Drive Power Initiative

Market Progress Evaluation Report, No. 5

prepared by

Currents Consulting

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DRIVE POWER INITIATIVE

MARKET PROGRESS EVALUATION REPORT #5

Final Report

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Executive Summary

A. Introduction

The Northwest Energy Efficiency Alliance (the Alliance) is a non-profit group of electric utilities, state governments, public interest groups, and industry representatives committed to bringing affordable, energy-efficient products and services to the marketplace. The *Drive Power Initiative* (the Initiative) is a market transformation effort funded by the Alliance and administered by the Electric League of the Pacific Northwest (the League). The League began work on the Initiative in January 1999. Funding was approved at the October 2003 Alliance Board meeting for continuation of the contract through December 31, 2004. Pacific Energy Associates, Inc. (PEA) was the evaluation contractor for the Initiative through April 2001. The contract was then transferred to Currents Consulting, under the management of Jennifer Stout in May 2001.

This report comprises the fifth *Market Progress Evaluation Report* (MPER) on the Initiative and covers the period from June 2002 through June 2003. The following provides an overview of Initiative activities, market effects, and recommendations. These items are also summarized in a more compact form in Table 9 in the main report.

B. Drive Power Initiative Objectives and Services

The *Drive Power Initiative* has three core areas of service: *Electric Motor Management* (EMM), motor systems efficiency, and marketing and administration of the *Compressed Air Challenge* (CAC) training and the *Pumping System Assessment Tool* (PSAT) workshops.

Initiative Objectives

The Initiative's primary objectives are to:

1. Increase the region's overall fleet and systems efficiency.

2. Influence end-users' repair/replace decision-making for motors so they plan ahead and use operating or life-cycle costs.

3. Help motor service centers improve their repair practices and expand their motor management services.

4. Market and deliver the regional training for *Compressed Air Challenge* (CAC) and the *Pumping System Assessment Tool* (PSAT).

Initiative Methods

To meet the program objectives, the Initiative uses the following methods:

- Implementing a broad motor end-user education program, including seminars, a newsletter, a toolkit of printed information, motor database software (*EM2*), and a web site.
- Deploying four field consultants to work one-on-one with end-users throughout the region and develop success stories.
- Leveraging program success stories and information through dissemination in various media.
- Executing a pilot demonstration of motor system optimization.
- Working with motor service centers on improving repair methods, integrating motor operating costs into repair/replace decisions, and expanding motor management services.
- Coordinating promotion of motor management efforts with trade associations, utilities, and organizations and agencies such as the Consortium for Energy Efficiency (CEE).
- Marketing and implementing CAC and PSAT training.

C. Summary of Initiative Activities and Achievements

Below is a brief recap of the Initiative's progress through May 2002, described in the last MPER, followed by a description of additional activities carried out through June 2003. Market effects are discussed in the following section.

One-on-One End-User Work and Success Stories

- Through May 2002, the field consultants had met with 151 motor end-users. Through June 2003, they had met with another 43, bringing the total to 194.

- Data on numbers of motors were available for 162 of 194 motor end-users. About 56% have over 250 motors or more than 20 motors larger than 50 horsepower, the target size for the Initiative.

- Through May 2002, thirteen formal stories documenting motor management successes had been prepared; these vary in level of reported savings and marketability. These stories have not been updated and no new formal success stories have been prepared. However, there are eight prospects for new stories, and three additional "mini" success stories have been prepared.

- Based on assessments by the field consultants, in addition to the existing success stories, 27 more contacted motor users have excellent potential to make concrete improvements to their practices and about 57 have fair-to-good potential.

- Since the beginning of the Initiative, fifteen articles on EMM have appeared in various publications, including *US Industry Today* and *Forbes.* The CEE *Motor Decisions Matter* web site[1] uses six of the EMM success stories.

Motor Service Centers (MSCs)

- Through June 2003, field consultants had met with 41 motor service centers representing about 60% of the region's repair market.

- Through June 2003, about 27% of shops region-wide (30 of 112) have attended one of the *Electric Motor Management* seminars, representing about 40% of the region's total repair market.

[1] www.motorsmatter.org.

- In May 2002, *MotorTracker* was initiated on a pilot basis with ten MSCs (and one additional shop has essentially moved forward on their own). *MotorTracker* is a marketing package designed to help MSCs expand their service offerings. The eleven *MotorTracker* shops represent about 25% of the region's repair market.

Electric Motor Management (EMM) Seminars

- The EMM seminar has been offered a total of 53 times through June 2003.

- Attendance lists were available for 44 of the 53 seminars. They show 896 individuals attending, representing 446 organizations, of which 76% were facilities that use motors. Among the attending motor users, 57% (254) were industrial.

- Based on analysis of exit surveys, attending motor users represented about 135,000 motors, or 28% of the Northwest fleet total (based on number of motors, not horsepower).

Work with EASA

EMM staff also continue to work actively and effectively with the Electrical Apparatus Service Association (EASA), both regionally (in the Mountain and Oregon Chapters) and nationally. Below are highlights.

Dennis Bowns, the field consultant for Idaho and Montana, is a voting member of both the EASA Mountain Empire and Pacific Northwest Chapters, and is editor of the *EASA Mountain Empire Newsletter*. He recently established a web site for both EASA chapters[2]. His involvement is very important to the growing collaboration between EASA and EMM.

Attendance at Other Events

Since January 2003, Initiative staff have attended the *Northwest Food Processors Association Annual Conference* (program exhibit with *EM2*

[2] www.easamountainempire.org.

demonstration) and the *Northwest Plant Engineering & Maintenance Show and Conference* (presentation and booth).

In the fall of 2003, Initiative staff attended the *Washington Plant Engineering & Maintenance Show and Conference* in Seattle (with a presentation and booth) and held a technical workshop for the Oregon Cement & Aggregate Producers Association and the Washington Aggregate & Concrete Association.

Motor Management Toolkit

The toolkit has been significantly improved over time: the kit has been streamlined, the marketing brochure has been upgraded, copies of the success stories are included, and the *EM2* software was created and a second upgrade has been completed.

Two new and useful elements were added to the toolkit:

- A quick reference table of motor operating costs for various motor sizes and efficiencies.
- For motor repair shops, posters of *Good Motor Repair DOs and DON'Ts* were developed and have been distributed.

EM2 Motor Management Database Software

Through June 2003, a total of 618 copies of the *EM2* motor management database software had been distributed to 571 individuals who represent 401 companies and organizations. Among those 401, 281 are facilities that use motors, 38 are repair shops, 34 are consulting/engineering firms, 11 are motor manufacturer/distributors, and 24 are utilities; the remaining 13 are uncategorized users.

In June 2003, the *EM2* software had been upgraded to *Version 3.0* by Dennis Bowns, the creator of the original software. The upgrade includes a new tutorial and a written user's manual.

Motor Systems Pilot

One of the goals of the *Drive Power Initiative* has been to complete several pilot motor systems projects. Despite diligent efforts by Initiative

staff, work with the first pilot customer was substantially delayed and ultimately suspended because of decision-making issues with the customer. Work is now proceeding with a different company. The following is a brief summary.

Fan Replacement Project

After several months, SP Newsprint's corporate management approved replacement of a boiler induced draft fan. It will save an estimated $237,000 per year in electrical energy costs (about 0.54 aMW based on $0.05/kWh), has a six-month payback, and is anticipated to have important reliability benefits.

Pump Replacement Project

SP Newsprint indicated that because they already had committed capital to the fan venture, they would not be able to complete a recommended pump project. The project is estimated to save $150,000 per year (about 0.34 aMW based on $0.05/kWh), with an estimated payback of between 18 and 24 months. It also would solve a number of maintenance problems.

Compressed Air Challenge and Pumping System Assessment Tool Training

In the summer of 2002, the Initiative team assumed responsibility for marketing and implementing training for *Compressed Air Challenge* (CAC) and workshops for the *Pumping System Assessment Tool* (PSAT) software. Between October 2002 and June 2003, the Initiative team held five *Level 1* CAC workshops and one *Level 2* CAC workshop. The *Level 1* workshops had a total of 102 attendees, who represented 54 different companies and organizations. The *Level 2* workshop had 24 attendees.

The *Pumping System Assessment Tool* (PSAT) is a software program for assessing energy savings opportunities in pumping systems. The Initiative team implemented three PSAT workshops in January 2003, attended by 143 individuals who represented 73 companies.

Collaboration Between MDM and EMM

The *Electric Motor Management Program* (EMM) and the *Motor Decisions Matter Campaign* (MDM) being implemented by the Consortium for Energy Efficiency (CEE) have benefited from active collaboration. MDM is using six of the EMM success stories on their web site. EMM staff attended the MDM meeting in Chicago in March 2003 and the CEE meeting in Portland, Oregon, in July 2003. EMM and MDM had adjoining booths at the EASA national convention in June 2003.

The *Drive Power* evaluation team has assessed awareness of MDM among industrial end-users. These results are reported below.

D. Market Transformation Effects

The following section focuses on changes in motor management practices among motor end-users who have attended the seminars and/or worked with the field consultants. The Initiative is clearly playing a role in motivating end-users to improve their motor management practices.

The market transformation effects described below are positive indicators that changes *are occurring* in the market, both among end-users and among motor service centers. While market effects are clearly related to market transformation, it not possible yet to draw conclusions about whether market transformation *has occurred*. This will involve a longer-term assessment of market penetration, spillover to other end-users and market actors, and sustainability of market change.

One-on-One End-User Work

Success Stories

Table ES-1, below, summarizes the potential of motor users to make substantial and lasting changes to their motor management practice. These assessments were done by the field consultants for 177 of the 194 motor users with whom they have worked directly. The assessments are based on the field consultants' overall sense of these end-users' level of interest in and ability to make motor management changes.

Table ES-1: Potential for Motor Management Practice Changes

N = 177	NONE	WEAK	FAIR TO GOOD	EXCEL-LENT	FORMAL SUCCESS STORY
POTENTIAL FOR PRACTICE CHANGE	31 (18%)	49 (28%)	57 (32%)	27 (15%)	13 (7%) (9 finalized; 2 more finalized but have since closed; 1 on hold; 1 in draft)

The success stories vary in level of reported savings and marketability with only five reporting substantial savings. Eight of the success stories are available on the Initiative's web site[3]. The stories have not been updated with current information and no new formal success stories have been prepared since May 2002. However, there are eight story prospects, and three additional "mini" success stories have been prepared.

Participants and Nonparticipants Compared

Internet surveys were conducted of 34 participants and 39 non-participants. Participants were motor users working with field consultants. Nonparticipants were motor users who had not worked with the field consultants (although about 10% said they had attended a seminar).

The four most important electric motor management practices promoted by the Initiative are:

- Using operating costs for motor management,
- Specification of premium efficiency motors,
- Using a written guideline for motor repair/replace decisions, and
- Implementing a computerized motor database.

For all of these practices, participants are more than twice as likely as nonparticipants to have adopted the approach, and attribution to the

[3] www.drivesandmotors.com.

Initiative by participants is also high – ranging from 40% to 60%, depending upon the practice.

Some additional highlights include:

- In terms of decision-making drivers for repair/replace decisions, operating costs are "always" or "usually" a factor 60% of the time for participants versus 41% of the time for nonparticipants, a substantial difference.

- Fifty-four percent of participants said they were using the *EM2* software.

- Nine percent of participants and 3% of nonparticipants have made recent changes to their practices that have achieved energy savings.

- Nonparticipants ranked seminars and field consultants as a source of guidance for motor management at 8% and 0% respectively, while participants ranked the same at 26% and 29%.

- More than half (54%) of participants rated the influence of the *Electric Motor Management* field consultant and the seminar as "influential" or "very influential" for the improvements that the end-user has made (or is currently making).

It was also noted that even though fewer nonparticipants than participants have over 100 motors, there were no meaningful differences between the responses of those nonparticipants with more than 100 motors and the responses of those nonparticipants with less than 100 motors.

Motor Management Practice Change from the Seminars

The *Electric Motor Management* seminars are also having a substantial impact on the motor management practices of end-users. Research conducted for the two previous MPERs indicated that between 79% and 88% of attendees had made at least one practice change as a result of the seminar. For individual tools or practices, between 15% and 38% of users said they have "changed or increased" their use of or "started" using specific tools or practices. The highest percentage, at 38%, was for operating costs, a key seminar concept. A substantial number of

respondents also said they were "going to start" using the tools and practices.

Motor Service Centers

From January to April 2003, nine in-person and seven phone interviews were conducted with motor service centers. These included eleven participants in the *MotorTracker* program and five nonparticipants. All had received at least one field consultant visit.

A key finding was that MSCs participating in *MotorTracker* are using the practices being promoted by the *Drive Power Initiative* much more than non-participating shops and a substantial number of participants have attributed this to the Initiative. These practices are: use of motor operating costs, recommendation of premium efficiency motors, and offering motor database services. These results are shown below in *Table ES-2*. (Note that by definition each of the *MotorTracker* shops is offering database services in some fashion.)

Table ES-2: Initiative Attribution of Promoted Practices

HOW OFTEN	MOTOR OPERATING COSTS	RECOMMEND PREMIUM MOTORS	OFFERING MOTORS DATABASE
MOTORTRACKER PARTICIPANTS USING PRACTICE	82%	91%	100%
MOTORTRACKER PARTICIPANTS ATTRIBUTING PRACTICE USE TO INITIATIVE	55%	18%	45%
NONPARTICIPANTS USING PRACTICE	20%	80%	10%

Another key finding was that when results from MSC interviews conducted in 2001 are compared with those performed in 2003; the average percentage of repairs that involve rewinds has decreased by about half (from 46% to 25%). We believe that this indicates an overall trend to replace failed motors in poor condition instead of repairing them, and is likely also the result of higher thresholds for motor replacement.

Each of the MSCs participating in *MotorTracker* is offering motor database services as they see fit – from awareness only and being able to respond if customers specifically ask (but not actively seeking customers for new services) to full-tilt promotion of *MotorTracker* to every customer.

Two of the *MotorTracker* shops are developing motor databases for customers and retaining the databases in the shop; five shops are simply handing out the *EM2* software to their customers; and another three are going to maintain the database at both the shop and customer's facility. The remaining shop does not appear to have a specific approach in mind.

There are indications that the Initiative was directly or indirectly influential in the decisions of several motor repair shops to buy a core loss tester, a critical tool for assessing a motor that is undergoing repair. In 2001, a survey of shops indicated that only two out of three had a core loss tester. Since that time, at least two additional shops have acquired the tool and another three are making decisions to buy one before the end of 2003.

In addition to practice change of end-users and motor shops, there is also a Northwest utility that is in the initial phase of promoting the use of a motor inventory for their industrial customers.

Compressed Air Challenge

A number of follow-up surveys of *Compressed Air Challenge* participants have been conducted using various methods. Some of the key findings are:

- There is a high rate of post-training activity. Seventy-five to 80% of end-users in three surveys (phone, mail, and Internet) say they have made or are making practice improvements. (Similar to the national CAC survey results.)

- In the Internet survey conducted in early 2002, 43% of respondents said they had saved compressed air energy and dollars as a result of the CAC training they attended. The national CAC study indicates that attendees save on average

149,000 kWh (0.017 aMW) per year, or roughly 7.5% of pre-project compressed air system energy.[4]

- Participants are changing the way they look at compressed air operating costs. Sixty-four percent of respondents to the 2002 Internet survey reported that they are either changing the way they look at operating costs or were planning to use operating costs for evaluations in the future.

- Half of respondents said they had achieved one or more non-energy benefits.

Pumping System Assessment Tool (PSAT)

An Internet follow-up survey was conducted of PSAT workshop participants in the late spring of 2003, four months after attendance. There were a total of 44 respondents to the survey. Some of the key findings are:

- Sixty-seven percent of respondents have done at least one activity related to practice improvement since the workshop.

- Forty-four percent of respondents said they had installed the PSAT software. Twelve percent said they had used the software since the workshop and 31% said they were going to use it. Another 7% said they had been using the PSAT software (or a tool like it) for some time.

- None of the respondents volunteered a particular dollar or percent energy cost savings, but this may be because pump system projects can take some time to identify and complete.

