IMPROVING THE EFFICIENCY OF ELECTRIC MOTOR SYSTEMS: MOVING BEYOND EFFICIENT MOTORS[1]

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INTRODUCTION

Electric motors operating in the U.S. consume more than half of the nation's electricity. Electric utilities were among the first groups to begin offering programs to promote efficiency in electric motors. A 1994 Electric Power Research Institute (EPRI) survey of utility demand-side management (DSM) programs[1] found 151 efficient-motors and drives programs being offered by 95 utilities in the U.S. The most common programs have been prescriptive rebates for the purchase of high-efficiency motors. While many of these programs have been popular and successful, their cost is an issue of contention with some industrial consumer groups and within utilities attempting to reduce program costs.

With the minimum motor efficiency regulations in the Energy Policy Act of 1992 (EPAct) set to go into effect for most products in October 1997, utilities will need to move beyond these simple high-efficiency motor rebate programs if they are to continue to offer motor programs to their customers. The focus will also have to shift from simply motors to motor-*system* issues. In addition, the utility industry is restructuring with an increased emphasis on providing value-added services to customers. Some of the more advanced program designs already being implemented by utilities in North America indicate that it is possible, with proper program design, to achieve both cost-effective energy savings and value-added services that customers desire. In addition, market transformation initiatives have emerged as an appropriate use of utility systems benefits charges at both the state and regional level.

As a 1993 U.S. Department of Energy (DOE)-sponsored motor-system roundtable identified, motor-system expertise is not widely available, and many electric utilities will need assistance to develop and implement new programs. It is thus important that information be made available to these utilities on how to analyze customers' motor-systems needs, what program designs will most likely meet these needs, what resources they will need to implement their program, and where to find those resources. DOE's Motor Challenge has already been identifying or developing many of these resources, and these are already being used by some utilities. If utilities are provided a program context, more of them can make better use of these resources and achieve success from their own standpoint (e.g., increased customer satisfaction and improved customer retention), from the customers' standpoint (e.g., lower motor-system costs and improved performance), and from the national standpoint (e.g., reduced motor-system energy consumption and lower carbon emissions).

The American Council for an Energy-Efficient Economy (ACEEE) has begun to establish this context by analyzing utility motor-systems programs. This work builds upon past ACEEE analyses of other utility DSM programs and ACEEE's extensive involvement in the technical aspects and design of programs involving electric motor systems.

HISTORY OF UTILITY MOTOR PROGRAMS

Initially, utility program strategies focused on energy-efficient motors. This motor design was a new class of products introduced in the late 1970s with significantly higher levels of efficiency than previous products. In addition, the energy-efficient design achieves maximum efficiency at two-thirds to three-quarters of full load in contrast with standard motors which achieve maximum efficiency near full load. This is important because studies have shown that most motors are operated at about 60 percent of full load.[2]

Many early utility programs focused on integral horse power, poly-phase motors between 1-200 HP, which are the most important class of motors in the industrial sector. Less difference in efficiency exists in motors above 200 HP, and these motors tend to be special order items.[3] Some programs that focus heavily on industry, such as those

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in the Pacific Northwest, have elected to focus even more specifically on four pole (i.e., 1,800 RPM synchronous speed) totally-enclosed, fan-cooled (TEFC) motors, which represent the largest share of new motor purchases by industrial end-users.[4] Those utilities with a significant commercial-sector focus need to include open, drip-proof (ODP) motors, which are predominately used in heating, ventilation and air-conditioning (HVAC) applications.[5]

The most prevalent program approach has been for utilities to encourage customer purchases of energy-efficient motors by offering incentives, information on making motor-selection decisions, and databases on the efficiency and characteristics of available equipment. Initially programs encouraged the replacement of operating standard motors with new energy-efficient motors. This strategy has not generally proved economically viable because it is difficult to justify replacing an operating motor with a higher efficiency one at the U.S.'s low electricity prices. Most programs now attempt to influence the selection process for new motor purchases and the decision to repair or replace a failed motor.[6] These programs have become a core element of many utilities' industrial DSM efforts.

