2) significantly exceed the mandatory *EPACT* federal efficiency standards and are cost-effective to customers for most motors with significant operating hours. The CEE standards were set at efficiency levels which can be met for each size and type of motor by products from several manufacturers.

Table 1: Electric Motor Efficiency Levels Prescribed in the Energy Policy Act of 1992

	Nominal Full-Load Efficiency					
	Open Motors (Totally Enclosed Fan-Cooled) Number of Poles			Closed Motors (Open, Drip-Proof) Number of Poles		
Motor Horsepower	6	4	2	6	4	2
1.0	80.0	82.5	--	80.0	82.5	75.5
1.5	84.0	84.0	82.5	85.5	84.0	82.5
2.0	85.5	84.0	84.0	86.5	84.0	84.0
3.0	86.5	86.5	84.0	87.5	87.5	85.5
5.0	87.5	87.5	85.5	87.5	87.5	87.5
7.5	88.5	88.5	87.5	89.5	89.5	88.5
10.0	90.2	89.5	88.5	89.5	89.5	89.5
15.0	90.2	91.0	89.5	90.2	91.0	90.2
20.0	91.0	91.0	90.2	90.2	91.0	90.2
25.0	91.7	91.7	91.0	91.7	92.4	91.0
30.0	92.4	92.4	91.0	91.7	92.4	91.0
40.0	93.0	93.0	91.7	93.0	93.0	91.7
50.0	93.0	93.0	92.4	93.0	93.0	92.4
60.0	93.6	93.6	93.0	93.6	93.5	93.0
75.0	93.6	94.1	93.0	93.6	94.1	93.0
100.0	94.1	94.1	93.0	94.1	94.5	93.5
125.0	94.1	94.5	93.6	94.1	94.5	94.5
150.0	94.5	95.0	93.6	95.0	95.0	94.5
200.0	94.5	95.0	94.5	95.0	95.0	95.0

Market Conditions

The utility commissioned a thorough assessment of the local market for failed and replacement motors,[4] and the program design consultant subsequently held program design interviews with motor vendors (unpublished). The market study looked at volumes and patterns of sales and prices for motors, and described both sales by type of end-user and sales by distribution channel, with primary focus on motor sales for local use (as compared to local equipment manufacturers who incorporate motors in their products for nationwide or global sales). These studies had several key findings:

Table 2: Premium Efficiency Motor Incentives

Motor Size in HP	Per Motor	Open Drip-proof (ODP) 1200 RPM		1800 RPM	3600 RPM	1800 / 3600 RPM	Totally Enclosed Fan-cooled (TEFC) 1200 RPM		1800 RPM	3600 RPM	1800 / 3600 RPM
	Vendor Incentive	Min Efficiency	Customer Incentive	Minimum Efficiency		Customer Incentive	Min Efficiency	Customer Incentive	Minimum Efficiency		Customer Incentive
1	$20	82.5	$60	85.5	80.0	$50	82.5	$100	85.5	78.5	$70
1.5	$20	86.5	$70	86.5	85.5	$50	87.5	$100	86.5	85.5	$70
2	$20	87.5	$80	86.5	86.5	$50	88.5	$100	86.5	86.5	$80
3	$20	89.5	$120	89.5	86.5	$50	89.5	$100	89.5	88.5	$80
5	$20	89.5	$140	89.5	89.5	$60	89.5	$150	89.5	89.5	$80
7.5	$25	91.7	$160	91.0	89.5	$110	91.7	$210	91.7	91.0	$110
10	$25	91.7	$180	91.7	90.2	$130	91.7	$210	91.7	91.7	$130
15	$30	92.4	$240	93.0	91.0	$160	92.4	$280	92.4	91.7	$150
20	$35	92.4	$280	93.0	92.4	$190	92.4	$330	93.0	92.4	$170
25	$45	93.0	$380	93.6	93.0	$210	93.0	$420	93.6	93.0	$220
30	$60	93.6	$400	94.1	93.0	$240	93.6	$460	93.6	93.0	$300
40	$75	94.1	$460	94.1	93.6	$310	94.1	$470	94.1	93.6	$370
50	$85	94.1	$460	94.5	93.6	$320	94.1	$670	94.5	94.1	$430

1. While the availability of CEE-qualifying motors from distributors in New Jersey is adequate, only about 15% of sales are of premium motors. This is significantly lower than in some other regions.[5]

2. Only about half of the locally-available premium motors meet CEE standards.

3. Standard motors dominate sales below 20 horsepower and are the majority of motors sold below 50 horsepower. At higher horsepowers, customers are already buying a large proportion of premium motors.

4. A large proportion of motor sales go to a limited number of very large industrial customers. Many of the motors purchased by these businesses are not efficient.

5. Overall, industrial motor sales dominate the local market, with HVAC motors playing a modest role.

6. When manufacturers upgrade their "standard" motor lines to meet the *EPACT* standards, the cost of a motor will go up by several percent. That will decrease the cost differential between the new "*EPACT*-standard" motors and CEE-qualifying motors.

