Strategies to Achieve Voluntary and Sustainable Market Transformation in Industrial Electric Motor System Markets

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This paper summarizes efforts by the U.S. Department of Energy (as part of the planning for the Motor Challenge program) to develop strategic actions for a coordinated and national effort to move the motor system market from a "component" to a "systems-oriented" market that will better enable industrial customers to capture substantial energy cost savings and productivity benefits. The study employed a market-driven, collaborative process to identify a series of consistent, voluntary 'win-win' strategies for transforming the markets for industrial fan and blower, air compressor, and process pump systems. The strategic actions presented reflect over two years of DOE working cooperatively with industrial customers, motor and adjustable speed drive manufacturers, original equipment manufacturers, electric utilities, trade associations, and other organizations (such as the Consortium for Energy Efficiency) to develop complimentary strategies to facilitate and sustain transformation of motor system markets.

DOE talked to industrial customers to determine their needs, and conducted market research, workshops and focus groups to analyze market structures and dynamics, identify market deficiencies, and design a portfolio of strategic actions. DOE has fashioned a framework for thinking strategically about market transformation activities that provides a structure for looking at the breadth of activities organizations can participate in. Market transformation strategies for motor-driven systems are presented that -- (i) address identified market deficiencies to achieve greater system-level efficiency improvement, (ii) coordinate existing motor systems programs in the U.S. and Canada; and (iii) build upon the strengths and mutual interests of different participants. Both private and public sector parties can play important roles in implementing and supporting market transformation activities. The paper concludes with a discussion of how market players can get involved in the market transformation process.

INTRODUCTION

Motor systems consume about 70 percent of all the electric energy used in the manufacturing sector of the United States.[1] Most public and private motor system programs have focused on the motor, primarily because of the complexity associated with motor-driven equipment and the overall system. However, numerous studies have identified significant opportunities for energy efficiency improvements in electric-motor systems.[2] These studies have noted that opportunities for efficiency improvement and performance optimization are actually much greater in the other components of the system--controller, mechanical system coupling, the driven equipment, and the interaction with the process operation. To achieve this savings potential will require a change in the manner in which organizations think about and use motors and motor-driven systems. New market-based initiatives that encourage behavioral change and infrastructural development will play an important role in achieving this potential.

From the motor systems perspective, market transformation can be facilitated by initially targeting the top three driven-equipment market segments -- industrial fan and blower systems, plant air compressor systems, and industrial process pump systems -- that consume a large percentage of motor-related electricity, and represent a large energy savings opportunity. These three manufacturing applications comprise an estimated 25-30 percent of the total motor related electricity consumption by the manufacturing sector[3], but represent over two-thirds of motor-driven electrical

energy savings potential.[4]

The strategic actions presented arise from a market-driven, collaborative process employed by the Department of Energy over the past two years as part of the planning for the Motor Challenge Program. DOE talked to industrial customers to determine their needs, and conducted market research, workshops and focus groups to analyze market structures and dynamics, identify market deficiencies, and design a portfolio of strategic actions.

This effort draws upon numerous sources including: DOE's Roundtable on Market Transformation Strategies for Industrial Motor Systems, April 1995; the Motor System Committee meetings of the Consortium for Energy Efficiency (CEE); meetings of the Midwest Motor Systems Consortium; Stakeholder Meetings held to develop the U.S. Climate Change Action Plan, 1994; and DOE's Roundtable on Efficient Electric Motor Systems for Industry, February 1993.[5] Involvement in these various forums has enabled DOE to gain perspectives from market stakeholders and learn from their experience in the marketplace. Finally, an important source of information came from DOE-sponsored market research focusing on original equipment manufacturer (OEM) market segments.[6]

Market transformation strategies have been prepared in accordance with five guiding principles: (1) early on, listen to real people with real solutions, and involve market players in the design of activities; (2) focus on the "whole systems" approach that targets system-level efficiency improvement opportunities, not just individual components; (3) don't reinvent the wheel, use and build on networks already developed; (4) promote activities that will yield market improvements that are sustainable even after external facilitation and support resources are withdrawn; and (5) leverage public and private resources.

Drawing on input from the marketplace, a comprehensive mix of strategic actions were developed to (1) increase the use of existing, under-used energy efficient technologies and services, and (2) encourage the development of "new to the world" technologies. It is anticipated market transformation activities will lead to enormous business opportunities and provide a foundation to facilitate strategic partnership and alliances among participants who have common interests. Businesses and organizations who participate in the market transformation process may find clear business opportunities and put themselves at a market advantage over those who do not participate in the process.