Motor Decisions Matter

The evaluation team for *Drive Power* is also assessing awareness of the *Motor Decisions Matter* (MDM) campaign in the Pacific Northwest.

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[4] This survey was conducted in early 2001 by Xenergy. The final report is not yet available. As a point of reference, compressed air system efficiency experts find that for the typical compressed air system, 30% of system energy savings can be saved through cost-effective measures.

- Forty-four percent of the sixteen motor service centers interviewed said they had heard of MDM; 6% said they actually knew something about it.

- Nine percent of the 35 *Drive Power* participants who responded to the Internet survey said they had heard of MDM; 3% said they actually knew something about it.

- Three percent of the 39 Initiative nonparticipants who responded to the Internet survey said they had heard about MDM.

E. Drive Power Cost-Effectiveness Review Status

The evaluators reviewed the cost-effectiveness assumptions in 2001. The results of that review are included in the *Drive Power* MPER #3. A number of recommendations were made such as bringing the measures included in the Alliance's cost-effectiveness model more closely in line with the evolving activities, market changes, and approach of the Initiative.

In 2002-03, because the Drive Power customer database has been under development, Initiative tracking was suspended. Therefore, the evaluators have not conducted any further review of the Alliance's assumptions. It is anticipated that the database will be completed in 2004.

F. Key Recommendations

Summary of Progress

The *Drive Power Initiative* has made substantial progress, and end-users are making concrete improvements to their motor management practices. Highlights of program accomplishment include:

- Field consultants have met with 194 motor users and distributed about 600 copies of the *EM2* motor management database software. Thirteen motor management success stories have been developed. Field consultants believe that another 27 (15%) of the end-users they have met with have excellent potential to make practice changes, and another 57 (32%) have fair-to-good potential.

- Recent Internet surveys of participants and nonparticipants in the EMM program clearly show that the program is impacting participants' motor management practices.

- Based on follow-up surveys of seminar attendees, 15 to 28% of seminar attendees say they changed their use of, or started using various tools or practices discussed in the seminars. Another 30% to 38% say they are *going* to use the seminar tools or practices.

- Field consultants have met with 41 motor service centers. *MotorTracker* is being piloted with eleven shops.

A number of recommendations were made in MPER #4, published at the end of 2002. Below are two discussions. The first describes those recommendations from MPER #4 to which the Initiative team has responded. The second describes recommendations for the current MPER #5.

MPER #4 Recommendations Responded To by the Drive Power Team

Recommendation: Create a Specific Work Plan

As of the publication of this report, a work plan was being drafted for activities through 2004.

Recommendation: Improve Program Tracking

The Initiative team is now nearing completion of a database for motor users that have met one-on-one with the field consultants. Additional program tracking recommendations are provided below.

Recommendation: Provide Funding After 2003

A request to the Board is being prepared for funding through 2004.

Additional Recommendations for MPER #5

The recommendations below are listed in approximate order of their importance according to the evaluators. Note that the recommendations in the body of the report contain considerably more detail, and there are five additional recommendations there that are not included in the *Executive Summary*.

Recommendation: Take the Most Motivated End-Users and MSCs to the Next Level

It is recommended that the *Drive Power* team identify *specific motor users* they plan to continue to work with, and why, and create a brief plan for each. Motor service centers can also be taken to the next level to strengthen the market infrastructure.

Recommendation: Update Existing Success Stories and Develop New Ones

The existing success stories need to be updated and additional ones prepared, including one focusing on a motor service center success in expanding their services and/or improving their repair practices.

Recommendation: Develop a Long-Term Plan for CAC, PSAT, and the EMM Seminars

To maximize the effectiveness of training as a market transformation tool, the evaluation team recommends the following: conduct more targeted marketing based on analysis of market penetration to date; have a written plan for early personal marketing of EMM by field consultants, vendors, and utilities; have a specific plan for coordinating *Level 1* and *2* seminars as well as *AirMaster+*; arrange for the EMM seminar to qualify as continuing education for electricians and engineers; and consider developing an on-line version of the seminar.

Recommendation: Develop an Advanced Seminar

The evaluators recommend that the *Drive Power* team develop an advanced half-day seminar for end-users and motor service centers that

covers the following topics: tips for mining a motor management database to maximize plant reliability and energy savings over time; the benefits of a motor database for systems applications; and an introduction to simple motor systems concepts. This seminar would still primarily target plant-level staff.

Recommendation: Take a More Incremental Approach to Motor Systems Work Over the Coming Year

One recommendation is an introduction to simple motor systems in a more advanced seminar as mentioned above. It is also recommended that PSAT attendees be "mined" to reveal where opportunities are for motor systems work, and that the Alliance focus on smaller projects and case studies involving relatively simple system changes.

Recommendation: Expand the Database and Make Data Collection Consistent

It is recommended that the *Drive Power Access* database of EMM participants be expanded to include attendees of the EMM seminars and CAC and PSAT training, *EM2* software users, and recipients of the *Windings* newsletter. In addition, the trip report form should be consistent with the data points in the database, and collection and entry of data on seminar participants and recipients of *EM2* need to be more systematic.

Recommendation: Involve Field Consultants in Initiative Planning

Because of their value to the Alliance's market transformation efforts in motor management and motor systems, and their relationships with end-users and motor shops, it is recommended that the field consultants be involved more directly and frequently in Initiative planning. Involving the field consultants should include making sure that they have a clear vision of how their work in the field drives market transformation.

Recommendation: Leverage EM2 Users' Motor Fleet Data

Obtain copies of *EM2* users' motor databases to analyze and evaluate them for potential recommendations to the customer and reveal potential case studies for fan or pump systems improvements.

Recommendation: Revise and Regularly Update the Electric Motor Management Web Site

In particular, the calendar of events is often out of date for long periods of time. Other recommendations are detailed in a separate memorandum.

Introduction

The Northwest Energy Efficiency Alliance (the Alliance) is a non-profit group of electric utilities, state governments, public interest groups, and industry representatives committed to bringing affordable, energy-efficient products and services to the marketplace. The *Drive Power Initiative* (the Initiative) is a market transformation effort funded by the Alliance and administered by the Electric League of the Pacific Northwest (the League). The League began work on the Initiative in January 1999. Funding was approved at the October 2003 Alliance Board meeting for continuation of the contract through December 31, 2004. Pacific Energy Associates, Inc. (PEA) was the evaluation contractor for the Initiative through April 2001. The contract was then transferred to Currents Consulting, under the management of Jennifer Stout in May 2001.

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The Initiative's primary objectives are to:

1. Increase the overall efficiency of the motor fleet and motor systems in the region.

2. Influence end-users' repair/replace decision making for motors such that they plan ahead and consider operating costs in their decisions.

3. Help motor service centers improve their repair practices and expand their motor management services.

4. Market and deliver the regional training for *Compressed Air Challenge* (CAC) and the *Pumping System Assessment Tool* (PSAT).

B. Drive Power Initiative Staffing, Tools and Methods

Staffing

Field Consultants: There are four field consultants, each covering a distinct region (Oregon, Western Washington, Eastern Washington, and Idaho/Montana). Their responsibilities include the following:

- Work one-on-one with end-users to improve their motor management practices and facilitate better communication with their motor service centers;
- Work one-on-one with motor service centers on technical and business development;
- Help market, coordinate, and teach motor management seminars; and
- Design program tools and materials such as the *EM2* software and seminar hand-outs.

Other Program Personnel: Six other part-time staff handle a broad array of tasks – strategic direction, program marketing and educational materials, and day-to-day implementation and administration.

Tools

Toolkit: A toolkit includes information on the EMM program services, motor management tools (e.g., charts on horsepower thresholds for motor repair/replace decisions), the sample repair specification, and technical background information.

Database Software**:** The Initiative has developed motor database software called *EM2* that allows better management of in-service motors and spares through good record-keeping on motor size, type, and application, as well as operating conditions and hours. *EM2* helps users make case-by-case repair/replace decisions that consider operating costs. It is designed to be simpler and easier to use than the similar software *MotorMaster+*. *EM2* compatibility with a *PalmPilot™* allows for direct electronic data entry on the plant floor and synchronizes with the main database. It is currently

provided at no charge and field consultants are available to help with installation and training.

Marketing Package for Motor Service Centers (MSCs): *MotorTracker* is a marketing package designed to help MSCs expand their service offerings, particularly for motor management database services. It consists of promotional brochures and a poster that can be displayed in the participating shop, and motor tags that describe motor operating costs – both annually and lifetime. The shop also receives copies of the *EM2* motor management database software. To participate, the shop must agree that it will calculate the operating cost of each motor serviced, put the operating costs on the *MotorTracker* tag, and affix the tag to the motor.

Methods

To meet the program objectives, the Initiative uses the following methods:

- Implementing a broad end-user education program including motor management seminars, a newsletter, a toolkit, motor database software (*EM2*), and a web site.
- Deploying four field consultants to work one-on-one with motor end-users and to develop success stories for publication.
- Leveraging program success stories and information through dissemination in various media.
- Executing a pilot demonstration of motor system optimization.
- Working with motor service centers on improving repair methods, integrating motor operating costs into repair/replace decisions, and expanding motor management services through *MotorTracker* and related support mechanisms.
- Working cooperatively with other entities such as trade associations, utilities, state and federal offices of energy, and organizations such as the Consortium for Energy Efficiency (CEE) to combine efforts and work together wherever possible.
- Marketing and implementing training for CAC and PSAT.

C. MPER #5 – Scope and Purpose of This Report

This fifth MPER builds on the first four evaluation reports. Its purposes are to:

1. **Document "Progressive Indicators" of EMM Program Progress**: motor users and shops make practice changes; shops improve repair practices and expand services; motor users plan ahead for and use operating costs in motor decisions; and motor users save energy.

2. **Document "Progressive Indicators" of the Impact on Practices of the CAC and PSAT Trainings**: compressed air and pumping system end-users make practice changes.

3. **Assess Motor User and Shop Awareness of Motor Decisions Matter in the Pacific Northwest**.

4. **Make Program Recommendations** to improve future Initiative strategy, effectiveness, and activities.

To complete MPER #5, the evaluators conducted the following activities:

- Internet surveys of 35 EMM participants and 39 non-participants. (Participants are defined as those motor users working with field consultants; nonparticipants are defined as motor users who have had no contact with the EMM program.)

- Nine in-person and seven phone interviews with motor service centers in early 2003.

- A follow-up Internet survey of 44 PSAT workshop participants in late spring 2003, four months after attendance.

- A follow-up Internet survey of 14 compressed air end-users from one of three Level 1 Compressed Air Challenge classes that took place in fall 2002, about four months after attendance.

- Review of field consultant trip reports from end-user and shop visits conducted June 2002 through June 2003.

- Communications with Alliance staff, Initiative staff, and field consultants.

II. Initiative Progress

A. Introduction

In the *Executive Summary*, the Initiative's activities, accomplishments, and market effects were summarized. The reader should refer to the *Executive Summary* for an overview.

This section describes the Initiative's activities and progress in detail, weaving in relevant data on market effects as well as recommendations. The areas discussed are:

- One-on-one work with motor users and resulting success stories
- Work with motor service centers (MSCs)
- *Electric Motor Management* (EMM) seminars
- Work with EASA
- Attendance at other events
- Motor management toolkit
- *EM2* motor management database software
- Motor systems pilot
- *Compressed Air Challenge* (CAC) training and *Pumping System Assessment Tool* (PSAT) workshops
- Collaboration between MDM and EMM

The section ends with *Table 9* that summarizes Initiative activities, market effects, and recommendations.

B. Detailed Description of Initiative Activities

One-on-One End-User Work and Success Stories

A primary approach of the Initiative is to have field consultants provide one-on-one technical support to motor users in the region. Resulting "success stories" are publicized through trade publications, news and advertising media, presentations, and program materials so as to influence the practices of other motor users and service centers.

Through May 2002, the field consultants met with 151 motor users. Through June 2003, they had met with another 43, bringing the total number to 194. The subsections below cover the following topics related to this one-on-one work:

- Number, types, and geographic distribution of motor users
- Documentation of site visits
- Potential for motor management practice change among these motor users
- Success stories
- Summary of participant and nonparticipant Internet survey results.

Number, Types, and Geographic Distribution of Motor Users Contacted

As shown in *Tables 1* and *2,* below, the 194 motor users who have been contacted by the field consultants represent a diversity of industries and geographic locations (each field consultant covers a portion of the Northwest).

Table 1: Motor Users by Industry

INDUSTRY TYPE	NUMBER OF USERS	PERCENT OF TOTAL
PULP AND PAPER	9	5%
WOOD PRODUCTS	43	22%
PETROLEUM	3	2%
FOOD PROCESSING	34	18%
WATER/WASTEWATER/IRRIGATION	21	11%
MINING/MINERALS	6	3%
PRIMARY METALS	15	8%
CHEMICALS	7	4%
AEROSPACE	2	1%
OTHER INDUSTRY	25	13%
INSTITUTIONAL & COMMERCIAL	2	2%
TOTAL	194	100%

Table 2: Motor Users by Geographic Region

GEOGRAPHIC REGION	NUMBER OF USERS	PERCENT OF TOTAL
EASTERN WASHINGTON	61	31%
WESTERN WASHINGTON	51	26%
OREGON	50	26%
IDAHO	25	13%
WESTERN MONTANA	4	2%
NEVADA[5]	3	2%
TOTAL	194	100%

[5] These site visits took place early in the program at the specific request of PacifiCorp.

Documentation of Work with End-Users

In MPER #4 it was noted that the Initiative staff was compiling a *Microsoft Access* database of Initiative activities with the expectation that that work be completed by Fall 2002. The database is finally near completion, but several issues need to be addressed.

- *Access Database:* The *Drive Power Access* database currently includes only end-users with which the field consultants have worked one-on-one. It would be helpful to include attendees of the EMM seminars, CAC and PSAT trainings, *EM2* software users, and recipients of the *Windings* newsletter. This would allow for analysis and understanding of how each customer has been involved.

- *Trip Report Forms:* At the moment, there are two, or perhaps more, versions of a trip report form circulating among the field consultants. There needs to be one form for end-users and perhaps another for MSCs. The end-user form needs to include the same data points contained in the database. *Drive Power* should consider installing the forms on a *PalmPilot*™ for use in the field.

- *Seminar Registration:* Currently the recording of seminar registrants and attendees is done a variety of forms, some quite informal. As a result, data collection and entry has been inconsistent, with key data points (such as number of motors and email address) sometimes omitted. For each seminar, data should be entered electronically, with registration using the same *Excel* format each time. The *Excel* column heading names should exactly match the data fields in *Access* so uploading of data is easy. The registrar should send the registration list to the seminar organizer for sign-in and then the organizer should return it for final data corrections and additions.

- *EM2 Data Collection:* Similarly to that noted above, data collection for users of *EM2* needs to be made consistent.

- The *Windings* mailing list should be culled of those no longer interested, updated with new users, and integrated with the overall database.

Potential for Motor Management Practice Change

Table 3 below summarizes the potential of motor users to make substantial and lasting changes to their motor management practices based on assessments done by the field consultants for 177 of the 194 motor users with whom they have worked directly. The assessments are based on the field consultants' overall sense from working directly with staff at facilities, usually at the plant level, of their level of interest in and ability to make motor management changes. Factors may include verbal commitments to making changes, staff's reports of management support and/or direct management involvement, commitment of staff time to training or database development, and initial steps towards change such as installing the EM2 software and beginning data collection.

As shown in the table, thirteen have resulted in formal success stories of lasting change to motor management practices (see *Market Transformation Effects* below for more detail). Another 27 have excellent potential to make change, and 57 have fair-to-good potential.

Table 3: **Potential for Motor Management Practice Changes**

N = 177	NONE	WEAK	FAIR TO GOOD	EXCEL-LENT	FORMAL SUCCESS STORY
POTENTIAL FOR PRACTICE CHANGE	31 (18%)	49 (28%)	57 (32%)	27 (15%)	13 (9%) (9 finalized; 2 more finalized but have since closed; 1 on hold; 2 in draft)

Success Stories

The following is a brief summary of the status of the thirteen success stories developed through June 2003:

- Five stories describe substantial practice change and substantial quantified savings.
- Four are good stories but report only modest savings.