7. While many premium motors on the market today do not meet the CEE efficiency standards, manufacturers are likely to revise their premium lines to meet the standards, if many utilities offer rebates for CEE-qualifying motors.

8. Most motors sold in any year replace failed motors. Vendors are crucial to most motor programs because they are the only party called when a motor needs to be replaced in a hurry.

9. A significant number of high-volume motor vendors were actively interested in working with the utility to promote CEE-qualifying motors.

10. While a few high-end technically-oriented vendors sometimes promote efficient motors and provide more analytic services to customers (at a premium), vendors oriented toward the retail trade (who sell a large proportion of the smaller motors) use streamlined order-taking systems. Their salespeople do not have a great deal of expertise in motors, nor the time to give customers extensive advice. In sum, vendors may be willing to substitute products, but are more reluctant to change their sales approach.

SUMMARY OF APPROACH

Prior experience with motor replacement programs indicates that the most effective approach is to try to "flip," or transform, an entire market at the manufacturer and distributor level to predominantly carry and sell efficient motors instead of less-efficient motors. While there will always be situations where premium motors are not appropriate (e.g., very low hours of use, specialized motors which are not available at high efficiencies), the majority of motor end-use applications can be served by CEE-qualifying motors.

Sales volume can bring with it economies of scale in production, more retail competition for sales, and, as a result, moderating price increments for high-efficiency products. While exact figures are not available, the extra retail cost of premium motors appears today to exceed the "imbedded" extra cost of materials and tighter manufacturing tolerances, so price drops with higher volume appear to be feasible. Furthermore, many vendors sell -- and customers select -- motors more by "habit" than analysis. Standard purchasing specifications, vendor propensity to focus on a single product line, and field experience all create a tendency toward consistent purchasing practices. These forces now work to resist any change from standard motors. If CEE-qualifying motors dominate sales for a few years, these factors will work to favor those motors.

The advent of *EPACT* means that customers who are now buying standard motors must reconsider their purchasing habits, since their current preferred products will largely disappear from the market by 1998. Price differentials for premium versus standard motors are decreasing, and the new, low-efficiency products have no performance record. This may break the market inertia sufficiently to create an uncommonly-receptive market for high-efficiency products.

While, currently, the pilot program is formally funded for only one year, the program plan calls for a three-year intensive effort to transform the market. By offering attractive incentives and intensive promotion for a limited time, the utility hopes to transform the market rapidly, resulting in high penetration and a sustained impact on motor purchase decisions, even after the program sunsets.

The primary drivers behind this attempt to transform the market are money and promotion. These aspects of the program are described below.

Target Market

Initially, the pilot program will primarily target AC polyphase, low-voltage motors in sizes where motors are usually replaced, not rewound, upon failure (1-20 HP). To make the program more appealing to vendors, motors up to 50 HP will be included.

The program does not target retrofit of motors (motor replacement for reasons of energy efficiency at times when the old motor is functional and the customer has no plans to buy a new one). The decision to focus on market-driven replacement and new motor purchases reflects the lower cost and better marketing prospects for influencing the choice of a new motor, as compared to persuading a customer to replace a motor earlier than planned.

A decision was made not to initially focus on situations where the customer would normally rewind the motor, not replace it. The rewind market was not targeted because: 1) rewinds are common only for the larger motors in the targeted size range (representing a modest fraction of the horsepower); 2) the incremental cost for influencing rewind/replace decisions are higher, reducing the chances for market transformation; and 3) there is a danger of alienating rewind shops when programs heavily promote new motors instead of rewinds. A program to improve motor repair practices would be a more appropriate first venture into the rewind market. CEE plans to develop a standardized program of this sort in 1997. The utility will consider offering such a program, if it looks promising.

Incentives and Program Standards

The program will use the CEE efficiency standards. In 1997, the utility is offering an incentive to customers which roughly covers the cost of buying a CEE-qualifying motor instead of a standard motor. Incentives were calculated based on the market research[4] and then rounded to keep calculations simple.

For 1998, the incentives will be adjusted downward to reflect the smaller incremental cost for upgrading to an *EPACT*-qualifying motor instead of to a standard motor.

In addition, for the first six months of the program, a special promotional vendor incentive equal to about 20% of the customer incentive is offered. This incentive is designed to get vendors' attention and help vendors get "over the hump" of learning program procedures, stocking qualifying motors, as well as introducing new products into their sales regime.

Incentives are summarized in Table 2 (above).

Administration

The program is run almost entirely through a turnkey program administration contractor (PAC), both to minimize the burden on utility staff and to assure integrated operation. The utility provides oversight and utility field operatives assist in promotion.

Program procedures are designed to minimize paperwork and inconvenience to vendors and to work with the way different types of vendors sell motors. The utility has empowered its PAC to pay customer and vendor incentives, based on application approval (and invoice documentation), without running the individual transactions through utility paper-channels for pre-approval and, except for large jobs, without prior inspection. The PAC will selectively conduct inspections to assure that the programs' very simple conditions are being fulfilled.