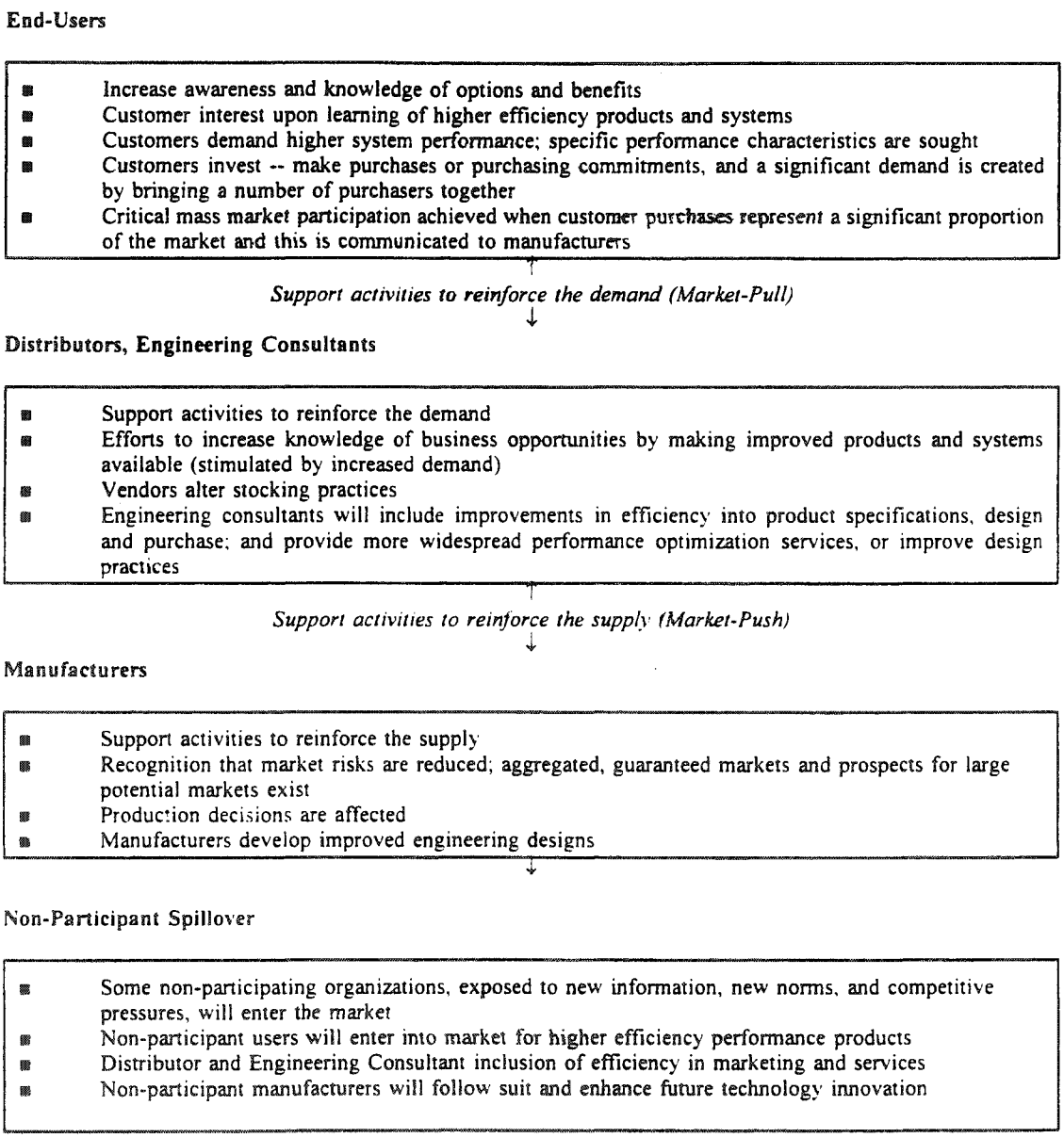
WHAT IS MARKET TRANSFORMATION ?

Market transformation refers to an evolutionary process aimed at permanently changing the structure of a product market in a desired way, in this case toward greater energy efficiency. In the context of this study, market transformation is defined as a process to achieve faster and sustainable market penetration of "desired" products and services. Products are "desired" for the things they make possible, e.g., higher productivity, efficiency, or reduced environmental effects. Market transformation may seek to induce desired products and services into the market faster by enhancing the demand for them [market-pull] and/or it may seek to make desired products and services available to the market faster by enhancing the supply of them [market-push]. **The goal of the market transformation strategies for electric motor-driven systems that are presented in this paper is to shift the market focus from individual components and functions to a total system performance perspective.**

Figure 1 attempts to illustrate how this market transformation process can achieve a dynamic and lasting improvement in the market. Efforts to enhance the demand for higher performance products combined with efforts to enhance the supply may be used to achieve lasting improvements in the marketplace.