Probably the most successful of these programs was offered by B.C. Hydro in Canada, which served as a model for many other Canadian and U.S. programs. The B.C. Hydro Power Smart program combined an extensive customer and dealer information program with rebates to customers for the purchase of energy-efficient motors. This approach proved less effective than had been hoped because distributors did not stock the motors. Once incentives were offered to the distributor as well, participation picked up and ultimately achieved very high levels of participation (at the peak of the program, approximately 70% of qualifying integral motor horsepower sold in the province were high efficiency units (Figure 1). This high market share made it possible to convince the provincial legislature to enact mandatory motor efficiency standards, similar to those now going into effect nationally in both Canada and the U.S.[7,8,9]

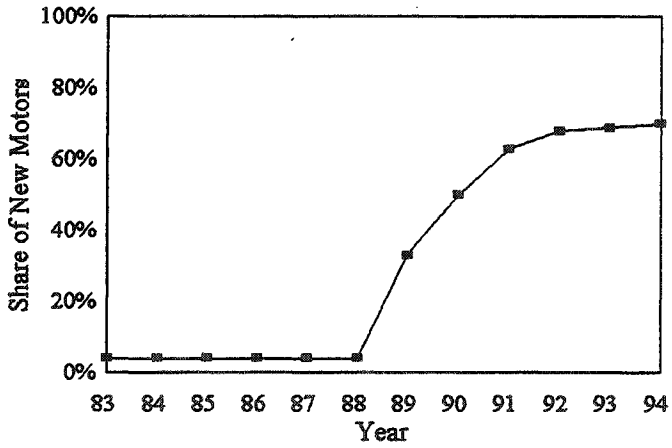

Figure 1. Share of High-Efficiency New Motor Purchases in BC Hydro Service Territory (Source: McMenamin 1994).

Some utilities have chosen not to offer rebates as part of their motors programs. One such utility, Carolina Power and Light, has none the less, operated an effective program assisting customers in identifying, through audits, which motors should be repaired or replaced with energy efficient motors upon failure. Customers are then encouraged to mark these motors, which have high operating hours for which high efficiency motors offer a good payback, with a large yellow dot. Maintenance crews are instructed that when a yellow-dot motor fails, to install a new high-efficiency motor.[10]

In the mid-1980s, some utilities also began to encourage the use of electronic adjustable speed drives (ASDs). This new technology allowed the speed of a motor to be varied to meet changing process needs. This technology was particularly attractive for centrifugal loads like pumps, fans and compressors where the power consumption varied as approximately the cube of the speed. Since these loads are very common, the potential for energy savings is very large. A few of these programs involved prescriptive rebates for the purchase of ASDs, with the 1994 rebate levels being \$20-\$100 per horsepower controlled.[11] The advantage of prescriptive rebates is that they are easy to understand, administer, and promote. The disadvantage of prescriptive rebates is that they oversimplify complex motor systems and can encourage installation of ASDs in inappropriate applications. For these reasons, most ASD promotions involved custom incentives, in which engineers prepared proposals estimating the energy savings from specific ASD applications, and incentives were paid per projected kWh of savings (rebates ranged from 3-22¢/kWh in 1994[12]).

In some cases, the savings anticipated from application of ASDs never materialized, because the actual loads were very different from those used to do the economic evaluations. The problem of the unrealized savings was traced to lack of accurate system operating information. Ontario Hydro quickly recognized this later problem and began a program that promoted a comprehensive system evaluation which then proposed changes that would optimize the system. The Energy Center of Wisconsin, a utility-supported statewide nonprofit, began developing this concept in their state in the mid-1990s. Other groups in the United States are now looking at this design as a model for the next generation of motor system program.[13]

CURRENT MOTOR PROGRAMS

Today, motor system programs are an important component of many utilities' industrial program offerings. These program offerings are changing in response to changes in the utility industry and to the evolution of the motor marketplace and to motor system technology. ACEEE has undertaken a survey of current utility motor-system programs designed to ascertain the types of programs/services that utilities are offering (past, present, and future programs) for motor systems and various motor-related equipment.