- One does not report any savings and is currently on hold because of compatibility issues between the client's software and *EM2*.

- Two plants that were the subject of stories have since shut down.

- One story is still in draft form and is expected to be completed by the end of 2003.

Table 4 describes the nine success stories that are complete and available for marketing. The stories summarized below are available electronically at *www.drivesandmotors.com* (except that for Atlas Foundry).

The nine stories described have not been updated and no new formal success stories have been prepared. However, there are eight prospects and three additional "mini" success stories have been prepared. Based on the evaluators' conversations with field consultants and results of participant surveys, there are many more successes that simply have not been documented.

We recommend that the *Drive Power* team update the stories to document further successes and savings, develop more formal stories, and document more "mini" stories. Non-energy benefits should also be identified and quantified where possible. End-users clearly intend to continue to improve their motor management practices, so savings should continue to grow over time. The team should consider providing an estimate of *potential* energy savings from eventual replacement of a plant's largest motors with energy efficient ones. While this should be done carefully, with all the necessary caveats, it could give the reader a better sense of the magnitude of potential savings over time.

Table 4: End-User Success Stories

FIRM NAME	TYPE	ACTION TAKEN	ENERGY AND NON-ENERGY BENEFITS
WOODGRAIN MILLWORK	Wood Products	Evaluated motor operational costs and found savings opportunities. Set up 500-motor database. Using the Initiative's *Electric Motor Management* (EMM) software and *PalmPilot™*.	Replacing a 250 HP motor with an energy-efficient motor at failure resulted in a net $600 annual savings. Company expects to identify other savings opportunities.
ASH GROVE CEMENT AND RIVERSIDE ELECTRIC	Cement and Lime Manufacturing	Integrated motor operating costs into R/R decisions and adopted EMM repair spec. Riverside Electric purchased core loss tester for pre- and post-repair testing per EMM spec.	Replaced 700 HP motor with damaged core; annual energy savings of $5,000 and avoidance of downtime that can cost $6,000 per hour. Riverside sees core loss tester and other diagnostic equipment as key to business growth.
CROWN PACIFIC LUMBER	Wood Products	Used *EM2* with *PalmPilot™* to inventory 450 motors. Using operating costs in decisions. Purchased logger to size motors.	Replaced compressed air system; motor saving $3,400 per year. With SAV-AIR's help, reduced compressors from two to one.
KENNEWICK WASTEWATER TREATMENT PLANT	Wastewater Treatment	Adopted EMM spec and found motor shop that could comply. Used *MM+* to inventory 95 motors; completed census of total motor population.	Estimated annual energy savings of $4,500 from quality repair work on eight motors between 40 and 150 HP.
ELLENSBURG WASTEWATER TREATMENT PLANT	Wastewater Treatment	Used *MM+* to inventory 80 motors (range of ½ to 100 HP). Used *MM+* to decide to replace rather than rewind at least one 50 HP motor.	Replacement of existing 50 HP saved an estimated $110 per year with immediate payback.
ATLAS FOUNDRY AND CENTER ELECTRIC	Manufacturer of Steel Cast Parts	Used *EM2* to create database of 80 largest motors. Plans to add 70 more.	Motor database services will be one of several new services for Center Electric. Analysis recently led to reduction from two to one compressor.

Continued

FIRM NAME	TYPE	ACTION TAKEN	ENERGY AND NON-ENERGY BENEFITS
BOEING, KENT, WA PLANT	Aerospace	Used *EM2* to create 200-motor database in its Kent plant, a 63 motor database in its Developmental Center plant in Seattle, and a database of 50 spares at its Renton plant. In-house training for 25 Boeing engineering and maintenance staff.	Used *EM2* software to analyze motor operating costs for repair/replace decisions. *Example:* $300 savings per year on replacement of 75 HP oversized motor with premium efficiency motor.
PLUM CREEK TIMBER COMPANY	Wood Products	Used *EM2* to create 750-motor inventory. Using EMM spec to help ensure motor efficiency retention by their repair shops.	Eliminated two processes saving over $70,000 annually. Used *EM2* to determine processing costs per log.
ALDER CREEK LUMBER	Wood products	Used *EM2* to create full motor inventory of 175 motors. New policy in place to buy premium motors. Downsizing motors based on load profile analysis using a current logger.	The first 200 HP motor replaced will save over $8,300 annually, giving a payback of less than 12 months. Reduction in energy peaks and manufacturing downtime resulting in increased product volume. Improved storage procedures and increased inventory control.

Summary of Participant and Nonparticipant Internet Survey Results

Internet surveys were conducted of 35 EMM participants and 39 nonparticipants. Participants were defined as those motor users working with field consultants. Nonparticipants were defined as motor users who have had no contact with the EMM program. Below is a summary of the results. More detailed results are presented in *Section 3*.

Table 5, below, clearly shows that the program is having an impact on participants. Particularly striking are the comparisons between the percentage of participants and nonparticipants saying they have no plans to use, or are not sure if they are going to use a practice.

Analysis also revealed that while 94% of participants said they use or are going to use "premium efficiency" motors, only 71% indicated they were aware of "NEMA Premium motors" (54% said they knew something about them and 17% said they had heard of them). We recommend below that more discussion of premium motors in general, and of "NEMA Premium" in particular, be included in the field consultants' work with customers and in the EMM seminars.

Table 5: Potential for Motor Management Practice Changes

MOTOR MANAGEMENT PRACTICE	USE OR PLAN TO USE		NO PLANS TO USE OR UNSURE IF WILL USE	
	PARTICIPANT	NONPARTICIPANT	PARTICIPANT	NONPARTICIPANT
OPERATING COSTS FOR MANAGEMENT DECISIONS	85% (60%)	36%	12%	62%
PREMIUM EFFICIENCY MOTORS	94% (40%)	61%	6%	34%
USE OF WRITTEN REPAIR/ REPLACE GUIDELINES	80% (51%)	26%	20%	67%
USE OF COMPUTERIZED MOTOR DATABASE	69% (54%)	31%	31%	62%
PLAN FOR CRITICAL MOTORS AT FAILURE	82% (37%)	69%	18%	26%
INTERACTION WITH REPAIR SHOP REGARDING SPEC	75% (46%)	54%	17%	33%

Work with Motor Service Centers

Through May 2002, field consultants had met with 36 MSCs. Since then, they have met with another five shops for a total of 41, or about 37% of the 112 shops region-wide. In terms of the number of motor repairs, these 41 shops represent about 60% of the Northwest market. Through June 2003, 30 shops, or 27% of shops region-wide have attended one of the *Electric Motor Management* seminars. In terms of numbers of repairs, attending shops represent about 40% of the regional total.

In May 2002, *MotorTracker* was initiated on a pilot basis with ten MSCs (and one additional shop has moved forward on their own without direct assistance from the EMM program). *MotorTracker* is a marketing package designed to help MSCs expand their service offerings, particularly motor management database services. It includes a marketing poster and brochures, and training and support for the *EM2* database software. In terms of number of motor repairs, the eleven *Motor Tracker* shops represent about 25% of the Northwest market.

From January to April 2003, nine in-person and seven phone interviews were conducted with motor service centers. These included eleven participants in the *MotorTracker* program and five nonparticipants. All had received at least one field consultant visit. Below is a summary of the results. More detailed results are presented in *Section 4*.

One key finding was that MSCs participating in *MotorTracker* are using the practices being promoted by the *Drive Power Initiative* much more than non-participating shops and a substantial number of participants attribute their motor management improvements to the Initiative. These practices are: use of motor operating costs, recommendation of premium efficiency motors, and offering motor database services. These results are shown below in *Table 6*. (Note that by definition, each of the *MotorTracker* shops is offering database services in some fashion.)

Table 6: Initiative Attribution of Promoted Practices

HOW OFTEN	MOTOR OPERATING COSTS	RECOMMEND PREMIUM MOTORS	OFFERING MOTORS DATABASE
MOTORTRACKER PARTICIPANTS USING PRACTICE	82%	91%	100%
MOTORTRACKER PARTICIPANTS ATTRIBUTING PRACTICE USE TO INITIATIVE	55%	18%	45%
NONPARTICIPANTS USING PRACTICE	20%	80%	10%

Another key finding was that when results from MSC interviews conducted in 2001 are compared with those from 2003, the average percent of repairs that involve rewinds has decreased from 46% to 25%. We believe that this indicates an overall trend to replace failed motors in

poor condition instead of repairing them and is also likely the result of higher thresholds for motor replacement.

Each *MotorTracker* "participant" is offering motor database services as they see fit; there is no consistent approach as it is up to individual shops to decide. Overall, for the eleven participants there is a full range of services – from awareness only and being able to respond if customers specifically ask (but not actively seeking customers for new services) to full-tilt promotion to every shop customer.

Two of the *MotorTracker* shops are developing motor databases for customers and retaining the databases in the shop, five shops are handing out the *EM2* software and letting their customers develop and keep the database (with no data for the MSC), and another three are going to maintain the database at both the shop and the customer's facility. The remaining shop is in response mode only and they do not appear to have a specific approach in mind.

There are also indications that the Initiative was directly or indirectly influential in the decisions of several motor repair shops to buy a core loss tester, a critical tool for assessing a motor that is undergoing repair. In 2001, a survey of shops indicated that only two out of three had the tool. Since that time, at least two additional shops have acquired a core loss tester, and another three are making decisions to buy before the end of 2003.

Motor Management Seminars

This section covers the following:

- Number of seminars and attendees and the locations
- Market penetration of EMM seminars
- Recap of seminar observations and survey results from MPER #4

Number of Seminars and Attendees

In early 2001, the Initiative team made substantial improvements to the seminars. *Table 7* shows the distribution by industry of the attendees.

Table 7: Seminar Attendees by Company Type

COMPANY TYPE	NUMBER	PERCENT
WATER/WASTEWATER	70	16%
OTHER INDUSTRIAL	47	11%
FOOD PROCESSING	36	8%
WOOD PRODUCTS	31	7%
IRRIGATION	20	4%
AGRICULTURE	13	3%
CHEMICALS	9	2%
PULP & PAPER	9	2%
MINING/MINERALS	6	1%
HIGH TECH	5	1%
PRIMARY METALS	4	1%
PETROLEUM	2	<1%
AEROSPACE	1	<1%
CONCRETE AND AGGREGATE	1	<1%
TOTAL INDUSTRIAL	254	57%
INSTITUTIONAL/AGENCY	31	6%
SCHOOL OR COLLEGE	31	7%
ELECTRIC UTILITY	31	7%
MOTOR SERVICE CENTER/REPAIR SHOP	30	7%
CONSULTING/ENGINEERING/RESEARCH FIRM	25	6%
COMMERCIAL BUILDING	17	4%
MOTOR MANUFACTURER/DISTRIBUTOR/SALES	9	2%
HOSPITAL/HEALTH CARE	8	2%
UNCATEGORIZED	6	1%
ELECTRICAL CONTRACTOR/OTHER EQUIPMENT SERVICES	4	1%
TOTAL NON-INDUSTRIAL	192	43%
TOTAL	**446**	**100%**

The original seminar (referred to here as *Version I*) was presented fifteen times through the end of 2000. The improved seminar (*Version II*) has been offered 38 times through June 2003.

Attendance lists were available for 44 of the 53 seminars. They show 896 individuals attending, representing 446 organizations, of which 76% were company facilities that use motors (some were different plant locations for the same company, but were counted as individuals). Among the attending motor users, 57% (254) were industrial (including water/wastewater and agriculture).

Based on analysis of exit surveys from the 53 seminars conducted through June 2003, attending motor users represented about 135,000 motors, or 28% of the Northwest fleet total (based on number of motors, not horsepower).

Table 8 shows a different breakdown – by motor users, motor shops, and other organization types.

Table 8: Seminar Attendees by Motor Use

COMPANY TYPE	NUMBER	PERCENT
MOTOR USERS	339	76%
MOTOR SHOPS	30	7%
OTHER ORGANIZATION TYPES*	77	17%
TOTAL	446	100%

* The majority of *Other Organizations* is comprised of utilities, consultants, motor service centers and motor distributors.

Motor Management Practice Change from the Seminars

The EMM seminars are also having a substantial impact on the motor management practices of end-users. Research conducted for the two previous MPERs indicated that between 79% and 88% of attendees had made at least one practice change as a result of the seminar. For individual tools or practices, between 15% and 38% of users said they have *changed or increased* their use of, or *started* using specific tools or practices. The

highest percentage (38%) was for operating costs, a key seminar concept. A substantial number of respondents also said they were *going to start* using the tools and practices. For more details on these results, see MPER #4.

In addition to practice change of end-users, there is also a Northwest utility that is in the initial phase of promoting the use of a motor inventory for their industrial customers. They are doing this for two reasons – because industry should have an inventory for their own use and because an inventory provides useful information to the utility for analyzing process improvements and for assessing whether a motor replacement could qualify for an incentive.

Work with EASA

EMM staff also continue to work actively and effectively with the Electrical Apparatus Service Association (EASA), both regionally in the Mountain and Oregon Chapters and nationally. Below are highlights.

Dennis Bowns, the field consultant for Idaho and Montana, is a voting member of both the EASA Mountain Empire and Pacific Northwest Chapters, and is editor of the EASA Mountain Empire newsletter. He recently established a web site for both EASA chapters *(www.easamountainempire.org*). His involvement is very important to the growing collaboration between EASA and EMM.

Mr. Bowns also represented EMM at the following recent EASA events (he and other field consultants have also done this at a number of other EASA events):

- *Mountain Region Meeting* – March 27-28, 2003, Montana (presentation and booth)
- *Pacific Northwest Region Meeting* – April 11-12, 2003, Oregon (presentation and booth with Jim Williams)
- *National Convention* – June 29 through July 1, 2003, California (exhibit, breakfast reception for Pacific Northwest members, EASA representatives, and *Motor Decisions Matter* on June 30).

Attendance at Other Events

Since January 2003, Initiative staff have attended the *Northwest Food Processors Association Annual Conference* (program exhibit with *EM2* demonstration) and the *Northwest Plant Engineering & Maintenance Show and Conference* (presentation and booth).

In the fall of 2003 Initiative staff attended the *Washington Plant Engineering & Maintenance Show and Conference* in Seattle (with a presentation and booth) and held a technical workshop for the Oregon Cement & Aggregate Producers Association and the Washington Aggregate & Concrete Association.

Motor Management Toolkit

The toolkit has been significantly improved over time: the kit has been streamlined; the marketing brochure has been upgraded; copies of the success stories are now included, and the *EM2* software was created and a second upgrade has been completed.

Two new and useful elements were added to the Toolkit:

- A quick reference table of motor operating costs for various motor sizes and efficiencies.
- For motor repair shops, posters of *Good Motor Repair DOs and DON'Ts* were developed and have been distributed.

EM2 Motor Management Database Software

Through June 2003, a total of 618 copies of the *EM2* motor management database software had been distributed to 571 people, representing 401 companies and organizations. Among those 401, 281 are facilities that use motors, 38 are repair shops, 34 are consulting/engineering firms, 11 are motor manufacturers/distributors, 24 are utilities, and the remaining 13 are uncategorized users. (Some of the motor-using facilities were different plant locations for the same company, but were counted individually.)

In June 2003 the *EM2* software had been upgraded to *Version 3.0* by Dennis Bowns, the creator of the original software. The upgrade includes a new tutorial and a written user's manual.

Motor Systems Pilot

Despite diligent efforts by Initiative staff, work with the first motor systems pilot customer was substantially delayed and ultimately suspended because of decision-making issues with the customer. Work is now proceeding with a different company, SP Newsprint. The experience related below is indicative of how long it can take to complete systems projects even when the economics appear excellent.

Fan Replacement Project

After several months, SP Newsprint's corporate management approved replacement of a boiler induced draft fan. It will save an estimated $237,000 per year in energy (about 0.54 aMW based on $0.05/kWh), has a six-month payback, and is anticipated to have important reliability benefits. Recommendations about the design were made by Don Casada, who was introduced to SP Newsprint by the EMM team.