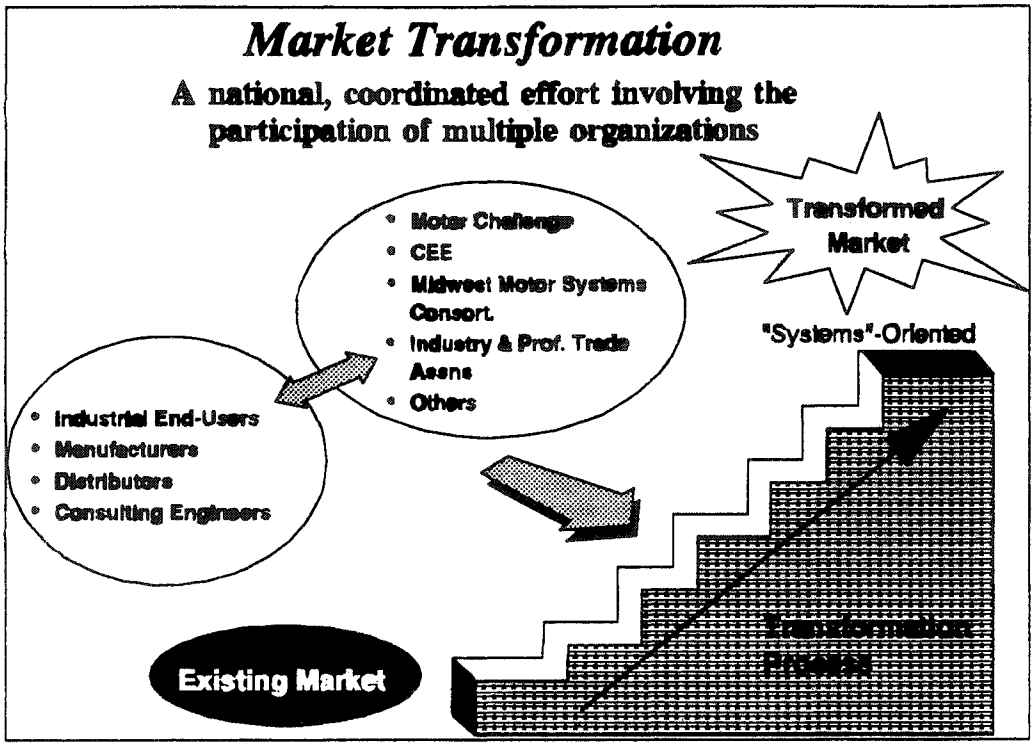
As depicted in Figure 2, in order to be successful, the market transformation as applied to the electric motor systems market, requires a *national, coordinated effort*, with the full participation of all relevant stakeholders. The range of stakeholders includes both the direct market players (e.g., end-users, manufacturers, distributors, engineering consultants and contractors) as well as key organizations that can facilitate and support market transformation (e.g., trade associations, utilities, government, public-interest groups, etc.).

Figure 1: Dynamics of Market Transformation



Most efforts at market transformation, with the notable exception of energy-efficient motors, have focused on residential and commercial appliances. Successes in these areas have included: refrigerators that increased in efficiency by 175 percent from 1972 to 1993; and sales of multiple-glazed windows increased from 37 percent of the market in 1974 to 87 percent in 1991.[7] These product areas are fairly simple in their energy performance and market dynamics. In the case of refrigerators, we have a good understanding of how the products are used and how far technology can evolve with respect to energy efficiency. We plug them in and continue to use them as we have previous models with no change in their utility.

Figure 2: The Market Transformation Process



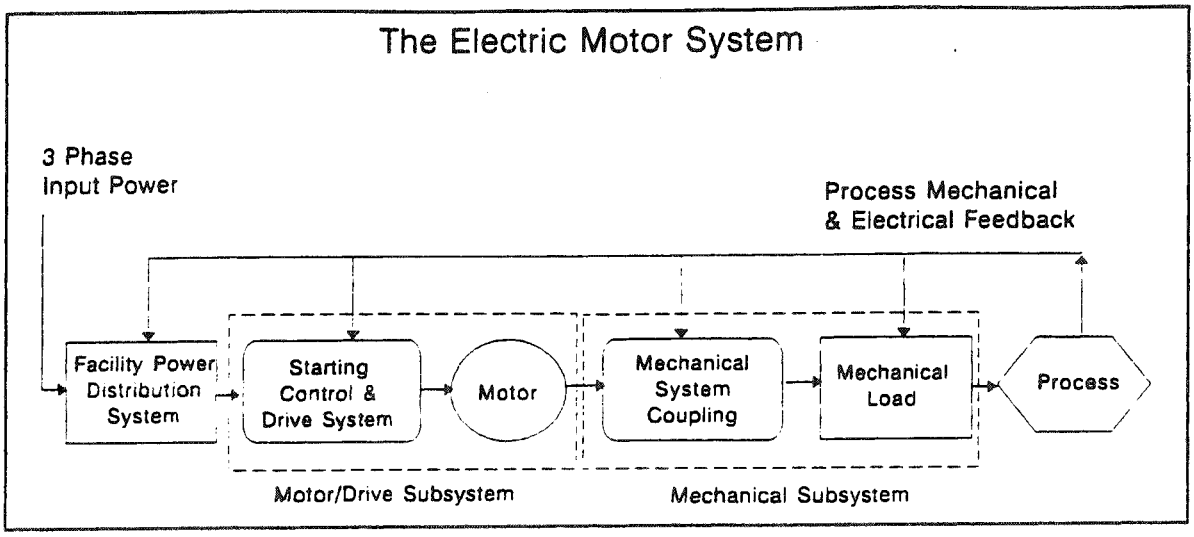
By contrast, motor systems and their markets are complex. As we move into industrial equipment and systems, the relationships between market players become more complex. In addition, the motors system presents several integrated components, frequently with widely varying operating conditions. Often we don't know how efficient products are currently or how efficient they could be made. For example, the efficiency of ASDs is defined more by the process application than the inherent efficiency of the components. Correctly applied, process control and energy efficiency can be greatly enhanced. If misapplied, the ASD may have adverse effects on the process without yielding significant savings.[3] It is therefore important to note that a market transformation strategy appropriate for refrigerators may be inappropriate for an industrial system.