ACEEE contacted more than 50 utilities and energy efficiency organizations to discuss current trends and/or request survey participation. The utilities or organizations contacted represent more than 35 percent of the industrial electricity consumption in the U.S. A survey was sent to 27 utilities or related groups that indicated in the initial interview that they had significant motors activities. Twenty-two surveys were completed and returned, representing more than 26 utilities that offer some sort of efficient-motors-related customer service. These utilities represent about 23 percent of the industrial electricity sales in the U.S.

By far, the most popular type of program/service (in terms of percent of sample offering the service for the various categories of motor-related equipment) is providing basic technical assistance (e.g., audits), followed by publication/software tools and customer/vendor training, incentives, in-depth engineering assistance, and customer financing. The following table indicates the percent of sample that currently offers various services and plan to continue offering them:

Area	Publications/ Software	Training	Technical Assistance	Engineering Assistance	Financing	Incentives
High efficiency motors	77%	64%	86%	27%	23%	45%
ASDs	68	59	77	36	27	36
Pumps	36	32	68	18	23	27
Fans and blowers	36	36	68	18	25	23
Air compressors	45	45	36	18	27	32
Motor repair	14	18	0	5	0	0
Belts, gears, lubricants	23	5	27	0	5	0
Systems O&M	36	23	50	14	18	0
System design	18	18	41	23	5	9

The results of this survey indicate that utilities are providing a divers range of program services. The most services provided are for high efficiency motors, ASDs, pumps, fans, blowers, air compressors, and systems operations and maintenance. Few of these utilities report offering services addressing motor repair; belts, gears and lubricants; or system design.

Many of the utility staff interviewed equated "motor system programs" with "energy-efficient motor rebates." In addition, motors technical assistance and incentives are an aspect of many utilities' customized industrial programs,

the interviews revealed. Motors are frequently not dealt with discretely, but as part of an integrated program activity.

Discussion about restructuring the U.S. electric utility industry has created uncertainty about the future of electric utility DSM programs. However, ACEEE's survey of more than 50 utilities, indicates that most utilities that offer motor-systems programs are planning to continue or expand these programs, and some utilities are planning to begin offering new programs. Energy-efficient motors and ASDs continue to be the primary targets for these programs, with education, training, and technical assistance as the dominant strategies. These programs help utilities provide extra services to key customers, and can contribute to customer loyalty when, in the future, customers can select their electricity provider. Financial incentives are becoming less common, although 80% of those utilities that offered incentives in the past are still offering financial incentives. More than a third also offered programs in motor-driven equipment, with compressed air systems being the most common equipment. These equipment-specific programs, along with systems optimization assistance, are frequently included as part of customized programs.

Certainly, there are some utilities that are choosing to terminate motors programs. For example, Entergy ran a motors program, which was mandated by New Orleans, for less than a year. The program offered direct rebates equal to the motor's incremental cost, and had good acceptance. The city, however, was not prepared for the cost of the program, and did not want to burden the general base of ratepayers for the cost of a service that was enjoyed primarily by only the largest commercial customers. As a result, the program was terminated in May 1996.[14]

The most common motivation for offering motor systems programs mentioned in the interviews with the utilities was customer satisfaction. This stated motivation reflects the changing dynamics of the utility industry mentioned above. Several of the utilities that are establishing non-regulated energy service businesses (ESBs) indicated that motor system technical assistance is an important customer service. None, however, indicated that they are currently pursuing motor system efficiency services as a profit opportunity.