Vendors and customers have two options for processing payment. These reflect different types of customer/vendor relationships.

1. Vendors may document a reduction in price equal, or greater than, the customer incentive for CEE-qualifying motors on customer invoices, and then apply to the PAC for reimbursement of the incentive amount. This method works best for most customers, because it minimizes their paperwork. The customer must authorize vendors only once to receive incentives on an ongoing basis. Then the customer can simply buy motors from the vendor as they always have, and receive qualifying motors. Vendors can apply for reimbursement on a monthly basis, or more frequently.

2. Customers may receive their incentive directly from the utility's PAC. This is prudent in situations where there are parties between the motor vendor and the customer (e.g., where the vendor sells to

a contractor, who then may install through a subcontractor) and it would be otherwise difficult to assure that the customer receives the incentive. Direct customer application for incentives is also important for some retail motor vendors, who sell motors through a large and non-specialized sales force by phone and at the retail counter. This type of vendor cannot train its entire sales force to work with retail rebates and often cannot conveniently get authorization from the customer to pass the rebate through.

Promotion

The program largely relies on the PAC to promote the program to vendors though personal contact, and on vendors to promote the program to customers. The program was kicked off with a series of breakfast meetings with vendors, which has led to significant interest in the program. As of April 1997, with one month of experience, it is too early to tell how much further promotion to vendors will be needed.

While the emphasis on vendors is important to reach the huge number of customers who don't spend much time planning for motor replacement, many large commercial and industrial firms have at least limited internal expertise regarding motors, and the potential to establish motor-buying policies. A significant portion of the utility's motor population is concentrated in a group of 20 to 40 large industrial customers. Thus, to have the maximum impact, the utility's program operations contractor will market directly to these large customers. This customer-specific marketing will be carefully coordinated with the utility's field operations to assure that both the message and the schedule for contact are harmonious with the utility's other marketing activities.

Technical Support

Consideration was given to requiring, for centrifugal motor applications, that the new motor have no faster an operating speed than the old motor. For these applications, small increases in speed can negate or reverse efficiency gains made from selecting CEE-qualifying motors.[6] Many premium motors run slightly faster than their lower-efficiency counterparts from the same manufacturers. Thought was also given to creating a minimum power factor standard for the program, to minimize resistive losses.[5] Additionally, the idea of requiring that motors installed through the program have no greater horsepower than the motor replaced.

Enforcement of these technical requirements by the PAC would detract from the program's strategy of influencing normal market channels and creating minimum red tape. Instead, the program will offer training and technical support materials to contractors and customers to help them address these issues.

Technical training sessions are being held for utility field staff and for interested contractors. The training regime will rely extensively on materials already developed by CEE and the US Department of Energy's *Motor Challenge* program. Prominent among the *Motor Challenge* resources are the *MotorMaster* inventory tool and database of motor efficiencies and costs, and the *Motor Challenge* tutorial kits on technical issues and motor inventory management.

POSSIBLE PROGRAM ENHANCEMENTS

Regionalization

From the inception of the program design, it has been an open question whether a single utility acting alone can meet this program's ambitious market penetration and transformation goals, even if it is using a nationally-accepted efficiency standard and promoting in concert with the federal government. Motor vendors often sell across the territory of many utilities. Many large multi-site customers buy power from multiple utilities. These large organizations tend to be frustrated with, and disinterested in, a Balkan checkerboard of different promotions, incentives, processing procedures, etc., offered by many utilities acting out of concert.

The Northeast Energy Efficiency Partnership, Inc (NEEP), a nonprofit organization dedicated to coordinated market transformation programs in the Northeast United States, has worked with a group of thirteen utilities to develop a proposal for harmonization and coordination of utility motor efficiency programs throughout the region. A significant proportion of the region's utilities have committed to this effort, at least in concept. As of April 1997, funding arrangements between NEEP and participating utilities are being discussed. The utility sponsoring the program discussed in this paper is a potential participant in this effort.

Evaluation

A three-year evaluation plan has been developed for the program. In addition to an assessment of impact and a review of the program process, the plan establishes a series of market indicators and market-impact assessment activities which will be used to gauge the success of the program in addressing the barriers to transforming the market to CEE-qualifying motors. In the early years, these indicators focus on vendor and customer awareness and familiarity with the program, the breadth of offerings of qualifying motors by manufacturers, vendor motor stocking, consumer purchasing practices, and program participation levels among both customers and vendors. By the third year, the plan suggests that additional indicators might include overall market share of qualifying products (not just simple program volume), influence on customer motor purchasing procedures, and any shifts in the price differential between *EPACT* versus CEE-qualifying motors.

Technical Enhancements

The utility is considering several possible future technical enhancements and complements to the program, including a support effort to improve the efficiency of rewinds and a pilot effort to help large customers inventory motors, assess which ones are oversized, and then tag them for appropriately sized, efficient replacements. Decisions regarding these activities will await more experience with the motors program and with efforts to regionally coordinate and fund motors program activities.

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