ELECTRIC MOTOR SYSTEMS AND THE "SYSTEMS APPROACH"

Electric motor systems are a combination of electric motor-driven equipment and associated hardware that when coupled together converts electrical energy to mechanical or fluid power. There can be many elements to a motor system. Although motor systems vary widely in configuration, characteristics and their number of integrated parts, there are certain elements that are common to all types of systems (See Figure 3). A typical motor system will include the following components: facility power distribution system; starting, control and feedback mechanism; motor; coupling or transmission; mechanical load; accessory equipment; distribution system; and process.

Motor systems may be defined at two levels -- "packaged systems" or "integrated systems". The term packaged-systems refers to fan/blower, air compressor, or process pump systems that are packaged and sold as units containing motors, drive train, mechanical controls, outlet devices, and ancillary components, as appropriate. Packages are designed and assembled by OEMs and sometimes may include electronic controls (e.g., ASDs). For example, a standard air compressor package consists of an electric motor, a compressor, an air-end, filters, and water separators.

Figure 3: The Electric Motor System



(Source: Blazewicz, et. al., 1995)

A belt drive is offered on some models. Optional package components include dryers and aftercoolers.

The term integrated-systems refers to the entire system boundary, from energy input, to the outlet of the process itself, including piping/ducting distribution system, controls, motors, driven-equipment and downstream process equipment. The distinction between components, packaged-systems and integrated-systems is necessary because different market transformation strategies can be targeted at different system levels.

The Systems Approach

Total system efficiency is determined by the weighted component efficiency and the interaction between components. It is not enough to specify high efficiency components to increase the performance of motor systems. Emphasis on components (e.g. motor, ASD, etc.) alone may obscure the more important fact that much greater cost savings are possible by optimizing the performance of the complete system. In an electric motor system, the energy efficiency of the motor itself (typically 3 to 10 percent greater for energy efficient motors) is only part of the energy efficiency of the total system. Installing an energy-efficient motor without understanding the system may negate the benefits that would have otherwise been attained.[9]

The systems approach is a way to increase the effectiveness for designing and installing better systems and for more efficient motor systems operation. It shifts the focus from individual elements and functions to the total system performance and effect. Careful consideration must be given to the selection of the elements in the system to ensure that they will collectively operate at their peak performance once they are integrated.

Central to applying the systems concept is the need for cooperation among those involved in the market -- end-users, equipment vendors, consultants, contractors, services firms, etc. The optimum performance of the overall motor system must be considered when the system is designed and when the elements are specified and integrated. Whether retrofitting or supplying new equipment, a total system solution, not just quick equipment fixes, must be the goal.

OBSERVATIONS FROM MARKET ASSESSMENT

DOE funded market research to characterize markets and determine the opportunities for energy savings. A summary of the main observations regarding energy savings potential, leverage points, and market deficiencies by market segment is presented below.

Industrial Fan and Blower Systems

Preliminary estimates suggest that further electricity reductions of up to 50% in industrial fan and blower energy consumption are possible at individual sites (e.g., equipment savings potential, 5-15%; speed control, 20-50%; and system design improvements, 5-25%). Moderate equipment-level savings potential exists, but these savings opportunities may be applicable to a large share of the market. Although intrinsic efficiency gains are marginal for improving the motor, drive train and impeller selection practices offers savings potential. Improving system design to reduce the "system effect" offers additional opportunities to improve overall performance.

The industrial fan and blower market is fragmented and competitive, with no manufacturer having more than a 12 percent market share.[10] Manufacturers sell fans and blowers through manufacturer representatives or to other OEMs, including dust collection, HVAC, oven, boiler, and pollution control equipment manufacturers, among others. Contractors install most fan and blower systems. Specifiers work with the contractor, end-user, and manufacturer representative to design the system and select equipment. Independent air balancing firms may be called upon to test the system after installation and certify that it meets design criteria.

Air Compressor Systems

Field research and secondary sources suggest that there is significant savings potential in system design and operations and maintenance improvements; electricity consumption could be reduced by 50 percent or more at individual sites (e.g., equipment savings potential, 15-25%; speed design improvements, 15-20%; and operations and maintenance, 20-30%). Efficient plant air system design could reduce electricity consumption by as much as 20 percent. Finally, proper system operation and maintenance could contribute as much as 30 percent savings.