THE FUTURE OF UTILITY MOTOR SYSTEM PROGRAM

Initially, most utility motors programs focused on the motors themselves. New motors were the easiest target. EPAct established national motor efficiency standards based upon the NEMA energy-efficient motor standards for integral horsepower polyphase motors. The minimum efficiency levels will go into effect in October 1997, and will prohibit the manufacture or import of general purpose motors that do no meet or exceed specified minimum efficiency levels. The same minimum efficiency levels are already in place in Canada.

While national minimum efficiency standards are now becoming law in both Canada and the U.S., utility and government educational and incentive programs on efficient motors will continue. Premium-efficiency motors a new class of general-purpose motors with even higher efficiency, has emerged from design improvement developments by manufacturers. The Consortium for Energy Efficiency (CEE), a consortium of utilities, government agencies and public interest organization seeking to advance the state of the art of energy efficiency, has set new efficiency levels for this class of motors. Utilities serving approximately 14 percent of the industrial load have already adopted these levels for their incentive and education programs.[15] Many of these new programs are cooperative efforts between utilities, focusing on transforming market behavior in a region by changing vendor stocking behavior, as discussed later in this paper. As a result, the focus has moved from incentives to end-user and moved toward incentives for vendors.

As strides were made on the efficient-motors front, and knowledge has increased about the motor system, the focus has broadened, with initiatives now being offered or developed in motor repair, motor-driven equipment, and system design. Canada has worked, under the leadership of Natural Resources Canada, with the support of the Canadian Electrical Association (CEA) and Canadian Standards Association (CSA), to develop efficiency standards for small motors, as well as motor-driven equipment.[16] Because of the common North American market for motor products, Canadian efforts provided some early leadership for U.S. efforts. Both U.S. DOE Motor Challenge and voluntary programs, such as CEE, are cooperating with the Canadian activities.

Quality of motor repair is an important issue for motor efficiency. For every new motor sold in the U.S., there are two and one-half motors repaired.[17] It has long been realized that improper repair of a motor can result in significant degrading of its efficiency and reliability. Until recently however, a comprehensive understanding of

the repair marketplace was not available making development of strategies to influence the repair market difficult. In addition, sound research on how to maintain motor efficiency during repair was lacking. This lack of knowledge and the complex nature of the motor repair market delayed the introduction of programs to address this aspect of motor efficiency. With the implementation of EPAct motor standards, these issues may gain even greater importance since the higher investment in efficient motors will make it cost-effective to repair, rather than replace, many of these new, efficient motors.

Recently, research by the Bonneville Power Administration (BPA) and Canadian utilities have begun to address these issues. The research has estimated that more than two million integral horsepower AC motors are repaired in the U.S. Motors are typically repaired every five to seven years, and are repaired three to five times before they are discarded. While proper repair can preserve the original efficiency in most cases, improper repair can result in up to a 5 percent loss in efficiency, with an average loss of efficiency of about 1 percent. The research linked quality repair practices to greater retained motor efficiency and reliability. Also, improperly repaired motors operate at higher temperatures, which has been demonstrated to reduce the operating life of the motor significantly.[18]

The Electrical Apparatus Service Association (EASA), the trade association for the repair industry in North America, has established a comprehensive standard for a quality repair, EASA-Q, which is ISO-9000 compliant. Because of its rigor, however, few repair shops have yet to qualify. In addition to EASA-Q, EASA, CEA and BPA have developed guidelines for repair shops and customers to identify the key points that characterize a quality repair. EASA and Motor Challenge are developing educational materials for customers on quality repairs. CEE and several of its member utilities are beginning to design repair programs using these anticipated products to encourage shops to perform quality repairs and encourage customers to request them. These initiatives are likely to involve the proposal of a customer repair "specification" intended to assist the purchaser in identifying quality repair facilities and obtaining quality services. Additionally, EASA is considering establishing a repair technician certification program.[19] The first of these programs are likely to be initiated in late 1997 or early 1998.