Pump Replacement Project

Because of their positive experience with Don Casada on the fan project, SP Newsprint was willing to consider his further recommendations for upgrades to their pumping system. Still, SP Newsprint indicated that because they already had committed capital to the fan project they would not be able to complete a pump project. The project is estimated to save $150,000 per year (about 0.34 aMW based on $0.05/kWh), with an estimated payback of between 18 and 24 months. It also would solve a number of maintenance problems. EMM is continuing to work with a pump supplier to provide more specific cost estimates in hopes of persuading SP Newsprint to move forward.

Compressed Air Challenge (CAC)

In the summer of 2002, the Initiative team assumed responsibility for marketing and implementing *Compressed Air Challenge* (CAC) training and workshops for the *Pumping System Assessment Tool* (PSAT) software. Between October 2002 and June 2003, the Initiative team held five *Level 1* CAC classes and one for *Level 2*. The *Level 1* training had a total of 102 attendees, representing 54 different companies and organizations. The *Level 2* class had 24 attendees.

A number of follow-up surveys of CAC participants have been conducted using various methods. Some of the key findings are:

- There is a high rate of post-training activity. Seventy-five to 80% of end-users in three surveys (phone, mail, and Internet) say they have made or are making practice improvements. (This is similar to preliminary results from a national CAC survey.)

- In the Internet survey conducted in early 2002, 43% of respondents said they had saved compressed air energy and dollars as a result of the CAC training they attended. Preliminary results for the national CAC study indicate that attendees save on average 149,000 kWh (0.017 aMW) per year, or roughly 7.5% of pre-project compressed air system energy.[6]

- Participants are changing the way they look at compressed air operating costs. Sixty-four percent of respondents to the 2002 Internet survey reported that they are either changing the way they look at operating costs or were planning to use operating costs in the future.

- Half of respondents said they had achieved one or more non-energy benefits.

Pumping System Assessment Tool (PSAT) Training

The *Pumping System Assessment Tool* (PSAT) is a software program for assessing energy savings opportunities in pumping systems. The Initiative team implemented three PSAT workshops in January 2003, attended by 143 individuals who represented 73 companies.

An Internet follow-up survey was conducted of PSAT workshop participants in the late spring of 2003, four months after their attendance. There were a total of 44 respondents to the survey. Some of the key findings are:

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[6] This survey was conducted in early 2001 by Xenergy. The final report is not yet available. As a point of reference, compressed air system efficiency experts find that, for the typical compressed air system, 30% of system energy savings can be saved through cost-effective measures.

- Sixty-seven percent of respondents have done at least one activity related to practice improvement since the workshop.

- Forty-four percent of respondents said they had installed the PSAT software. Twelve percent said they had used the software since the workshop and 31% said they were going to use it. Another 7% said they had been using the PSAT software (or a tool like it) for some time.

- None of the survey respondents volunteered a particular dollar or percent energy cost savings, but this may be because pump system projects can take some time to identify and complete (the SP Newsprint project is an example).

Collaboration Between MDM and EMM

The *Electric Motor Management Initiative* and the *Motor Decisions Matter Campaign* (MDM) being implemented by the Consortium for Energy Efficiency (CEE) are actively collaborating. MDM is using several of the EMM success stories. EMM staff attended the MDM meeting in Chicago in March 2003 and the CEE meeting in Portland, Oregon, in July 2003. EMM and MDM had adjoining booths at the EASA national convention in June 2003.

The *Drive Power* evaluation team has assessed awareness of MDM among industrial end-users. These results are reported below under *Market Transformation Effects*.

The evaluation team for *Drive Power* is also assessing awareness of the *Motor Decisions Matter* (MDM) campaign in the Pacific Northwest.

- Forty-four percent of the sixteen motor service centers interviewed said they had heard of MDM; 6% said they actually knew something about it.

- Nine percent of the 35 *Drive Power* participants (those working with field consultants) who responded to the Internet survey said they had heard of MDM; 3% said they actually knew something about it.

- Three percent of the 39 Initiative nonparticipants who responded to the Internet survey said they had heard about MDM.

C. Market Effects versus Market Transformation

The market transformation effects described above are positive indicators that changes *are occurring* in the market, both among end-users and among motor service centers. While market effects are clearly related to market transformation, it not possible yet to draw conclusions about whether market transformation *has occurred*. This will require a longer-term assessment of market penetration, spillover to other end-users and market actors, and sustainability of market change.

Examples of these long-term efforts might include the following:

- Comparison of end-users activity as a result of the Initiative to the total market size and potential for practice change using sources of information such as the Dun & Bradstreet database in combination with the EMM customer database still under development. This assessment of penetration could be based on numbers of end-users in the region, or better yet, numbers of motors.

- Collection and analysis of end-users' EM2 databases to determine if end-users' motor fleet efficiency is improving, and comparison of these databases to national data on, for example, sales of NEMA premium motors.

- Periodic interviews with motor service centers to see whether and how their services are evolving.

- Long-term follow up interviews with end-users involved in the Initiative to assess whether changes to their practices have been sustained.

D. Drive Power Cost-Effectiveness Review Status

The evaluators reviewed the cost-effectiveness assumptions in 2001. The results of that review are included in the *Drive Power* MPER #3. A number of recommendations were made such as bringing the measures

included in the Alliance's cost-effectiveness model more closely in line with the evolving activities, market changes, and approach of the Initiative.

In 2002-03 because the Drive Power customer database has been under development, initiative tracking was suspended. Therefore, the evaluators have not conducted any further review of the Alliance's assumptions. It is anticipated that the database will be completed in 2004.

E. Summary of Initiative Progress to Date, Market Transformation Effects, and Key Recommendations

Table 9 below describes program progress indicators and key recommendations. Additional recommendations are also provided in *Chapter VII*. *Table 10* below describes market transformation progress indicators. These include practice changes reported by participants (defined as motor end-users working one-on-one with field consultants) compared with nonparticipants. (Practice change reported by seminar attendees was briefly summarized above. For more detailed results, the reader can refer to MPER #4.) Results are also shown for practice change among *MotorTracker* participants as compared with nonparticipants and also change over time for all repair shops interviewed.

Table 9: Program Progress Indicators

PROGRAM ELEMENT	GOAL	PROGRESS THROUGH JUNE 2003	EVALUATION TEAM RECOMMENDATIONS
LEAGUE'S PROGRESS COMPARED TO GOALS IN DELIVERY OF INITIATIVE SERVICES			
TOOLKIT	Create a *Motor Management Toolkit* for use by end-users and FCs.	The *Toolkit* has been continually evolving and improving. Since MPER #4 was completed the following have been added: • A quick reference table of motor operating costs. • For shops, posters of *Good Motor Repair DOs and DON'Ts*.	Provide a written description of how to formulate a repair/replace guideline. Consider incorporating materials from the *Motor Decisions Matter's "1-2-3" Approach.*
ONE-ON-ONE WORK WITH MOTOR USERS	FCs work with motor users to change practices.	FCs have worked with 194 motor users. Among these, 7% (13) have resulted in formal success stories; another 15% (27) have excellent potential to make change; 32% have fair to good potential.	Decide which *specific motor users* to continue to work with and have field consultants create plans for each. Evaluate new candidates carefully. Improve collection of key end-user data.
SUCCESS STORIES	No specific goal currently.	Nine success stories have been completed. A tenth is in draft form. (For two others, the plant has shut down. Another is on hold.)	Update the stories to document further progress. Create more stories. Consider providing a "what if" scenario for energy savings (e.g., eventual replacement of a plant's largest motors).

Continued

PROGRAM ELEMENT	GOAL	PROGRESS THROUGH JUNE 2003	EVALUATION TEAM RECOMMENDATIONS
MOTOR MANAGEMENT SEMINARS	No specific goals set.	Fifteen *Version I* seminars and 38 *Version II* seminars. These 53 seminars have been attended by almost 450 organizations of which about three-quarters were motor users. Fifty-seven percent of the motor users were industrial. Attending industrial motor users represent about 135,000 motors or nearly 28% of the fleet total.	Create a specific plan for more sector-specific marketing of the EMM seminars. Involve field consultants, utilities, and vendors earlier in personal marketing. Add a section on getting upper management support for motor management. Arrange for qualification of EMM seminar for continuing education credits for electricians and engineers. Develop a more advanced seminar to cover tips for mining databases to maximize reliability and energy savings; benefits of a motor database for systems applications; and introduction to simple motor systems concepts. Consider an Internet self-study version.
MOTOR SERVICE SHOP CONTACTS	No specific goals set.	Forty-one contacted by field consultants. *MotorTracker* pilot program fielded with eleven shops representing 25% of the repair market.	Assess degree to which a market infrastructure exists among MSCs for motor management services. Develop a plan for strengthening it. Use EASA more strategically as a leverage point to move EASA shops forward as a group.

Continued

PROGRAM ELEMENT	GOAL	PROGRESS THROUGH JUNE 2003	EVALUATION TEAM RECOMMENDATIONS
EM2 MOTOR MANAGEMENT DATABASE SOFTWARE	No specific goals set.	Through June 2003, a total of 618 copies of the EM2 motor database software had been distributed to 400 companies and organizations.	Install *EM2* on a *PalmPilot™* and market them together. The Alliance should continue to move towards releasing the *EM2* software license to an independent company.
MOTOR SYSTEMS WORK	No specific goals set.	SP Newsprint has approved replacement of a boiler induced draft fan. EMM is encouraging SP to consider a pump system upgrade.	Over the next year, introduce simple motor systems concepts through an advanced seminar and work with customers at the plant level. "Mine" the PSAT attendees following the trainings to reveal where opportunities are for motor systems work and case studies. Develop smaller pilot projects and case studies based on simple systems concepts.
CAC AND PSAT TRAININGS	No specific goals set.	Between October 2002 and June 2003, five *Level 1* and one *Level 2* CAC workshops were held. The *Level 1* workshops had 102 attendees and the *Level 2* had 24 attendees. Three PSAT workshops were held in January 2003 with 143 attendees.	Create a plan for coordinating the CAC *Level 1* and *2* courses; consider coordinating with *AirMaster+*. Plan for more personal marketing by FCs, utilities, and vendors. Do more sector-specific marketing. Increase the pool of CAC instructors.

Table 10: Market Transformation Indicators

GOAL	PROGRESS INDICATOR	PROGRESS THROUGH JUNE 2003
PROGRESS INDICATOR: END-USERS REPORT CHANGES IN MOTOR MANAGEMENT PRACTICES AND ATTRIBUTE THOSE TO THE INITIATIVE		
SUMMARY OF END-USERS' MOTOR MANAGEMENT PRACTICE CHANGES	End-users make substantive changes to their motor management practices and attribute them to the Initiative.	For the four key practices promoted by the Initiative (the first four shown below), participants (those working with the FCs) are more than twice as likely on average as nonparticipants to do them. Attribution to the Initiative is also high – ranging from 40% to 60%.
USE OF OPERATING COSTS FOR MOTOR MANAGEMENT	End-users use operating costs as a primary criterion when deciding whether to repair or replace a motor.	A total of 85% of participants said they use or are going to use operating costs. Sixty percent say their current or planned use is direct a result of the program. By contrast, only 36% of nonparticipants indicate they use or will use operating costs. In another question, participants said operating costs are "always" or "usually" a factor 60% of the time versus 41% of the time for nonparticipants.
SPECIFICATION OF PREMIUM EFFICIENCY MOTORS	End-users establish premium purchase guidelines based on the operational cost of alternatives.	A total of 94% of participants say they use or are going to use premium efficiency motors. Forty percent say their current or planned use is a direct result of the program. By contrast, only 61% of nonparticipants indicate they use or will use premiums.
IMPLEMENTATION OF A COMPUTERIZED MOTOR MANAGEMENT DATABASE	End-users set up motor databases and use them to make better repair/replace decisions.	A total of 69% of participants say they use or are going to use a database. Fifty-four percent say their current or planned use is a direct result of the program. By contrast, only 31% of nonparticipants indicate they use or will use a database.
ESTABLISH OR IMPROVE REPAIR/ REPLACE GUIDELINES	End-users establish repair/replace guidelines based on the operational cost of alternatives.	A total of 80% of participants say they use or will use guidelines, and 51% say their current or planned use is a direct result of the program. By contrast, only 26% of nonparticipants indicate they use or will use guidelines.

Continued

GOAL	PROGRESS INDICATOR	PROGRESS THROUGH JUNE 2003
PROGRESS INDICATOR: MOTOR SERVICE CENTERS (MSCS) INVOLVED IN MOTORTRACKER REPORT SERVICE AND PRACTICE CHANGE[7]		
MOTOR MANAGEMENT SERVICE/PRACTICE CHANGE AMONG MOTORTRACKER PARTICIPANTS	MSCs change their services and/or recommendations to customers regarding motor management.	MSCs participating in *MotorTracker* are using the practices promoted by the Initiative much more than non-participating shops and a substantial number of participants attribute practice changes to the Initiative.
USE OF OPERATING COSTS	MSCs use operating costs when helping customers make repair/replace decisions.	Eighty-two percent of *MotorTracker* shops report that they use operating costs when helping customers make repair/replace decisions. Fifty-five percent attribute this to the Initiative. Only 20% of nonparticipants report using operating costs.
RECOMMENDATION OF PREMIUM EFFICIENCY MOTORS	MSCs increase recommendation of premium efficiency motors.	Ninety-one percent of *MotorTracker* shops report that they recommend premium efficiency motors to customers; 18% attribute this to the Initiative. Eighty percent of nonparticipants report recommending premiums.
OFFERING MOTOR DATABASE SERVICES	MSCs increase their offering of motor database services.	One hundred percent of *MotorTracker* shops say they offer database services (in some fashion); 45% attribute this to the Initiative. Only 10% of nonparticipants say they offer database services.

Continued

[7] Note that sample sizes are small for the MSC interviews so the reported data should be considered anecdotal.

GOAL	PROGRESS INDICATOR	PROGRESS THROUGH JUNE 2003
PROGRESS INDICATOR: MOTOR SERVICE CENTERS IMPROVE REPAIR PRACTICES OVER TIME AND CUSTOMER DEMAND FOR QUALITY REPAIRS INCREASES OVER TIME		
IMPROVED REPAIR PRACTICES BY SHOPS	MSCs improve their repair practices.	In 2001, 38% of shops reported always using core loss testing, and 0% of shops reported using it at least 50% of the time. In 2003, these percentages were 56% and 38% respectively. Several shops have obtained core loss testers or plan to acquire.
CUSTOMERS ASK ABOUT REPAIR QUALITY	Motor shops report an increase in the frequency with which customers ask about repair quality.	In 2001, 8% of shops said customers "often" or "always" ask about repair quality. In 2003, 19% of shops gave these responses.
PROGRESS INDICATOR: ATTENDEES OF COMPRESSED AIR CHALLENGE (CAC) TRAININGS IMPROVE THEIR COMPRESSED AIR MANAGEMENT PRACTICES		
HIGH LEVEL OF POST TRAINING ACTIVITY	Attendees have made or are making practice improvements.	Seventy-five to 80% of end-users in three surveys (phone, mail, and Internet) say they have made or are making compressed air practice improvements (similar to the national survey results). In addition, 64% of the Internet survey respondents said they are changing the way they look at operating costs or were planning to use them for system evaluations in the future.
REPORTED ENERGY SAVINGS	Attendees report quantified energy savings resulting from their practice improvements.	In 2002, 43% of Internet survey respondents said they had saved compressed air energy and dollars as a result of the training. Preliminary results for the national CAC study indicate attendees save 7.5% of pre-project compressed air system energy.
REPORTED NON-ENERGY BENEFITS	Attendees report non-energy benefits.	Half of Internet survey respondents said they had achieved one or more non-energy benefits.