There are a number of key players that can influence market behavior and are potentially valuable leverage points. Manufacturers have significant influence on equipment, package and controls design. Compressor "air-end" manufacturers/packagers are key players in the air compressor industry; these OEMs are involved in component design and manufacturing, package design and assembly, and in some cases, distribution. As a result, they determine the level of compressor engineering and design and the overall efficiency of the compressor packages. Some manufacturers also rebuild compressors. Motor and other ancillary compressed air system component manufacturers, as well as foreign air-end manufacturers, also supply components to the compressor OEMs. Consulting engineers design and plan compressed air systems for ease of maintenance, low noise, and reliability. However, efficiency is rarely a primary concern. Few engineering firms have a compressor specialist on staff, and systems expertise is rare. Engineers focus primarily on ensuring the system can deliver sufficient air flow at the required pressure to all point-of-use locations.

Industrial Process Pump Systems

Initial field research indicates that electricity consumption for industrial process pumping could be reduced by as much as 10-40% at individual sites (e.g., equipment savings potential, 5-15%; speed control, 20-50%; and system design improvements, 5-25%). Opportunities exist to improve pump package efficiency. More efficient system design could reduce process pump system consumption. Finally, increased use of speed control could reduce pump system consumption depending on the individual system and the applicability of speed control devices such as ASDs.

The pump market is extremely competitive, and not every manufacturer serves each end-use market. Manufacturers sell pumps through manufacturers' representatives and distributors, or in some cases, directly to very large end-users. Many process pumps are engineered specifically for a particular end-use application and thus are sold directly to the end-user through the manufacturer. Manufacturers and their agents exert a strong influence on this market because of the role they play in determining pump efficiency and selection. Pump distributors vary widely in sophistication. Some provide design, repair, and maintenance services while others simply order and obtain pumps for the end-user or contractor. Distributors use manufacturer-provided manuals, pump curves, and software to help select pumps. The information provided by the manufacturers is adequate for proper pump selection. Pump distributors play an important role in determining which pump is chosen for a job; however, they have little stake in pump system efficiency. Mechanical contractors install most process pumps. Consulting engineers design and may also get involved

with system renovation or major retrofit situations. Larger end-users, particularly in the chemical and petroleum industries, often have internal process engineers who perform system design work.

Market Deficiencies

For the purposes of this study, market "deficiencies" are defined from the point of view of practices and behavior that do not lead to minimum motor-driven electricity consumption. The term is not meant to imply market failure. Table 1 lists deficiencies that may hinder the market's ability to address customer demands for products and services to improve energy efficiency and total system performance.[11] Market transformation efforts seek to address one or more of these deficiencies, either directly or indirectly.

FRAMEWORK FOR FORMULATING MARKET TRANSFORMATION STRATEGIES

The framework for formulating market transformation strategies distinguishes between actions leading directly to enhanced system performance and reduction in energy consumption, and those that lay the foundation for follow-on actions with direct results. We call the latter infrastructure/enabling actions because they build and strengthen market infrastructure to enable future market actions to take place. Without these enabling actions, direct market progress would be limited. Infrastructure/enabling actions in general address knowledge, information or awareness deficiencies that exist in a market. For example, motor rebate programs which have led to direct benefits and results are only possible today because standards for testing and labeling motors were already in place. Enabling actions may also address a deficiency within the marketplace which allows the market to evolve to a higher level of efficiency without any direct market actions. Direct market actions attempt to influence market behavior directly. These actions may include public recognition, promoting purchasing collaboration, financial incentives, and audit services to identify and quantify savings resulting from performance optimization.

There are forward and backward linkages between the enabling and direct market actions. While in many cases, the enabling action is a prerequisite for conditioning the market such that it is ready to accept the direct market action, there are always instances where the enabling action will not be followed by a direct market action. Similarly, there are other instances where direct market actions may proceed independently and without need for an enabling action.

Table 2 lists broad categories of actions that may be included as elements of a market transformation strategy. Different actions may be appropriately targeted at specific industrial sector applications segments within each market. In practice, to successfully implement market transformation a number of these actions may need to be implemented in parallel, with enabling and direct-market actions coordinated in some way.

Table 1: Electric Motor System Market Deficiencies

Motors and Drives

- Insufficient knowledge on true savings potential of energy-efficient motors and ASD applicability
- Uncertain and dynamic definitions of "high" and "premium" efficiency motors are confusing and potentially misleading to stakeholders
- Sub-optimal failed motor situation practices including poor motor rewind practices and "like-for-like" and low first-cost purchase behavior.

Fan and Blower Systems

- ASDs underused due to lack of knowledge of applicability and high first-cost of ASDs
- Lack of system design expertise creates sub-optimal (from an efficiency standpoint) system design, specification development, and equipment selection
- The most efficient fan type for the specific operating conditions is often not used due to lack of information about alternative equipment designs and performance capabilities
- Equipment/system end-users and purchasers do not always specify minimum efficiency levels or energy consumption requirements
- End-users may base purchase decisions on first cost and do not consider the life-cycle energy cost savings associated with higher efficiency fans
- It is difficult to make comparisons between different manufacturers' products because the existence of energy-efficiency performance data is not widely known or easily analyzed
- The equipment seldom operates under design conditions