One of the newest ideas is offering motor management services, probably on a for-profit basis. The contractor would survey all motors in a facility and do routine checks of key motor performance to attempt to predict failures and consider preventive actions. Upon failure, the contractor would replace or repair the motor depending upon operating conditions. MotorMaster+ software, available through Motor Challenge's Ally Partners program, is ideal for this use. User training on this powerful management tool is also available.[20] Some utilities and motor vendors are beginning to use these tools as part of a value-added motor management service.

Many motors are sold as part of equipment that is driven by motors, such as fans, pumps and compressors. End-user groups, utilities, and Motor Challenge are starting to work with makers of motor-driven equipment to improve the way they test and report the efficiency of their equipment, and to improve promotion of high-efficiency equipment to customers. The three manufacturer trade associations are: International Air Movement and Control Association (AMCA) for blowers and fans; Hydraulic Institute (HI) for pumps; and Compressed Air and Gas Institute (CAGI) for air compressors and related components. None of these groups currently require that members consistently report efficiency of their equipment, except for the agricultural fans manufactured by AMCA members. AMCA does perform validation testing of other performance parameters for listed products. AMCA is beginning to work with Motor Challenge and CEE to develop educational materials on fan system efficiency and equipment selection. AMCA is also considering the possibility of rating listed equipment for energy efficiency. HI does recommend a standard test procedure for pump testing, though members are not required to list efficiencies nor are they independently validated. They are developing pump selection guidelines and related educational materials in cooperation with Motor Challenge. CAGI is currently developing compressed air system management recommendations, in cooperation with Motor Challenge, and preparing standard testing and labeling recommendations for its members. Additionally, a national consortium of utilities, government agencies and nonprofits is working with CAGI to develop a national educational initiative on compressed air system efficiency, which may evolve into a technical training program. This training program may evolve into a technical certification program in the future.[21]

Several equipment-selection and system products have been developed independently of the manufacturers. Commercial software exists for designing pump and fan systems with proprietary databases for equipment specification. BPA has developed a computerized compressed system analysis program, AirMaster, which is being

made available through Motor Challenge. This program allows an engineer or facilities manager to analyze a compressed air system and evaluate changes in compressor operations and control strategies. The preliminary release also contains a limited database of performance data on the air compressors available from manufacturers. The authors of the program hope that other manufacturers will provide data on their equipment and allow it to be included in the database.[22]

Various forms of motor-driven equipment service are also being considered, in which the contractor operates, and possibly owns, the equipment and charges the customer per unit of the product (e.g., cubic feet of air of compressed air at a specified pressure). Wisconsin Electric Power Company (WEPCO) has considered this type of program with its value-based, End-Use Pricing Service (EUP). Under EUP, WEPCO would design, install, own and operate end-use systems on the customers' premises in return for a flat fee. A long-term contact (10 to 15 years) for the end-use service would be negotiated, with the customer paying a flat fee subject to renegotiation at intervals during the contract. An option for customer purchase of the equipment was also included. The program began with pilots of HVAC, refrigeration and compressed air.[23] While the pilot was successful, the program prompted complaints of unfair competition from some trade groups and was suspended.[24,25] As the electric utility industry is restructured in the U.S., and electric service ceases to be a monopoly, these objections may no longer apply. A number of other groups, including utilities, air compressor distributors and energy service companies, are considering offering this service. Some are also looking beyond compressed air, to other motor services such as pumping, cooling or even shaft horsepower. No examples exist at this time, though this appears to be an exciting area for development.

REGIONAL INITIATIVES

Multi-utility regional motor systems efforts are beginning to emerge in some areas of the country. Two of the oldest are the Industrial Electrotechnology Laboratory, operated by North Carolina Alternative Energy Corporation's (AEC), and the Energy Center of Wisconsin, both created under state utility commission auspices. During the last year, two new collaborative efforts, the Northwest Energy Efficiency Alliance and Northeast Energy Efficiency Partnerships, have been initiated, both with significant motors efforts.