Continued

GOAL	PROGRESS INDICATOR	PROGRESS THROUGH JUNE 2003
PROGRESS INDICATOR: ATTENDEES OF PUMPING SYSTEM ASSESSMENT TOOL (PSAT) TRAININGS IMPROVE THEIR PUMPING SYSTEM PRACTICES		
HIGH LEVEL OF POST TRAINING ACTIVITY	Attendees have made or are making practice improvements.	In Spring 2003, 67% of respondents to an Internet survey said they had done at least one activity related to practice improvement since the training. Forty-four percent of respondents said they had installed the PSAT software; 12% said they had used the software since the workshop; 31% said they were going to use it.
REPORTED ENERGY SAVINGS	Attendees report quantified energy savings resulting from their practice improvements.	None of the Internet survey respondents volunteered a particular dollar or percent energy cost savings. This may be because pump system projects can take some time to identify and complete (the SP Newsprint project is an example.)

III. Participants and Nonparticipants Survey Results

A. Introduction

For this MPER #5, Internet surveys were conducted of 34 participants and 39 nonparticipants. Participants were defined as those motor users working with field consultants while nonparticipants were defined as motor users who have had no contact with the EMM program (although a small number of the latter have had some exposure through the *Electric Motor Management* seminars).

The participant survey email addresses were obtained from data compiled by the Initiative field consultants. A response rate of 30% for participants reflects both that the respondents knew something on the subject they were being surveyed (electric motor management) and that they were known to have some responsibilities for motors in their facility.

Nonparticipant survey email addresses were gleaned from persons attending two Northwest Plant Engineering trade shows in Seattle and Portland in 2002. The low response rate of 8% likely reflects that only a small portion of attendees of these shows have responsibility and knowledge of motors in their facility. Additional, they would not have heard of "electric motor management" and would therefore be less inclined to respond. *Table 11* shows the basic disposition for each of the surveys.

Table 11: Survey Disposition

DISPOSITION	PARTICIPANTS		NONPARTICIPANTS	
	NUMBER	PERCENT	NUMBER	PERCENT
SURVEYS SENT	115	100%	489	100%
BAD EMAIL ADDRESSES	18	16%	110	22%
SURVEYS COMPLETED	34	30%	39	8%

B. Summary of Key Findings

The four most important electric motor management practices promoted by the Initiative are: using operating costs for motor management; specification of premium efficiency motors; using a written guideline for motor repair/replace decisions; and implementing a computerized motor database. The following represent findings from the survey of participants and nonparticipants:

- Participants are more than twice as likely on average as nonparticipants to have adopted a key practice. Attribution to the Initiative by participants is also high – ranging from 40% to 60%, depending on the practice in question.

- Nine percent of participants and 3% of nonparticipants had recently made changes to their motor management practices that had achieved energy savings.

- Participants were asked if they were using the *EM2* software and 54% reported that they were.

- Nonparticipants ranked seminars and field consultants as a source of guidance for motor management at 8% and 0% respectively, while participants ranked the same at 26% and 29%. This result suggests that the impressions made by the EMM seminars and the field consultants among motor end-users are substantial.

- In terms of decision-making drivers for repair/replace determinations, operating costs are always or usually a factor – 60% of the time for participants versus 41% of the time for nonparticipants, a substantial difference.

- Again, for repair/replace decision-making, the cost of repair versus new is always or usually a factor 66% of the time for participants and 80% of the time for nonparticipants. This may indicate that because of their exposure to EMM, participants are more likely than nonparticipants to consider factors other than first cost.

- Forty percent of participants and about 30% of nonparticipants say their repair shops' recommendation is always or usually a factor in repair/replace decision-making. In an earlier, more

general question where respondents were asked where they typically get guidance for motor repair, replacement, and motor management decisions, repair shops were mentioned by 77% of participants and 62% of nonparticipants. This indicates that shops are a good target for dissemination of motor management information and that they could benefit by more explicitly marketing their assistance in this area, including database development.

- More than half (54%) of participants rated the influence of the *Electric Motor Management* field consultant and the seminar as "influential" or "very influential" for the improvements that the end-user has made (or is currently making) to their motor management practices.

C. Characterization of Survey Respondents

For the participant survey, the majority of persons responding, about one-third, were supervisors of maintenance (see *Table 12*).

Table 12: Respondent Job Title or Position

POSITION	PARTICIPANT	NONPARTICIPANT
SUPERVISOR OF MAINTENANCE/MECHANICAL/ ELECTRICAL	34%	23%
PROJECT/PROCESS ENGINEER	20%	13%
MAINTENANCE/ELECTRICIAN/OPERATOR	17%	31%
FACILITY MANAGER	11%	21%
PRODUCTION/OPERATIONS SUPERVISOR	6%	0%
PURCHASING SUPERVISOR	3%	3%
PROJECT MANAGER	6%	0%
SENIOR MANAGER	0%	5%
DIRECTOR OF ENGINEERING/SENIOR ENGINEER	0%	5%
NO ANSWER	3%	0%

The next most responses were from project engineers at 20% and then maintenance electricians or operators at 17%. Results were somewhat different for the nonparticipants, with the largest portion being maintenance electricians at 31% and then supervisors of maintenance at 23%. The third largest response for nonparticipants was maintenance supervisor at 23%.

The participant survey respondents were reasonably distributed across the industry and business types found in the Pacific Northwest. The major difference between the two populations is that a much higher portion of the nonparticipant survey respondents were from institutional and commercial organizations. *Table 13* summarizes the results by organization type.

Table 13: Organization Type

ORGANIZATION TYPE	PARTICIPANT	NONPARTICIPANT
WOOD PRODUCTS	20%	8%
FOOD PROCESSING	11%	8%
WATER/WASTEWATER	11%	5%
MINING MINERALS	9%	0%
PRIMARY METALS	6%	0%
CHEMICALS	6%	8%
FED/STATE/COUNTY/CITY	6%	23%
SCHOOL/COLLEGE	3%	3%
COMMERCIAL	3%	10%
OTHER INDUSTRY	23%	23%
NO ANSWER	3%	3%

As shown in *Table 14*, in general, the number of motors managed by nonparticipants was lower than average, with more than half of those respondents having less than 100 motors, while only 20% of participants had that few.

Table 14: Total Number of Motors

NUMBER OF MOTORS	PARTICIPANT	NONPARTICIPANT
500 OR MORE	20%	10%
250 TO 449	17%	10%
100 TO 249	34%	18%
LESS THAN 100	20%	54%
DON'T KNOW	6%	5%
NOT APPLICABLE	3%	3%

In addition to the total number of motors, there were fewer nonparticipants that had significant numbers of large motors greater than 50 HP; more than twice as many participants as nonparticipants had at least 20 of these (*Table 15)*.

Table 15: Total Number of Motors Over 50 HP

NUMBER OF MOTORS	PARTICIPANT	NONPARTICIPANT
100 OR MORE	26%	5%
50 TO 99	0%	5%
20 TO 49	17%	8%
SUBTOTAL, >20 MOTORS	43%	18%
LESS THAN 20	54%	64%
DON'T KNOW	3%	5%
NOT APPLICABLE	0%	13%

The primary observation is that participants have more motors and larger motors than nonparticipants, which is what we would expect given that EMM is supposed to target larger customers. Also, for this Initiative the evaluation team has recommended that there be a focus on end-users with significant number of motors (more than 100 motors) or with a significant

number of large motors (more than 20 with larger than 50 HP). A further cross tab analysis of all respondents shows that 77% of participants, but only 49% of nonparticipants, fall into this "significant" end-user category.

Even though fewer nonparticipants than participants are "significant" end-users of motors as noted above, there were no meaningful differences between the responses of those nonparticipants with more than 100 motors and the responses of those nonparticipants with less than 100 motors.

D. Detailed Survey Results

Sources of Guidance for Motor Management

Participants and nonparticipants alike primarily received their guidance for motor repair, replacement, and management decisions from their motor repair shops, their own experience, plant maintenance staff, and motor manufacturers' representatives. Participants also relied significantly on their EMM field consultant for guidance. Of particular note is that the utility was the least often mentioned source for motor management guidance for both participants and nonparticipants.

Reliance on themselves and their repair shop argues well for the two-pronged approach taken by the EMM program, where customers and shops are both given information and assistance in making better motor management decisions.

Company policy was ranked about eighth out of ten possible sources for guidance. This suggests that decisions are still made by individuals rather than as a result of any particular company guideline or policy. The finding also suggests that in some companies, staff at various levels in an organization should be meeting with the field consultants and also attending seminars.

Changes to Motor Management Practices

The following *Table 16* shows that the program is having an impact on participants. The percentages in parentheses indicate that their current or planned use is directly a result of the EMM program.

Table 16: Motor Management Practice Changes and Potential

MOTOR MANAGEMENT PRACTICE	USE OR PLAN TO USE		NO PLANS TO USE OR UNSURE IF WILL USE	
	PARTICIPANT	NONPARTICIPANT	PARTICIPANT	NONPARTICIPANT
OPERATING COSTS FOR MANAGEMENT DECISIONS	85% (60%)	36%	12%	62%
PREMIUM EFFICIENCY MOTORS	94% (40%)	61%	6%	34%
USE OF WRITTEN REPAIR/ REPLACE GUIDELINES	80% (51%)	26%	20%	67%
USE OF COMPUTERIZED MOTOR DATABASE	69% (54%)	31%	31%	62%
PLAN FOR CRITICAL MOTORS AT FAILURE	82% (37%)	69%	18%	26%
INTERACTION WITH REPAIR SHOP REGARDING REPAIR SPEC	75% (46%)	54%	17%	33%

Below are some descriptions of notable comparisons from the table above:

- **Operating Costs:** A total of 85% of participants say they use or are going to use operating costs to make repair/replace decisions. Sixty percent say their current or planned use is directly a result of the program. By contrast, only 36% of nonparticipants indicate they use or are going to use operating costs. Looking at the results from another angle, only 12% of participants say they have no plans or are unsure of their plans to use operating costs for motor management, while 62% of nonparticipants say they have no plans or are unsure.

- **Premium Efficiency Motors:** A total of 94% of participants say they use or are going to use premium efficiency motors. Forty percent say their current or planned use is a direct result of the program. By contrast, only 61% of nonparticipants indicate they use or are going to use premiums. Another striking comparison is between the 6% of participants who say

they have no plans to use them or are not sure and the 34% of nonparticipants giving these same responses.

- **Use of Written Guidelines:** A total of 80% of participants say they use or are going to guidelines, and 51% say their current or planned use is a direct result of the program. By contrast, only 26% of nonparticipants indicate they use or are going to use guidelines. Another striking comparison is between the 20% of participants who say they have no plans to use repair/ replace guidelines or are not sure whether they plan to use a guideline, and the 67% of nonparticipants giving these same responses.

  It was also noteworthy that a comparison of responses between two questions indicated that when respondents say they use "premium" efficiency motors, they may not mean "NEMA Premium." Ninety-four percent of participants said they use or are going to use "premium efficiency motors." However, when asked about their awareness of "NEMA Premium" motors, only 54% said they knew something about NEMA Premium motors, and only 17% said they had heard of them at all.

- **Motor Database:** A total of 69% of participants say they use or are going to use operating costs to make motor management decisions. Fifty-four percent say their current or planned use is a direct result of the program. By contrast, only 31% of nonparticipants indicate they use or are going to use a database. Another revealing comparison is between the 31% of participants who say they have no plans to use a database or are not sure and the 62% of nonparticipants giving these same responses.

- **Repair Shop Interaction:** The differences between participants and nonparticipants are not as striking here. A total of 75% of participants say they have talked or are going to talk to their shop. Forty-six percent say their talking to their shop is a result of the program. Fifty-four percent of nonparticipants indicate they have talked or are going to talk to their shop, not as large of a difference as for some of the other practices. Seventeen percent of participants say they have no plans to talk to their shop or are not sure, versus 33% of nonparticipants.

Respondents were also asked to rate a number of factors as to their importance for making motor repair/replace decisions. The detailed results are shown in *Table 17* below.

Table 17: Responders' Rating of Factors In Importance in Repair/Replace Decision

RATING	QUICK TURN-AROUND	AVAIL-ABILITY OF SPARE	MOTOR SIZE (HP)	COST OF REPAIR VS. NEW	REPAIR SHOP RECOM-MENDS	OPERA-TING COST	MM+	EM2	AMONG THOSE USING EM2
PARTICIPANTS									
5 ALWAYS A FACTOR		49%	46%	46%	20%	40%	9%	9%	17%
4	17%	14%	20%	20%	20%	20%	9%	6%	11%
3 SOMETIMES A FACTOR	40%	29%	29%	31%	43%	23%	14%	29%	50%
2	3%	6%	0%	3%	6%	11%	20%	14%	6%
1 NOT A FACTOR	3%	3%	6%	0%	9%	6%	46%	37%	17%
DON'T KNOW					3%	0%	3%	6%	0%
NONPARTICIPANTS									
5 ALWAYS A FACTOR	44%	49%	36%	59%	13%	18%	3%	3%	
4	15%	15%	15%	21%	18%	23%	3%	5%	
3 SOMETIMES A FACTOR	38%	15%	33%	13%	46%	26%	8%	3%	
2	0%	13%	8%	5%	10%	18%	8%	3%	
1 NOT A FACTOR	3%	8%	8%	3%	13%	15%	77%	82%	
DON'T KNOW	0%	0%	0%	0%	0%	0%	3%	5%	

There are a number of conclusions we can reach from these results shown in *Table 17*:

- Operating costs are always or usually a factor in repair/replace decisions 60% of the time for participants versus 41% of the time for nonparticipants, a substantial difference.

- Cost of repair versus new is always or usually a factor 66% of the time for participants and 80% of the time for nonparticipants. This may indicate that because of their exposure to EMM, participants are more likely than nonparticipants to consider factors other than first cost.

- Forty percent of participants and about 30% of nonparticipants say their repair shop's recommendation is always or usually a factor. This suggests that shops are likely a good target for motor management information and that shops could benefit by more explicitly marketing their assistance in this area, including database development.

- Regarding motor management databases (either *MM+* or *EM2*): participants give a 4-5 rating about 16% of the time, while nonparticipants give a 4-5 rating only about 7% of the time. Those 18 motor users that say they use *EM2* give a rating of 4-5 28% of the time. This percentage may be low because participants haven't gotten enough data into the database to use it effectively for decisions. It is also possible that the field consultants need to work more with customers on how to use the database for motor decisions.

A few of both participants and nonparticipants had made changes to their motor management practices recently and had achieved energy savings. This included 9% participants and 3% of nonparticipants. About half of both participants and nonparticipants had made changes but don't know what the savings were.

The participants were asked if they were using the *EM2* software developed by the *EMM Initiative* as their database for motor management. Just over half, or 54%, said that they were using the software. On average, they had done data entry for about 40% of the motors in their plant. Additionally, just under half or 44% said that they were using a *PalmPilot™* for data entry.

For the EMM seminars, research conducted for the two previous MPERs indicated that between 79% and 88% of attendees had made at least one practice change as a result of the seminar. For individual tools or practices, between 15% and 38% of users said they have changed or increased their use of, or started using specific tools or practices. The highest percentage at 38% was for operating costs, a key seminar concept. A substantial

number of respondents also said they were going to start using the tools and practices.

In addition to the practice changes for end-users described above, there is also one Northwest utility that is promoting the use of motor databases for their industrial customers. They are in the initial phase of promoting the use of a motor inventory for two reasons – first because industry should have an inventory for their own motor management benefits, and secondly because an inventory is useful information for their utility incentive program as it allows motor failures to qualify and it supports analysis of overall process improvements.

IV. Motor Service Center Interview Results

A. Introduction

During January to April 2003, nine in-person and seven phone interviews were conducted with motor service centers (MSC, also described as motor repair shops). This was the second round of shop interviews conducted since the program began in January 1999. Results from previous interviews with twenty-four motor service centers are described in MPER #3.

The interviews included eleven participants in the *MotorTracker* program and five nonparticipants. *Table 18* shows the interview disposition. All of the shops interviewed have received at least one visit from a program field consultant and a number of them, including all the *MotorTracker* participants, have had ongoing communications with the field consultants.