Compressed Air Systems

- Loose test standards and voluntary participation make it difficult to compare compressor performance across compressor types and between manufacturers; selecting the most efficient compressor is difficult
- There is no "watchdog" organization to certify test results and encourage greater adherence to test standards
- Poor operation and maintenance practicesLack of design expertise resulting in sub-optimal system design, specification development, and equipment selection
- Lack of design expertise resulting in sub-optimal system design, specification development, and equipment selection
- Lack of knowledge of high efficiency options including higher efficiency compressors, ASDs, control systems, part-load mechanisms, etc. at the end-user and specifier levels
- Lack of cooperation among industry stakeholders to promote efficiency
- Lack of end-user awareness of energy consumption; end-users do not demand high efficiency compressor system designs

Process Pump Systems

- A lack of knowledge at the end-user, distributor, and specifier levels regarding which pump (impeller) types are applicable for particular applications
- A lack of knowledge of the applicability of ASDs and the associated energy savings potential
- End-users weight reliability and performance considerations more heavily than efficiency concerns
- Oversizing due to engineering design -- allowance for pump degradation and system friction losses
- Process systems designed to run at varying flow rates; run off best efficiency point
- Difficulty comparing different manufacturers' pumps--common rating and labeling guidelines not used.

Table 2: Market Transformation Actions

Network organization development	
Infrastructure/Enabling	Direct Market
Voluntary test protocols	Recognition activities
Training and education	Opportunity Identification
Develop information systems and databases	Encourage purchasing collaboratives
Develop/distribute decision support tools	Promote facilities management businesses
Develop guidelines/best practices	Financial incentives (e.g., rebates, grants, financing, tax incentives)
Voluntary ratings and labeling guidelines	Promote voluntary certification
Develop common user (performance/ purchasing) specifications	Encourage early equipment retirement
Technical Assistance	Minimum efficiency regulations and codes
Demonstrations	
Research and development	

Market transformation strategies also target specific market players (e.g., OEMs, distributors, specifiers, installers, and end-users) and actions for different "levels of the system" that will best enable market transformation goals to be achieved. "Level of the system" refers to whether the program is aimed at the component (e.g., motor or fan), the packaged system, or the integrated system (including system layout and control). Examples of strategies that may be targeted at component, packaged-system, and integrated-system levels are as follows: component -- promote increased high efficiency components (e.g., energy efficient motors, efficient impeller types, more efficient belts); packaged-system -- improve equipment designs, develop efficiency ratings and performance guidelines; and integrated-system -- promote performance optimization services, improve operation and maintenance practices.

STRATEGIC ACTIONS

DOE technical staff and contractors established a set of carefully-considered selection criteria (e.g., energy saving potential, availability of leverage points to influence the market, and portfolio mix) intended to "zero-in" on the greatest opportunities for efficiency improvement in each sector with the greatest prospects for success. These criteria for success, combined with the extensive market research, yielded a set of market transformation actions. Of special interest in the selection process were common initiatives that cut across sectors and offered greater leverage by virtue of their broader applicability.

Table 3 lists the resulting set of leading actions that combine the DOE market research and Roundtable input. The actions in italics were identified by participants at the Market Transformation Roundtable. The remaining actions were identified prior to the Roundtable, based on DOE-sponsored market research and early communication with market stakeholders. Five actions are targeted at motors and drives, 21 actions are for pump systems, 16 for fan/blower systems, and 20 for air compressor systems. Ten of the actions are common across the three motor-driven systems markets. A full description of each individual action can be found in the DOE comprehensive report.[12]

Table 3: Portfolio of Strategic Actions

Action Categories	Motors and Drives	Pump Systems	Fan/Blower Systems	Air Compressor Systems
Network Organization Development	• Market transformation partnerships	• Market transformation partnerships • *Encourage Better Internal & Trade Ally Communication*	• Market transformation partnerships	• Market transformation partnerships
Voluntary test protocols	• Quality assurance rewind guidelines and practices			• Plant air compressor package testing procedures
Training and Education		• Training in strategic marketing for motor systems products/services • Training program for performance optimization • *Develop Models of Optimized Systems* • *Develop Specification Guidelines* • *Develop Case Studies for Benchmarking* • *Conduct Pump Seminars*	• Training in strategic marketing for motor systems products/services • Training program for performance optimization • *Promotion of Energy Efficient Fans and Blowers through Education and Awareness*	• Training in strategic marketing for motor systems products/services • Training program for performance optimization • *Customer Awareness Program*
Information Systems and Databases		• *Develop Catalogues of Equipment Cost and Performance Information* • *Quantify Life-Cycle Cost of Pumping* • *Quantify Non-Energy Benefits* • Internet access to technical, marketing, and financial data	• *Focus on Non-Energy Benefits* • Internet access to technical, marketing, and financial data	• *Directory of Stakeholders* • *Directory of Services and Information* • *Case Studies of cost savings & performance improvement benefits* • Internet access to technical, marketing, and financial data
Decision-Support		• Life-cycle costing tools and methodologies • *Develop Pump Selection Software*	• *Life-cycle costing tools and methodologies* • Develop fan/blower selection software	• Life-cycle costing tools and methodologies