Industrial Electrotechnology Laboratory

The AEC's Industrial Electrotechnology Laboratory (IEL) has been a focus for motor activities in the Carolinas and Virginia. AEC receives its funding from utilities in the three states, and delivers their programs in coordination with their member utilities. The three largest member utilities are Duke Power, Carolina Power & Light (CP&L), and Virginia Power. Both CP&L and Virginia Power have had long-running motors-related programs and make use of the IEL's motor testing and technical assistance capabilities. Duke's motors program has not been as active, but has recently expressed interest in developing a more active program.

None of the utilities in this region has offered rebates. They have instead relied upon education and technical assistance to promote greater motor-system efficiency. All three of the utilities indicated that they rely upon IEL as their source of motor systems expertise and view it as a unique and valuable resource for their customers. They count on IEL to obtain value from programs such as Motor Challenge. In contrast to Motor Challenge's focus on developing products for the general market, IEL has focused on developing unique and individualized capabilities that are available on an exclusive basis to member utilities and other customers. These capabilities currently are:

- motor efficiency testing to IEEE and CSA standards
- testing of ASD/motor system performance, reliability and efficiency
- testing of metric motors for purposes of replacement with NEMA standard motors
- Customer-Specific Consulting
- Training seminars on: motor management for managers, establishing a motor management program, and application of ASDs.
- Publications

Each of the utilities has been using these capabilities differently. Some are actively promoting IEL to customers and bringing them into the lab, while others are calling upon IEL to address specific customer requirements on a selective basis. In general, however, none of these utilities are doing much in the way of DSM (i.e., conservation and load reduction). Some have a renewed focus on load growth through customer retention and expansion, and

attracting new customers. As a result, electrotechnologies are the major focus at IEL, with motors being of secondary importance.

Some of these member utilities are establishing energy service businesses (ESBs). For example, Virginia Power's Evantage subsidiary is offering comprehensive energy services with motors being one of the services available in a custom package.[26] Since these activities are non-regulated, and cannot use ratepayer monies, IEL has supported these ventures on a fee-for-service basis. IEL has viewed the fee-for-service business as an area of potential expansion and is considering expanding this to a national focus. In addition to consulting and testing services, IEL is also making access to its testing database available on a fee-for-use basis. Strategically, IEL views itself as a unique and exclusive source of motors information, and intends to market itself as such.[27]

The Energy Center of Wisconsin

The Energy Center of Wisconsin (ECW) is a private nonprofit organization that performs energy efficiency research, development, education and demonstration to help improve the State's economy while protecting the environment. ECW, which is funded primarily by voluntary contributions from Wisconsin's utilities, coordinates motors programs for the state's utilities.

Responsible Power Management (RPM) is a collaborative effort of Wisconsin's electric utilities that offers motor-efficiency programs. RPM was created in January 1993 to reduce the confusion caused by the utilities' having a variety of motor programs. As of the end of 1996 the program had increased the market share of energy-efficient motors to 35-40%.

Another part of RPM is the Performance Optimization Service (POS), a joint effort among participating utilities to improve motor-driven systems' efficiency. Beginning in 1993, several Wisconsin utilities sponsored Wisconsin Demand-Side Demonstrations, Inc. to begin demonstration of POS. The POS program built upon the work of the coordinated Canadian utilities' Performance Optimization program led by Ontario Hydro and begun in the late 1980s. Utilities in both Canada and Wisconsin had initially focused their efforts on identifying applications for adjustable speed drives (ASDs). However, the utilities realized that this component focus proposed an answer before asking the question of which technologies make the most sense for each customer. Consequently, the POS concept uses a systems approach to optimize the entire motor-driven system (e.g., minimize system losses and match pump or fan output to system requirements). It is estimated that 20 - 50% energy savings are possible in industrial fan, pump, and blower systems by matching the machine's output to the needs of the process. In January 1995, the program was transferred to the Energy Center of Wisconsin. The Center began offering POS training sessions in 1996, and has now trained enough engineers in the utility service territories that pilot installations are beginning to take place. The participating utilities offer a range of incentives to encourage customers to undertake POS projects. These include: feasibility study partial reimbursement; customized rebates based upon projected energy savings; low-interest loans; and shared-savings contracts through an independent financing organization.