Table 18: Disposition for Motor Service Center Interviews

LOCATION	IN-PERSON INTERVIEWS	PHONE INTERVIEWS	TOTAL
WESTERN WASHINGTON	3		3
EASTERN WASHINGTON	2	1	3
OREGON	1	3	4
MONTANA	--	2	2
IDAHO	3	1	4
TOTAL	9	7	16

In May of 2002, *MotorTracker* was initiated on a pilot basis with ten MSCs (and one additional shop has essentially moved forward on their own). *MotorTracker* is a marketing package designed to help MSCs expand their service offerings, particularly motor management database services. It includes a marketing poster, brochures and training, and support for the *EM2* database software. In terms of the number of motor

repairs, the eleven Motor Tracker shops represent about one-quarter of the total Northwest market.

The interviews assessed:

- The range of repair and other services, motors, and motor-related equipment offered by the MSC.
- The number of motor repairs and rewinds performed.
- The experience of respondents with *MotorTracker* and their opinions about how it may affect their business.
- If and how service centers assist customers with repair/replace decisions.
- Their use of motor management practices promoted by the *Drive Power Initiative*.
- Awareness of energy-efficiency related programs.

B. Key Findings

A key finding is that MSC participating in *MotorTracker* are using the practices being promoted by the *Drive Power Initiative* much more than nonparticipants and a substantial number of participants have attributed their involvement to the Initiative. These practices are: use of motor operating costs, recommendation of premium efficiency motors, and offering motor database services.

Each of these *MotorTracker* participants is offering motor database services as they see fit. There is not a consistent approach for offering motor database services as it has been left to individual shops to determine. Some of the *MotorTracker* shops are developing motor databases for customers while others are simply handing out the *EM2* software and letting their customers develop the database on their own. Others shops say that they will maintain the database at both the shop and customer facility.

The MSC that are actively offering *MotorTracker* see it as a way to make them stand out compared to other shops and to also improve the level of service they offer to their customers. (Shops that will maintain the

database in house, seemly will know customer's motors better than the customer does.) It is seen as a way to help to keep their own customers competitive and in business – thus ensuring that they have the motor repairs and sales from those customers. For some MSC, *MotorTracker* is being touted as a tool to help reduce inventory and thus inventory taxes, and also to ensure that the right spare motors are on hand.

C. Detailed Findings

Size of Motor Service Centers

Eleven of the sixteen of respondents knew approximately how many repairs their shops do each year – the others could provide only very rough estimates ("Thousands…" was one response).

Using all the values provided and including values for the rough estimates, these MSC account for a total of about 22,000 repairs. On average, respondents reported that about one-third of repairs involved rewinds. The interviewed MSC account for about 7,200 motor rewinds annually.

Of particular significance is that the portion of motor repairs involving rewinds has decreased markedly. The portion of rewinds from shops that were interviewed for both MPER #3 and #5 were compared. In the two years since the previous interviews were conducted the average number of rewinds for these shops had decreased from about one-half to just one-quarter (46% to 25%).

Table 19 shows ranges of number of repairs. As shown, more than half of the respondents reporting said they do over 1,000 repairs per year.

Table 19: Number of Repairs

NUMBER OF REPAIRS RANGE	NUMBER OF SHOPS
OVER 2,000	4
1,000 TO 2,000	6
400 TO 999	4
LESS THAN 400	2
TOTAL	16

Services Offered

Table 20 shows the percentage of respondents who reported each type of service described. The results from the twenty-four interviews conducted in early 2001 are compared to the recent interviews. These are small samples of self-reported values so there will be substantial variation even when there are nine shops in common to both interview sets. Still, there are interesting changes in the sales of used motors, in the sales of motor system parts, and in the offering of some motor-related services such as energy audits.

Table 20: Services Offered

SERVICE DESCRIPTION	PERCENT OFFERING 2001	PERCENT OFFERING 2003
MOTOR REPAIR AND RECONDITIONING	100%	100%
SALES OF NEW MOTORS	96%	88%
SALES OF USED MOTORS	83%	69%
SALES OF MOTOR SYSTEM PARTS AND EQUIPMENT (E.G., PUMPS, DRIVES, COUPLINGS)	96%	75%
MOTOR INSTALLATION	54%	81%
ALIGNMENT	67%	75%
MOTOR MAINTENANCE	71%	63%
SELLING CUSTOMERS' SURPLUS OR USED MOTORS ON CONSIGNMENT	42%	38%
MOTOR TESTING	92%	94%
MOTOR SIZING	71%	50%
DESIGN OR REDESIGN OF MOTOR SYSTEMS	50%	56%
DEVELOPING A MOTOR MANAGEMENT DATABASE FOR CUSTOMERS		56%
COMPREHENSIVE MOTOR MANAGEMENT (INVENTORY, MAINTENANCE, ETC.)	29%	31%
ENERGY AUDITS	8%	31%
CUSTOMER EDUCATION/TRAINING SEMINARS	63%	63%

Technical Practices

Shops were asked if performance of core loss testing was part of their repair operations. These are documented in *Table 21* below. Note that there has been a substantial increase in the use of core loss testing since the survey of three years ago.

Table 21: Other Technical Aspects of Repair Practices

CORE LOSS TESTING BOTH BEFORE AND AFTER	NUMBER OF SHOPS 2003	PERCENT OF SHOPS 2003	PERCENT OF SHOPS 2001
ALWAYS	9	56%	41%
50-99% OF THE TIME	4	25%	0%
30-49% OF THE TIME	0	0%	18%
10-29% OF THE TIME	1	6%	18%
NEVER (DO LOOP TEST INSTEAD)	2	13 %	23%

Customer Demand for Quality Repairs

As shown in *Tables 22 and 23*, respondents reported that customers' interest in quality remains small, even if it has been increasing since shops were surveyed in 2001.

Table 22: How Often Customers Ask About Repair Quality

HOW OFTEN	NUMBER OF RESPONSES 2003	PERCENT OF SHOPS 2003	PERCENT OF SHOPS 2001
NEVER	2	13%	25%
RARELY	8	50%	38%
SOMETIMES	3	18%	29%
OFTEN	1	6%	4%
ALWAYS	2	13%	4%

Table 23: Change in Customers' Interest in Repair Quality

CHANGE IN INTEREST	NUMBER OF RESPONSES 2003	PERCENT OF SHOPS 2003	PERCENT OF SHOPS 2001
INCREASE	8	50%	58%
DECREASE	0	0%	4%
NO CHANGE	7	44%	38%
DON'T KNOW	1	6%	0%

Promoted Practices

Respondents were asked about their use of three of the practices being promoted by the *Drive Power Initiative*. These were: motor operating costs, recommendation of premium efficiency motors, and offering of a motors database. *Table 24* shows the results from these questions.

Table 24: Initiative Attribution of Promoted Practices

HOW OFTEN	MOTOR OPERATING COSTS	RECOMMEND PREMIUM MOTORS	OFFERING MOTORS DATABASE
PARTICIPANTS ATTRIBUTION TO INITIATIVE	55%	18%	45%
PARTICIPANTS USING PRACTICE	82%	91%	100%
NONPARTICIPANTS USING PRACTICE	20%	80%	10%

In each case, the eleven *MotorTracker* participants used the efficiency practice more than the five nonparticipants. Note that by definition, each of the *MotorTracker* shops is offering motor database services in some fashion. In addition, a substantial number of the participants gave attribution to the Initiative for their offering of the practice.

MotorTracker Activity

At the time of the interviews, just a few of the *MotorTracker* participant shops had engaged fully in offering database services. Even so, questions were asked about their activities and intentions of offering motor database services.

For the eleven *MotorTracker* participants, a total of seventy-seven customers were interested, with a range of none up to 25 interested customers. The number of customers actually using a motor database was about 31, with a range of zero to eight participating customers. Because many shops were just getting underway with *MotorTracker*, it is believed that these numbers would have changed substantially in the months following the interview. Each of the shops saw database services as an important long-term service.

Each of the MSC participating in *MotorTracker* is offering motor database services as they see fit. There is not a consistent approach for offering motor database services as it has been left to individual shops to determine. Overall, for the eleven participants there is a full range of "services" from awareness only and being able to respond to customer inquiry (but not seeking any) to full-tilt promotion of *MotorTracker* to all shop customers.

As mentioned earlier, two of the eleven *MotorTracker* shops are developing motor databases for customers and retaining the databases in the shop, five shops are handing out the *EM*2 software and letting their customers develop and keep the database (with no data kept by the MSC), and another three are going to maintain the database at both the shop and customer facility. The remaining shop is in response mode only and they do not appear to have any approach in mind yet.

Although the operating cost repair tags that are part of the *MotorTracker* marketing materials were appreciated only three shops were attaching them on the majority of repaired motors. Some shops were selective in promoting *MotorTracker* and additional services only to major industrial customers that they felt would be the best candidates for the services. Six other shops were using none or very few of the *MotorTracker* tags and the other two shops were only tagging a small portion of their repairs. A number had positive comments on the value of the recently available laminated sheets that showed motor operating costs.

Our observations and the anecdotal evidence from the case studies suggest that the *PalmPilot™* version of *EM2* is a useful and important addition to the capability of the software. However, only three of the eleven *MotorTracker* have implemented the motor database software on the *PalmPilot™* and a few believed that it would only have value to their customers.

Program Awareness

Respondents were asked if they had heard about or actually knew something about four energy efficiency programs being offered in the Northwest and nationwide. *Table 25* shows the programs and the responses. Despite direct promotion of CAC and PSAT by the *Drive Power Initiative* and the field consultants, there was unfortunately limited knowledge of both of these important training programs.

Table 25: Program Awareness

PROGRAM	DON'T KNOW ABOUT	KNOW SOMETHING ABOUT	ONLY HEARD ABOUT
MOTOR DECISIONS MATTER	8	1	7
COMPRESSED AIR CHALLENGE	5	1	10
NEMA PREMIUM	0	15	1
PSAT	7	2	7

V. Compressed Air Challenge Survey Results

A. Introduction

In July 2002, the *Drive Power Initiative* team (through the Electric League of the Pacific Northwest) assumed responsibility for marketing and implementing the *Compressed Air Challenge* (CAC) *Level 1* and *2* training courses in the Pacific Northwest. Prior to this, beginning in 1999, the Northwest Energy Efficiency Alliance directly managed CAC training in the region. During part of that period, the Northwest Energy Education Institute (NEEI) administered student tuition payments and performed some course coordination.

Table 26 below shows the number of *Compressed Air Challenge* courses held in the Pacific Northwest to date, the managing organization, the total number of participants each year, and the percent that were compressed air end-users (vs. consultants, shops, utility staff, etc.).

Table 26: Compressed Air Challenge Courses in the Pacific Northwest

DATE	MANAGING ORGANI-ZATION	COURSE TYPE	NUMBER OF COURSES	TOTAL PARTICI-PANTS	AVERAGE PARTICI-PANTS PER TRAINING	PERCENT COMPRES-SED AIR END-USERS
1999	Alliance	Level 1	6[8]	141	24	57%[9]
SUMMER 2000	Alliance	Level 1	5[10]	98	20	70%[11]
FALL 2000	Alliance	Level 1	6	102 est. records not available	N/A	N/A
2001	Alliance	Level 1	1[12]	20 est. records not available	N/A	N/A
		Level 2	1 canceled	N/A	N/A	N/A
2002	Electric League	Level 1	3	75	25	59%[13]
		Level 2	1	24	24	17%[14]
2003	Electric League	Level 1	2[15]	27	13	37%
TOTAL		Level 1	23	463	20	N/A, records not available
		Level 2	1	24	24	17%

[8] Spokane, WA; Seattle, WA; Portland, OR; Eugene, OR; Boise, ID; Missoula, MT. (From *SAV-AIR MPER #1*, May 15, 2000. Attendance was reported as 109 in that report. New data available brought the number up to 143).

[9] Based on analysis of five of the six classes.

[10] Spokane, WA; Seattle WA; Portland, OR; Medford, OR; Missoula, MT. (From *SAV-AIR MPER #2*, November 15, 2000.)

[11] Based on analysis of all 111 attendees of the five classes.

[12] This course was actually marketed and implemented entirely by Snohomish PUD.

[13] Based on 75 participants of the three *Level 1* trainings held in Fall 2002.

[14] Based on incomplete data as five of the 24 exit survey respondents did not indicate their type.

[15] One other was offered by was cancelled due to insufficient attendance.

B. Overview of Evaluation Activities and Key Findings

To date, evaluation activities for the *Compressed Air Challenge Level 1* training for the Pacific Northwest have involved four different types of participant surveys, including a phone survey, a mail survey, an Internet survey, and in-class exit surveys.[16] Phone interviews with compressed air distributors, consultants, and experts were also conducted. Exit surveys were completed by attendees of one *Level 2* course, but these will be included in a later report when more *Level 2* trainings have been conducted. In addition, a separate survey was performed of compressed air end-users who were not CAC participants. Finally, participants in the *Electric Motor Management* program were asked about their awareness of CAC. The following are key findings and recommendations:

- **In the broader population of industrial end-users, awareness of CAC is relatively low. Awareness is higher among participants in the *Electric Motor Management* program.** The phone surveys in late 2000 of trade allies (vendors, distributors, and experts) and of large end-users indicated that awareness of CAC is high among trade allies but low among end-users.[17] In an Internet survey conducted for the *Electric Motor Management* (EMM) program of nonparticipants,[18] only 26% of respondents (10 of 39) had either heard about or knew something about CAC. Awareness was higher, at 34%, among participants in EMM, perhaps because of cross-marketing efforts by the field consultants. More marketing is needed to broaden awareness among the general population of industrial end-users.

- **The proportion of compressed air end-users among CAC training participants has been uneven.** As shown in *Table 26* above, the proportion of end-users attending the trainings has

[16] Earlier CAC activities in the region were covered in SAV-AIR MPER #2 and #3, *www.nwalliance.org/resources/*.

[17] As phone surveys began of compressed air end-users, it became apparent that few were aware of the training, so class participants were added to the sample (*SAV-AIR MPER #2*, November 15, 2000).

[18] The population consisted of 2002 attendees of two *Northwest Plant Engineering and Maintenance* shows.

fluctuated, although it is generally higher than the 45% reported in the national CAC evaluation.[19] The evaluators believe the proportion of compressed air end-users could and should be consistently well above 60%.

- **Personal marketing is critical to raising awareness of CAC and recruiting training participants.** Personal marketing by utility representatives, vendors, and EMM Field Consultants is critical to recruiting important compressed air end-users. A useful tool would be a memo delivered by hand to utilities and vendors describing success stories and giving an estimate of the cost-affectivity of the training for end-users. In some regions where there have been regulatory incentives for utility recruitment, attendance was excellent.

- **Among participants in CAC, the awareness of the Alliance *SAV-AIR Compressed Air Initiative* could be higher, but still is impressive**. Seven percent of respondents to the follow-up Internet survey in early 2003 said they knew something about SAV-AIR, and 21% said they had heard of it. Thus, over a quarter, or 28%, were aware, even though SAV-AIR and other compressed air services and brands are not mentioned in the trainings so as to maintain vendor neutrality. SAV-AIR has a small staff and has only been operating for about three years.

- **There is a high rate of post-training compressed air management activities.** Results of three different surveys (phone, mail, and Internet) indicate that CAC appears to be an effective means to motivate participants to improve their management of compressed air and increase the market for compressed air efficiency consulting services. Seventy-five to eighty percent of end-users[20] say they have made or are making practice improvements as a result of attending the training. Preliminary results for the national CAC study are similar. Seventy-six percent of 100 end-users surveyed reported that they had made significant capital and/or operating

[19] This survey was conducted in early 2001 by Xenergy. The final report is not yet available.

[20] Phone survey in mid 2000, mail survey late 2001, Internet survey early 2002.

improvements to their compressed air system since attending the training and two-thirds of those who made improvements reported using materials and knowledge gained from the training to guide them.[21]

- **Significant energy savings are being achieved.** From a mail survey conducted in late 2001, eight CAC success stories were developed by MetaResource Group describing a total of $200,000 in annual savings and an average of almost $25,000 per participant. In the Internet survey conducted in early 2002, 43% of respondents said they had saved compressed air energy and dollars as a result of the CAC training they took. Preliminary results for the national CAC study indicate that attendees save on average 149 MWh per year, or roughly 7.5% of pre-project compressed air system energy.[22]

- **Respondents are changing the way they look at operating costs.** In the Internet survey in early 2003, respondents were asked to choose the answer that best described their use of operating costs for compressed air system management. Sixty-four percent reported that they were either changing the way they look at compressed air operating costs or were planning to use them in the future in their system management. None reported that they had started using them; this may be because the survey was given only three months after the training took place.