Action Categories	Motors and Drives	Pump Systems	Fan/Blower Systems	Air Compressor Systems
Guidelines and Best Practices	• Best practices for efficient motor rewind			• *In-Plant Air Distribution Guidelines*
Voluntary Rating/Labeling	• Develop guidelines for motors	• *Develop guidelines for packages* • Develop Voluntary Certification Process for packages	• Develop guidelines for packages • *Standardize Practices for the fan industry*	• *CAGI Test Procedure Fact Sheet* • Develop guidelines for packages
Common User Specifications			• Develop common purchase specifications for packages	• *Develop common purchase specifications for packages*
Demonstrations		• Demonstration projects	• *Demonstration projects*	• Demonstration projects
Opportunity Identification (e.g., audits and feasibility studies)				• *Improve the Consistency and Availability of Plant Energy Audits*
Purchasing Collaboratives		• Establish collaboratives	• Establish collaboratives	• *Establish collaboratives*
Facility Management Businesses				• Compressed air facilities management services
Financial Incentives		• *Identify and Provide Financial (and Non-Financial) Incentives*	• *Present Incentives for Choosing Energy Efficient Fans and Blowers*	
Voluntary Certification		• *Develop Certification Process for Pump Packages*	• Systems certification program	• Systems certification program
Early Equipment Retirement	• Early retirement for motors	• Early retirement for pumps	• Early retirement for fans and blowers	• Early retirement for air compressors

Note: The above actions do not presently include any activities for the action categories technical assistance, research and development, recognition, and minimum efficiency regulations.

POTENTIAL ROLES OF PRIVATE AND PUBLIC SECTOR ORGANIZATIONS

The types of organizations that may play roles in implementing market transformation activities include: end-users, industry and professional trade associations, motor, ASD, and original equipment manufacturers, utilities, distributors, Government agencies, engineering consultants and contractors, educational institutions, public interest groups, and research organizations.

Many of these parties have already played an active role in helping to design the strategic actions listed in this paper. Certain parties may engage in direct market participation, while other parties, such as Government and trade associations are expected to largely play a facilitation and support role. Some organizations may have a broad range of interest and be involved in activities which cross several markets, while others may want to be vertically focused on a particular equipment segment, specific end-use or market segment.

Partnerships and alliances between market players can enhance strategic business opportunities and foster development of cost-effectiveness market transformation programs, particularly where commonalities exist to leverage resources and combine strengths. Partnerships, alliances and collaboratives can also greatly influence purchasing power. They can create large market demand, influence product mix and pricing and encourage the introduction of higher efficiency products and services. By pooling knowledge, working cooperatively and sharing cost, partnerships enables market players to undertake ambitious efforts (e.g., development of test procedures and energy efficient products databases) that might otherwise be prohibitive for a single organization. These partnerships are characterized by such efforts as the Motor Challenge partnership, the Midwest Motor Systems Consortium, the CEE Motors Systems Committee and the Canadian Coordinated Utilities.

The benefits of participation in the market transformation process vary (see Table 4), depending on the organization. Organizations who choose to participate will do so out of a sense of opportunity and mutual interest in working cooperatively with other organizations sharing a common vision.

Table 4: Benefits of Improved "System-Efficiency" to Market Stakeholders Through Participation in the Market Transformation Process

Stakeholder	Primary Benefits
End-Users	Reduced energy cost, improved process/operations, productivity improvement, better environmental performance, competitive advantage
Manufacturers/ OEMs/distributors	Increased sales, sale of higher margin equipment and services, competitive advantage
Specifiers/designers	Increased design activity, improved skills, reduced costs, competitive advantage
Electric utilities	Avoided cost of new plant, improved customer relations
Other trade allies	Increased service business activity
U.S. DOE & Nation	Reduce CO_2 emissions, Strengthen national energy security

OPPORTUNITIES FOR PARTICIPATING IN THE MARKET TRANSFORMATION PROCESS

Numerous opportunities exist for involvement in market transformation activities. Six notable examples reflect ways to get involved.

DOE Motor Challenge

The Motor Challenge Program was established by the U. S. Department of Energy to help stakeholders transform

markets and to facilitate the development and adoption of the best equipment and practices possible in pursuit of the Program mission, to:

> *"Create a partnership with our allies to deliver products and services that assist our customers in gaining a competitive advantage in managing their electric motor systems while saving energy and enhancing environmental quality."*

To carry out this mission, Motor Challenge Partners and allies seek to increase the market penetration of energy-efficient industrial electric motor systems to improve industrial productivity and enhance environmental performance. The Motor Challenge Partnership draws upon the diverse perspectives and needs of stakeholders to form coordinated marketing and deployment strategies. Partner organizations include industrial end-users, original equipment manufacturers and distributors, utilities, state energy offices, engineering firms, trade associations, research institutions, universities, and public interest groups. Specific activities include: Showcase Demonstrations, recognition of excellence activities, information exchange through a national information clearinghouse, joint training development and implementation, and market research. Activities such as the Motor Challenge Showcase Demonstrations facilitate and support market transformation initiatives by bringing together various disciplines who are involved in system design, integration and operation to test new concepts and develop innovative approaches to maximize energy efficiency opportunities.