Northwest Energy Efficiency Alliance

As part of the restructuring process in the BPA service area, the Northwest Energy Efficiency Alliance (NEEA) was established in January 1997. NEEA is a partnerships of public and private utilities, and public-interest groups, funded by Northwest utilities, which improves electric energy efficiency though regional market transformation programs. One of the initial NEEA offerings will be a premium-efficiency motors program that seeks to change stocking practices of motor dealers so that efficient motors become the dominant inventory.

The premium efficiency motors program is an expansion of a program operated, with BPA funding, by the Electric League of Washington State since 1994. The program combines vendor and customer incentives with a motor "circuit rider" who provides marketing and technical support to customers and vendors, and provides a consistent incentive program across the region with centralized processing of rebate request. The circuit rider has been the key to the program's success as a single point of technical and administrative contact for program participants. In the 33 months ending December 1996, the program has rebated 1,937 motors, with a combined horsepower of 57,745 and estimated energy savings of 6,514 MWh.[28]

Northeast Energy Efficiency Partnerships

Northeast Energy Efficiency Partnerships, Inc. (NEEP) is a non-profit organization founded in the fall of 1996 to promote cooperative efforts to increase energy efficiency in the Northeast. It seeks to coordinate market

transformation efforts in the region by forming partnerships with utilities, trade allies, government agencies, and public interest groups. One of the initial programs proposed was a premium efficiency motors program intended to transform the regional motor market toward higher efficiency levels. NEEP held an organizational meeting on the topic in January 1997 at which time thirteen regional utilities indicated an interest in agreeing to use the CEE efficiency level in their motors programs and expressing interest in the development of common technical resources including a circuit rider similar to the NEEA program. Several utilities also expressed interest in a common rebate program, with special emphasis on vendor incentives, including joint processing of incentives payments. NEEP staff are proceeding with development of the program with a planned coordinated program start date of January 1998. A quality motor repair program is under consideration as a future partnership initiative .[29]

WHERE DO WE GO FROM HERE?

Utilities have played a critical role in creating the market for energy-efficient motors, and are now poised to continue to pull the market toward even higher new motor efficiencies. If utilities are to continue to have a role in motor systems, they will have to move beyond new motors programs, and begin to address the continued efficiency of existing motors and the systems they operate. As can be seen from the above examples, program opportunities already exist. Their implementation will create a greater level of technical resources on the part of the utility, and greater flexibility in the design and implementation of the programs.

These utility motor-system programs will likely fall into two categories: public-benefit activities and for-profit business opportunities. Activities like those being undertaken by NEEP, NEEA and ECW will fall into the first category with a goal of permanently changing market behavior. While they may start with efficient motors as their focus they will of necessity move to broader issues as has been seen by the most mature of these programs. The authors feel that these public-benefit initiatives will increasingly be formed on a regional basis so that they can leverage the larger market power and shared cost of expertise of a multi-utility region, while still being able to respond to the unique needs of a regional marketplace. National efforts such as Motor Challenge and CEE will play a supporting role to these initiatives, providing the products and tools, and common program frameworks, respectively.

Some aspects of motor systems represent an attractive new energy service business opportunity for utilities. Motors are ubiquitous among industrial customers, and technical expertise is in short supply. This business can take the form of a value-added, customer-retention activity as we see with many of the utilities ACEEE surveyed, or as a new unregulated business. In the unregulated case this may take the form of a targeted motor service, such as the motor management or compressed air ideas discussed above, or as in the case with Evantage, where motors are included as part of a comprehensive energy service offering.

In any case, several roles still exist for utilities in the future of efficient motor systems. All that remains is for each utility to identify what role best suits their future vision under restructuring, and begin building the motor systems programs to take them into the next century.

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