- **Participants are enthusiastic about CAC and want a *Level 2* course.** Course participants rate the course very highly.[23] They liked the *Level 1* curriculum and felt that the handouts and presentation materials were excellent and that the instructor was effective. Five participants from a more recent *Level 1*

[21] This survey was conducted in early 2001 by Xenergy. The final report is not yet available.

[22] This survey was conducted in early 2001 by Xenergy. The final report is not yet available. As a point of reference, compressed air system efficiency experts find that, for the typical compressed air system, 30% of system energy savings can be saved through cost-effective measures.

[23] Ninety-two percent of phone survey participants responded positively. *SAV-AIR MPER #2*, November 15, 2000.

course specifically requested a *Level 2* course in Portland. The mail survey conducted in 2001 also indicated a strong interested in *Level 2* training in Portland.

- **Respondents report non-energy benefits, but the training materials could be strengthened in this area.** In fact, in the Internet survey taken in early 2003, more respondents reported non-energy benefits than energy benefits (50% versus 43%). Reported non-energy benefits included reduced moisture and contamination in system air, and more consistent pressure to end-uses. In the recent national CAC study, 76% of end-users who implemented system efficiency measures reported similar types of non-energy benefits.[24] While these results are very positive, review of the CAC materials indicated that there could be more emphasis on non-energy benefits in the training.

- **More support is needed for how to sell CAC improvements to management.** In a phone survey of end-users, some expressed concern that managers are not well informed about the importance of taking a systems approach with compressed air. In the Internet survey conducted in early 2003, 43% of respondents said management was only "somewhat" supportive of improvements to compressed air system controls, 7% said management was not supportive, and 14% said they were not sure. It is recommended that *Level 1* include an action plan for selling CAC improvements to management. (The *Level 2* course includes material on selling to management.)

C. Detailed Results of CAC Evaluation Activities Conducted for This Report

The following evaluation activities were conducted in early 2003 for this report:

[24] This survey was conducted in early 2001 by Xenergy. The final report is not yet available. Additional evidence concerning the value of non-energy benefits are illustrated by the *DOE Best Practices* case studies. Nineteen of 22 facilities that provided case study information reported increased production capacity, avoided capital costs for new compressors, and reduced maintenance costs. The reported value of these benefits ranged from $55,000 to $500,000.

- Analysis of exit surveys completed by 69 of the 75 participants at the conclusion of the three *Level 1* trainings of fall 2002.

- A follow-up Internet survey of 14 participants in three *Level 1 Compressed Air Challenge* trainings that took place in fall 2002. (Forty-four of the 75 total participants were compressed air end-users. Among the 34 with viable e-mail addresses, 14 responded to the survey.) The survey was conducted in late January 2003, timed to obtain information on post-training activities.

The objectives, key findings, and key recommendations are summarized in *Table 26* above. Detailed results are provided below.

Participant Exit Survey Results

Participants were asked to complete exit surveys at the end of the *Level 1* training. Sixty-nine of 75 participants who attended three trainings in the fall of 2002[25] completed surveys.

Participants were asked to rate their ability to do ten different compressed air activities as a result of the training. They were to use a scale of one-to-five, where one was "strongly disagree" and five was "strongly agree" with the statement that they were better able to do the activity. As shown in *Table 27* below, participants' perceptions of their new abilities to do the activities varied somewhat, but across all activities, 80% or more of participants agreed or strongly agreed that their abilities had improved.

[25] Boise, ID; Kent, WA; Portland, OR.

Table 27: Perceived Ability to do Compressed Air Activities

ACTIVITY	4 TO 5	3	1 TO 2	N/A
EXPLAIN THE BENEFITS OF IMPROVING CA SYSTEM PERFORMANCE	97%	1%	0%	2%
DESCRIBE THE COMPONENTS ON THE SUPPLY SIDE	93%	6%	0%	1%
RECOGNIZE INAPPROPRIATE USES OF CA AND COMMON LEAK LOCATIONS	91%	7%	0%	2%
EXPLAIN THE MEASUREMENT POINTS FOR BASELINING	91%	6%	2%	1%
ASSESS QUICK AND SIMPLE COST CUTTING MEASURES	91%	7%	0%	2%
IDENTIFY STEPS FOR PROPER SYSTEM OPERATION AND MAINTENANCE	90%	7%	2%	1%
IDENTIFY THE PROS AND CONS OF DIFFERENT COMPRESSOR TYPES	88%	10%	0%	2%
ESTIMATE THE CURRENT COST OF COMPRESSED AIR FOR MY PLANT	87%	7%	3%	3%
DETERMINE THE IMPACT OF DIFFERENT COMPRESSOR CONTROL TYPES	84%	15%	0%	1%
TAILOR A COMPRESSED AIR SYSTEM MANAGEMENT PLAN	81%	17%	0%	2%

Using the same scale of one-to-five, where one was "strongly disagree" and five was "strongly agree," participants were also asked to rate a series of statements about the course content and instructors. The results are shown below in *Table 28*. Generally the course content and materials were well-received. Most importantly, over 90% of participants gave a ranking of 4 or 5 to the statement that the training provided information they would apply in their work.

Table 28: Course Content and Materials

ACTIVITY	4 TO 5	3	1 TO 2	N/A
THE TRAINING PROVIDED INFORMATION THAT I WILL APPLY IN MY WORK	92%	4%	0%	4%
THE TRAINING USED EFFECTIVE TEACHING METHODS	90%	4%	0%	6%
THE TRAINING PROVIDED USEFUL HANDOUTS FOR FUTURE REFERENCE	90%	3%	0%	7%
THE TRAINING ADDRESSED THE ISSUES AS ADVERTISED	88%	6%	0%	6%

There are two qualified CAC instructors in the region. Although most of the Level 1 trainings were done with just one instructor (#1), on several occasions these two individuals worked together. *Table 29* below shows ratings for each of the instructors. As shown, one instructor received higher ratings than the other.

Table 29: Ratings of Instructors

CRITERIA	4 TO 5	3	1 TO 2	N/A
INSTRUCTOR #1…				
WAS KNOWLEDGEABLE	99%	0%	0%	1%
USED EFFECTIVE TRAINING SKILLS	97%	2%	0%	1%
COVERED TRAINING OBJECTIVES	96%	3%	0%	1%
RESPONDED TO QUESTIONS AND ISSUES EFFECTIVELY	97%	2%	0%	1%
STAYED ON TOPIC AND ON TIME	97%	2%	0%	1%
INSTRUCTOR #2…				
WAS KNOWLEDGEABLE	94%	4%	0%	2%
USED EFFECTIVE TRAINING SKILLS	85%	9%	4%	2%
COVERED TRAINING OBJECTIVES	91%	6%	2%	2%
RESPONDED TO QUESTIONS AND ISSUES EFFECTIVELY	91%	6%	2%	2%
STAYED ON TOPIC AND ON TIME	91%	6%	2%	2%

Participants were then asked how likely it was that they would apply different actions to their plant as a result of the training. They were to use a scale of one-to-five where one was "very unlikely" and five was "very likely." They could also indicate if they were already doing the activity. As *Table 30* shows, for the four most critical compressed air management actions, about half of participants say they are likely or very likely to take those actions. This is an impressive result.

Table 30: Likelihood of Taking Different Actions

ACTION	4 TO 5	3	1 TO 2	N/A	ALREADY DOING
OPERATE COMPRESSORS ACCORDING TO AIR DEMANDS	52%	9%	7%	28%	4%
START A FORMAL LEAK REPAIR PROGRAM	49%	10%	7%	28%	6%
UPGRADE COMPRESSED AIR SYSTEM MAINTENANCE PROGRAM	48%	10%	9%	28%	6%
START A FORMAL LEAK DETECTION PROGRAM	46%	13%	7%	28%	6%
ADD AIR RECEIVER CAPACITY	39%	13%	18%	29%	1%
CONTACT MY LOCAL DISTRIBUTOR ABOUT SYSTEM UPGRADES	30%	23%	13%	29%	4%

Some of the verbatim comments made by respondents are provided below. These comments are overwhelmingly positive. The only negative comments concerned the order of the *PowerPoint* slides and set up of the case study. One participant also wanted more information on incentives, tax credits, etc.

- *A Level 2 course should be offered in Portland, OR (5 suggestions).*
- *Great informative class! I learned a lot of useful mathematical formulas for use in my industry as part of my job responsibilities.*
- *Very informative.*

- *Very good!!*
- *This is great!*
- *Nice class, material not exclusive to engineers.*
- *Second time. Glad to see increased focus on VFD and no air loss drains. Cycling dryers should be emphasized more.*
- *I'm an air treatment manufacturer, so I don't have a plant in which to implement this system, but I will have opportunities to mention this to customers and coach them on the system.*
- *This was new info for me. I'm just beginning to work with customers who use small compressed air systems. This was a great informative session. The printed materials are very valuable because I can go to them as reference.*
- *PowerPoint slides slightly out of order. Laser pointer should be used. Slides (photos) were great. Good team approach and group work.*
- *Good presentation - case study set up a little fractured but not a big deal.*
- *Include more references to incentives, state tax credits, energy analysis support, etc. Tools to get projects approved.*

Follow-Up Internet Survey Results

Characteristics of Respondents

Thirty-four end-user attendees of the CAC fall 2002 *Level 1* trainings who had e-mail addresses were selected to be surveyed by Internet. The fourteen respondents to this survey had the following characteristics:

- Ten of the fourteen firms were industrial, three were institutional, and one was commercial.
- Respondents held the titles shown below in *Table 31*. Respondents' responsibilities for the compressed air systems in their plants were broad. Nine of fourteen had both management

responsibilities (system purchase, specification, and sizing/design, etc.), as well as operational responsibilities (e.g., daily system operation, preventative maintenance, repair, and trouble shooting). Among the remaining five, three had responsibilities more in the maintenance and operations category, while two had responsibilities in the management category.

Table 31: Respondent Titles

TITLE	NUMBER
FACILITY MANAGER	1
PLANT ENGINEER	3
HEAD OF MAINTENANCE/MECHANICAL	3
PROJECT/PROCESS ENGINEER	5
MAINTENANCE/ELECTRICIAN	2

Practices Changes

In the follow-up survey, participants were asked which compressed air management activities they had done as a result of attending the CAC training. Overall, 79% of respondents or 11 of 14 reported that they had done at least one activity. Fifty-seven percent of respondents reported that they had done one or more activities. A total of 26 activities were reported by these 11 respondents.

As shown in *Table 32* below, the two most common activities were starting a formal leak detection and repair program and operating compressors according to air demand. These were also the top two responses in the exit survey to the question of what participants thought they would likely or very likely do as a result of attending the training. Not surprisingly, respondents were more optimistic about what they thought they would do than what they actually did. For example, 52% of respondents to the exit survey said they planned to operate compressors according to air demand, but only 36% of respondents to the follow-up

Internet survey reported that they had followed through three months after the training.

Table 32: Compressed Air Management Activities

ACTIVITY	PERCENTAGE OF RESPONDENTS N=11
STARTED A FORMAL LEAK DETECTION OR REPAIR PROGRAM	43%
OPERATE COMPRESSORS ACCORDING TO AIR DEMAND	36%
DEVELOPED A COMPRESSED AIR SYSTEM BASELINE DESCRIPTION	29%
CONTACTED MY LOCAL DISTRIBUTOR ABOUT SYSTEM UPGRADES	21%
UPGRADED OR ADJUSTED COMPRESSED AIR CONTROL SYSTEMS	21%
ADDED AIR RECEIVER CAPACITY	21%
UPGRADED OR ADJUSTED COMPRESSED AIR SYSTEM MAINTENANCE PROGRAMS	7%
EDUCATED MANAGEMENT	7%
AT LEAST ONE ACTIVITY	*79%*
MORE THAN ONE ACTIVITY	*57%*

Respondents were also asked whether they had gathered information on the total number of horsepower of air compressors at their facility since attending the training. Sixty-four percent said they had, 21% said they had not, and 14% did not respond. However, overall, 12 of 14 were able to provide an estimate of their total compressed air horsepower, and all 14 provided the number of compressors in their plant. These results are summarized in *Table 33* below. As shown, the distribution of respondents across horsepower ranges is uniform.

Table 33: Reported Compressed Air Horsepower and Number of Compressors

COMPRESSED AIR HORSEPOWER	PERCENTAGE N=12
UNDER 100 HP	25%
100 HP TO 250 HP	25%
250 HP TO 500 HP	25%
OVER 1,000	25%
TOTAL	100%
NUMBER OF COMPRESSORS	PERCENTAGE N=14
1 TO 3 COMPRESSORS	50%
4 TO 10	36%
OVER TEN	14%
TOTAL	100%

Participants were then asked a series of questions in which they were asked to choose the statement that best described their use of a certain compressed air management practice. The overall conclusion is that the CAC *Level 1* trainings are having a substantial impact on end-users' compressed air management practices. Some of the highlights are summarized below.

- **Operating Costs.** The training had a substantial impact on participants' consideration of operating costs in compressed air system management. A total of 64% of responses indicated change as a result of the training (43% of respondents said they had changed the way they looked at operating costs and 21% were going to use operating costs for system management in the near future). While none said they had actually started using operating costs, this may be because the survey followed only three months after the training. Just 14% of respondents said they had been using operating costs "for some time."

- **Program to Manage Compressed Air Leaks.** The impact of the training on leak detection and repair programs was substantial. A total of 71% indicated actual or planned changes since the training (21% said they had developed a program since the training, 14% said they had changed their program, and 36% said they were going to develop a program in the near future). Twenty-one of respondents indicated they already had a complete program to manage compressed air leaks. Only one respondent said they had no plans to develop a program; he said staffing was the issue.

- **Program of Maintenance.** Although 93% of respondents indicated they already had a program for compressed air system maintenance before attending the training, 29% also said they planned to upgrade their existing program. For respondents who had not made or did not plan to make any changes to their existing program, the main issues were budget/cost (2 responses), waiting until plant equipment changes/upgrades are complete (2 responses), staff time (1 response), and management buy-in (1 response).

- **Requests to Management to Fund System Improvements.** Forty-three of respondents either said that they had started asking management to fund compressed air improvements or were going to ask management to support compressed air improvements (14% and 29% respectively). Thirty-six percent said they had always had management support for compressed air improvements. Twenty-one percent responded that they were "not sure" if requests had been made to management since the training. In a separate question, when asked to characterize management's level of support for improvements to compressed air system management, 36% of respondents said very supportive, 43% of respondents said "somewhat," 7% said not supportive and 14% said they were not sure. These results indicate an important role for CAC in helping participants identify opportunities for compressed air system management improvement and explain the benefits to their plant management. One participant also specifically mentioned the need for more tools and information in the training for helping participants get projects approved, such as energy analysis tools and information on incentives and tax credits.

- **Interactions with Vendors Concerning System Efficiency (Q13).** Responses to the question about describing interactions with equipment vendors were mixed. Twenty-one percent of respondents said they had asked vendors about compressed air efficiency since the training. Twenty-nine percent said they have been working with a vendor on efficiency for some time. However, 29% of respondents said they had no plans to ask vendors about efficiency. To the question of why not, one said because they did not plan to upgrade equipment, another said because of the cost of upgrades, and a third said because of a lack of management buy-in. It may be that end-users consider their vendors narrowly as a source of equipment rather than a resource for compressed air management.

Energy and Non-Energy Benefits

The following results indicate that respondents are achieving both energy and non-energy benefits as a result of the training:

- Forty-three percent of respondents (6 of 14) said they had saved compressed air energy and dollars.

- Fifty-seven percent of respondents thought there were "large" energy savings cost benefits and 36% thought that there were "some" energy savings cost benefits from improving compressed air system management.