Motor Systems Committee of the Consortium for Energy Efficiency (CEE)

The CEE is a non–profit organization comprised of utilities, environmental and public interest groups, and government agencies. The purpose of this unique coalition is to encourage the development of markets for super–efficient appliances and other technologies and services in the residential, commercial, industrial, and agricultural sectors. CEE and its members seek to marshal a variety of program resources to facilitate market transformation through market pull strategies.

CEE has formed a Motor Systems Committee, consisting of electric utilities, industrial end-users, government agencies, research organizations and public interest groups. The committee also obtains input from trade associations and individual equipment manufacturers. The Committee's purpose is to assess and develop programs to capitalize on opportunities for accelerating transformation of the motor systems marketplace. Committee activities include: (1) identifying strategic business opportunities to encourage market change; (2) facilitating communications to build consensus among stakeholders; (3) coordinating and combining participants' resources and strengths; and (4) developing market-based programs to increase the energy efficiency of motor systems. The CEE Motor Systems Committee is emerging as a key force in North America's motor systems market, providing a forum to encourage discussion and a platform to influence market changes.

Regional Motor Systems Consortium

DOE and the Wisconsin Center for Demand-Side Research have been instrumental in the formation of the Midwest Motor Systems Consortium. The Consortium is a voluntary establishment dedicated to improving efficiency in motor systems. It is comprised of end-users, utilities, equipment manufacturers, distributors, and engineering consultants and contractors. The main focus of the group is to leverage resources through integrated business partnerships to provide an effective means of non-proprietary energy efficiency information transfer to industry. Specific activities include: cost sharing, information exchange, joint training development and implementation, and development product profiles for energy efficient products. By its nature, the Consortium has a regional focus with emphasis on industries located within a ten State area. The Consortium was established as a model that can be replicated in other regions in the country.

Purchasing Collaboratives

The consolidation of purchasing power can have significant effect in transforming a market as demonstrated in the fluorescent ballasts market. The Energy-Efficient Procurement Collaborative and Purchasing Network, formed in 1994, is comprised of federal and state government agencies, utilities companies and public interest groups.

Collectively, they aim to influence the production and supply of energy efficient products. Their mission is to provide large purchasing agencies with accurate and easily accessible information about energy-efficient and environmentally preferred equipment and appliances. To date, the collaborative's activities have been limited to developing information resources, however, future activities may involve initiatives such as the development of common purchase specifications.

Textile Manufacturers Purchasing Association

The American Textile Purchasing Association (ATPA) is a professional group with 120 member purchasing managers representing 60 southeastern textile manufacturing companies with 475 operating plants. The group provides information and recommendations to its member organizations with regard to purchasing decisions for supply, equipment and energy use. In addition, they offer summaries of state-of-the art research and provide energy efficiency benchmarking. The association provide a variety of motor related services to member organizations including development of motor management policy, conducting bi-annual energy efficiency impact surveys and conducting training workshops.

An industry trade association, such as ATPA, can offer member organizations an invaluable service to effectively manage plant motor systems and implement market transformation activities. They can provide tremendous leveraging opportunities to execute a variety of industry specific market transformation strategies (e.g., minimum performance levels, purchasing specifications, training and skills development, etc.) to benefit their members.

Industry Trade and Professional Associations

Like the ATPA, industry and professional associations such as CAGI, HI, AMCA, ASME, AIPE, AEE, API, CMA, AFPI, etc can play important roles in helping their members benefit from ongoing and future market transformation activities.

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1. EIA, 1994.

2. Nadel, et al., 1992; Howe, et al., 1993; Elliott, 1994.

3. Electricity consumption by the installed base of industrial fans and blowers is estimated at 45-55 Terawatt-hours (TWh) per year, roughly 8-10 percent of total motor-driven manufacturing sector electricity consumption. Centrifugal fans dominate the fan and blower market in the manufacturing sector, accounting for greater than 90 percent of fan and blower energy consumption. Axial fans, which are used primarily in commercial HVAC applications or for large flow, clean air applications in the mining, utility, and transportation sectors, make up the remainder of the market. An estimated 45,000 to 50,000 centrifugal fans are sold to the manufacturing sector each year. Pumps in the manufacturing sector consume an estimated 120-125 TWh per year, approximately fifteen percent of total manufacturing sector electricity consumption and more than one-fifth of the sector's motor-driven electricity consumption. Pumps in the chemical, pulp and paper, and petroleum processing industries consume approximately 90-95 TWh, more than three-fourths of all manufacturing sector pumping electricity consumption. Within these three segments, process pumps account for about two-thirds of the total pump consumption, or roughly 60-70 TWh. General industrial plant air compressor consumption is estimated at 27-32 TWh per year.

4. Easton, 1994.

5. DOE, 1993.

6. Easton, 1994, 1995.

7. Geller and Nadel, 1994.

8. Elliott, 1994.

9. For example, different motors have different load, speed curves. Since the load of a turbomachine (e.g., a fan) varies approximately as the cube of the speed, if an efficient, faster motor replaces an inefficient, slower motor, the total energy consumption of the system can increase. More air will be move, but unless the process requires more air, no benefit will be achieved.

10. Easton, 1994.

11. DOE, 1995.

12. DOE, 1995.