- Similarly, 57% of respondents thought there were "large" reliability benefits and 36% thought that there were "some" reliability benefits from improving compressed air system management.

- Fifty percent of respondents (7 of 14) said they had achieved one or more non-energy benefits. A total of 18 benefits were reported as shown in *Table 34* below.

Table 34: Non-Energy Benefits

NON-ENERGY BENEFIT	PERCENTAGE N=18
REDUCED SYSTEM MOISTURE	28%
REDUCED SYSTEM CONTAMINATION	28%
MORE CONSISTENT PRESSURE TO END USES	22%
REDUCED PRODUCTION DOWN TIME	11%
RESTORATION OF ADEQUATE PRESSURE TO ALL PARTS OF THE PLANT	11%
TOTAL	100%

When asked what might help participants improve their compressed air management practices, two said more funding or capital, two said more time, two said more data on compressed air costs, and one said buy-in from all parties involved in compressed air decisions.

Respondents were also asked their awareness of other energy efficiency programs and brands. The responses are shown in *Table 35* below in order of most well-recognized to least well-recognized.

Table 35: Awareness of Energy Efficiency Programs or Brands

PROGRAM OR BRAND	KNOW SOMETHING ABOUT	HAVE HEARD OF	DON'T KNOW	NO RESPONSE
NEMA PREMIUM EFFICIENCY MOTORS	71%	14%	7%	7%
MOTOR CHALLENGE	43%	29%	14%	14%
ELECTRIC MOTOR MANAGEMENT (EMM)	57%	14%	21%	7%
PUMPING SYSTEMS ASSESSMENT TOOL (PSAT)	36%	7%	36%	21%
MOTOR DECISIONS MATTER (MDM)	14%	14%	43%	29%
SAV-AIR COMPRESSED AIR CONTROL AND MANAGEMENT SYSTEMS	7%	21%	36%	36%

As shown, *NEMA Premium Efficiency Motors* were the most recognized brand while *Motor Decisions Matter* and *SAV-AIR* were least recognized. Even though awareness of *SAV-AIR* is only 28%, this is a significant achievement in market knowledge for this Initiative.

VI. Pumping System Assessment Tool (PSAT) Survey Results

A. Introduction

The *Pumping System Assessment Tool* (PSAT) is a software program developed for the U.S. Department of Energy. Its purpose is to assist users in assessing the extent of energy savings opportunities in pumping systems. Anyone involved with the use, management, or maintenance of pumping systems can benefit from a PSAT workshop, but it is particularly applicable to engineers who need to understand the pump as part of a system rather than as an individual component. Managers will find the workshop and software useful for estimating operating costs and understanding how to quantify energy savings.

B. Key Findings

Based on the evaluators' review of exit surveys completed immediately after the workshop, and follow-up Internet surveys conducted four months later, the PSAT workshops have been effective in reaching end-users, consultants, and equipment and service providers, motivating them to consider pumping system optimization and operating costs.

However, while a number of respondents to the follow-up Internet survey reported that they have taken some action and installed the PSAT software, none could report quantified energy savings from pumping system improvements as yet. Given the relatively long timelines involved in planning, designing, and implementing pumping system changes, it is not surprising that respondents could not yet report specific savings. System changes usually require capital investments, and often can only be done during scheduled plant shutdowns when maintenance needs and other production line changes are in competition with system optimization projects.

Overall, attendees represented a variety of industries and several commercial and educational facilities. However, the chemical, petroleum, and irrigation industries were underrepresented, considering that they have significant pumping and are important regional industries. More targeted marketing to these sectors would be helpful. There could be a class oriented towards irrigation end-users in regions such as eastern Oregon,

Washington and Idaho. Such a class could be associated with a meeting of irrigators.

Personal marketing by vendors to their customers is another avenue to explore. One in five attendees responding to the exit survey said they thought they would contact vendors about products following the workshop, suggesting that attendance encourages actions that may result in vendor sales. Further, in response to the Internet survey, 19% said they actually had contacted a pump equipment vendor.

C. Detailed Results

Workshops for PSAT software were offered at three locations in the Northwest at the beginning of 2003. The workshop locations and attendees are described in *Table 36*.

Table 36: Workshop Locations and Attendees

WORKSHOP		ATTENDEES				
LOCATION	DATE	TOTAL	END-USER	UTILITY/ GOVERNMENT	CONSULTANT	EQUIPMENT & SERVICE PROVIDER
BOISE, ID	1/28/2003	34	23	4	0	7
PORTLAND, OR	1/31/2003	61	38	13	8	2
RENTON, WA	1/29/2003	48	21	20	5	2
TOTAL		143	82	37	13	11
ORGANIZATIONS REPRESENTED		64	39 (61%)	10 (16%)	8 (12%)	7 (11%)

The attendees of the PSAT training workshop completed an in-course evaluation, which was followed by this Internet survey about four months after attendance. Disposition of each of the course evaluations and the Internet survey is as follows:

- One hundred forty-three total registered attendees.

- One hundred twelve course evaluations completed.
- Overall, there was a 78% response rate for the course evaluations (the responses are described below).
- Seventeen sponsors or end-users without email were not surveyed.
- One hundred twenty-six Internet survey solicitations were sent by email.
- Eight email addresses were bad or participation was declined.
- Forty-four Internet surveys were completed.
- Overall 37% response rate was achieved for the Internet survey.

Course Evaluation Responses

In terms of what attendees expected they would do following the workshop, most said they intended to use PSAT and to screen for pump system optimization candidates. One in five of the attendees thought that they would contact vendors about products. This suggests that vendors should personally market PSAT to their customers as attendance encourages actions that may result in vendor sales. Overall, only 2% of respondents thought that they would *not* take any action as a result of the workshop. These results are shown in *Table 37*. Note the comparison of these responses to those in *Table 43* below, which shows what attendees had *actually* done about four months after the workshop. Many more attendees (by about a factor of four) expected to use the PSAT software than actually had so after four months.

Table 37: Expected Actions from PSAT Workshop

COURSE EVALUATION: EXPECTED ACTIONS (104 RESPONSES)	COUNT	PERCENT
SCREEN FOR POTENTIAL PUMP SYSTEM OPTIMIZATION CANDIDATES	74	71%
EVALUATE PUMPING SYSTEM PERFORMANCE USING THE PSAT SOFTWARE	83	80%
PERFORM AN ECONOMIC ANALYSIS ON POTENTIAL PUMPING SYSTEM UPGRADES	63	61%
REVIEW THE BALANCE BETWEEN SUPPLY AND DEMAND FOR MY PUMPING SYSTEMS	38	37%
CONTACT VENDORS ABOUT PRODUCTS	21	20%
CONTACT CONSULTANT OR ENERGY SERVICE PROVIDER FOR ADDITIONAL EVALUATION	14	13%
UPGRADE MOTOR/DRIVE SYSTEMS	29	28%
I DON'T EXPECT TO TAKE ADDITIONAL ACTION	2	2%
OTHER	11	11%

The vast majority of the attendees reported that the workshop gave them some comfort in using the PSAT software (*Table 38*). However, it should be noted that out of 43 written comments, six specifically asked that the workshop include more hands on experience with the software.

Table 38: Comfort with PSAT Software

COURSE EVALUATION: COMFORTABLE WITH PSAT? (101 RESPONSES)	COUNT	PERCENT
YES	89	88%
NO	9	9%
DON'T KNOW	3	3%

The ratings attendees gave to four workshops sections were only about 80% of the highest possible score, while the instructor was more highly

rated. The average score for four workshop sections and four instructor attributes are described in *Table 39*. It is noteworthy that the item receiving the lowest rating for effectiveness was the portion on solutions to a specific problem (3.7 out of 5), suggesting that more time might be allocated to case studies. The instructor attribute rated lowest was "stayed on topic and on time." Indeed, comments indicated that a great deal of material was included in a one-day workshop and portions were rushed.

Table 39: Course and Instructor Ratings

COURSE EVALUATION: WORKSHOP SECTION RATING (N=112)	AVERAGE (MAX 5.0)
MOTOR-DRIVEN SYSTEM ASSET MANAGEMENT	4.1
SCREENING FOR OPTIMIZATION CANDIDATES	4.0
OBTAINING GOOD FIELD MEASUREMENTS	4.1
DISTINGUISHING BETWEEN SUPPLY AND DEMAND	4.0
COURSE EVALUATION: WORKSHOP EFFECTIVENESS (N=106)	**AVERAGE (MAX 5.0)**
PUMP AND SYSTEM BASICS	4.3
IDENTIFYING OPPORTUNITIES FOR EFFICIENCY	4.4
DIFFERENTIATING COMPONENTS AND SYSTEMS	4.1
ENERGY & ECONOMIC ANALYSIS TECHNIQUES	4.2
USEFUL SOFTWARE APPLICATIONS	4.3
SOLUTION(S) TO A SPECIFIC PROBLEM	3.7
COURSE EVALUATION: INSTRUCTOR ATTRIBUTES (N=106)	**AVERAGE (MAX 5.0)**
INSTRUCTOR WAS KNOWLEDGEABLE	4.8
INSTRUCTOR USED EFFECTIVE PRESENTATION SKILLS	4.6
INSTRUCTOR RESPONDED TO QUESTIONS EFFECTIVELY	4.6
INSTRUCTOR STAYED ON TOPIC AND ON TIME	4.4

Overall, attendees represented a variety of industries and several commercial and educational facilities. However, the chemical, petroleum, and irrigation sectors were underrepresented considering that they have significant pumping and are important regional industries. The end-users' company types in attendance are listed in *Table 40*.

Table 40: End-User Company Types

END-USER COMPANY TYPE (N=82)	COUNT	PERCENT
AEROSPACE	8	10%
AGRICULTURE	4	5%
COMMERCIAL/EDUCATIONAL	11	13%
FOOD PROCESSING	10	12%
HEALTH CARE	1	1%
HIGH TECH	14	17%
MINING/MINERALS	1	1%
IRRIGATION	2	2%
OTHER INDUSTRY	3	4%
PRIMARY METALS	2	2%
PULP & PAPER	3	4%
WATER/WASTEWATER	22	27%
WOOD PRODUCTS	1	1%
CHEMICAL/PETROLEUM	0	0%

Fifty end-users or 61% reported information on the number and size of pumps in their facility in the exit survey. *Table 41* shows the total number of pumps in five size categories. On average, these fifty end-users had about 150 pumps each totaling 9,000 horsepower. Note that those reporting on total pump horsepower in the Internet survey reported a much smaller average of 66 pumps totaling just over 2,800 horsepower.

Table 41: Number of Pumps

REPORTING ATTENDING END-USERS	PUMPS <50 HP	PUMPS 50-100 HP	PUMPS 125-250 HP	PUMPS 300-500 HP	PUMPS >500 HP
50	5,529	1,423	577	171	80

To extrapolate to all end-users registered for the three Northwest PSAT workshops, end-users responsible for managing between five thousand and twelve thousand pumps were exposed to improved practices for operating and designing pumping systems.

Follow-Up Internet Survey Responses

For the Internet survey, the types of respondents and the organizations that were represented are described in *Table 42*.

Table 42: Internet Survey Respondents

CATEGORY	TOTAL	END-USER	UTILITY	CONSULTANT	EQUIPMENT & SERVICE PROVIDER
RESPONDENTS	44	30	7	5	2
ORGANIZATIONS REPRESENTED	24	17	3	2	2

The Internet survey asked respondents what activities they have done as a result of attending the PSAT workshop. Respondents most often reported that they had screened for potential pump system optimization projects, followed by evaluation of pump system performance and economic analysis of pump system upgrades.

Table 43 shows these results. Note the comparison of these results to that of the course evaluation in *Table 37* above. Many more attendees (by about a factor of four) expected to use the PSAT software than actually had after four months.

Table 43: Activities Resulting from Workshop Attendance

ACTIVITIES RESULTING FROM ATTENDING THE PSAT WORKSHOP (32 RESPONDENTS)	COUNT	PERCENT OF RESPON-DENTS
SCREENED FOR POTENTIAL PUMP SYSTEM OPTIMIZATION CANDIDATES	10	31%
EVALUATED PUMPING SYSTEM PERFORMANCE USING THE PSAT SOFTWARE	8	25%
PERFORMED AN ECONOMIC ANALYSIS ON POTENTIAL PUMPING SYSTEM UPGRADES	8	25%
REVIEWED THE BALANCE BETWEEN SUPPLY AND DEMAND FOR PUMPING SYSTEMS	7	22%
CONTACTED VENDORS ABOUT PRODUCTS OR SERVICES	5	16%
CONTACTED CONSULTANT OR UTILITY FOR ADDITIONAL EVALUATION SERVICES	6	19%
UPGRADED A MOTOR OR DRIVE SYSTEM FOR A PUMP	5	16%
MADE A CHANGE TO A PUMPING OR PIPING SYSTEM	7	22%
NOTHING YET	3	9%

* Multiple responses allowed.

Another related question was whether they had gathered information on the total horsepower and number of pumping systems in their facilities. Responses are shown in *Table 44* below.

Table 44: Information on Total Horsepower

GATHERED TOTAL HORSEPOWER AND NUMBER OF PUMPING SYSTEMS (32 RESPONDENTS)	COUNT	PERCENT
YES	3	9%
NO	25	78%
ALREADY HAD COMPLETE INFORMATION	4	13%

Respondents were asked to describe their interaction with pumping equipment vendors concerning system efficiency (*Table 45*). These results correspond well with the course evaluation that suggested that 20% of those completing the survey would be contacting vendors about products.

Table 45: Interactions with Pumping Equipment Vendors

INTERACTIONS WITH PUMPING EQUIPMENT VENDORS (41 RESPONSES)	COUNT	PERCENT
WE'VE BEEN WORKING WITH OUR VENDOR ON PUMPING EFFICIENCY FOR SOME TIME	15	37%
SINCE THE WORKSHOP WE'VE ASKED OUR VENDOR ABOUT PUMPING EFFICIENCY	5	12%
WE ARE GOING TO ASK OUR VENDOR ABOUT PUMPING EFFICIENCY IN THE NEAR FUTURE	3	7%
WE HAVE NO PLANS TO ASK OUR VENDOR ABOUT PUMPING EFFICIENCY	0	0%
NOT SURE	12	29%
DON'T KNOW	6	15%

About 45% of respondents said they had installed the PSAT software (*Table 46*).

Table 46: Installation of PSAT Software

INSTALLED PSAT SOFTWARE (42 RESPONDENTS)	COUNT	PERCENT
YES	19	45%
NO	23	55%

Half of the respondents were either using the PSAT software already, started using it after attending the workshop, or intend to use it sometime soon. The results of intentions for use of the PSAT software are shown in *Table 47*.

Table 47: Use of PSAT Software

INTENTIONS FOR USE OF THE PSAT SOFTWARE (42 RESPONSES)	COUNT	PERCENT
WE'VE BEEN USING THE PSAT SOFTWARE (OR SIMILAR TOOLS) FOR SOME TIME	3	7%
SINCE THE WORKSHOP WE'VE USED THE PSAT SOFTWARE	5	12%
WE ARE GOING TO USE THE PSAT SOFTWARE IN THE NEAR FUTURE	13	31%
WE HAVE NO PLANS TO USE THE PSAT SOFTWARE	3	7%
NOT SURE	14	33%
DON'T KNOW	4	10%

We view the use of pumping system operating costs as a strong indicator of intentions for taking action on energy efficiency. Many of the respondents said they had already been using pumping costs before attending the workshop (40%), while a few have changed the way they use pumping costs as a result of the workshop (5%). None of the respondents said they had started using pumping costs in the four months between the workshop and the Internet survey, although 14% said that they were going to use pumping costs soon. *Table 48* details these results.

Table 48: Use of Pumping Costs for System Optimization

USE OF PUMPING COSTS FOR SYSTEM OPTIMIZATION (42 RESPONSES)	COUNT	PERCENT
WE'VE BEEN CONSIDERING PUMPING COSTS FOR SOME TIME	17	40%
SINCE THE WORKSHOP WE'VE CHANGED THE WAY WE USE PUMPING COSTS	2	5%
SINCE THE WORKSHOP WE STARTED USING PUMPING COSTS	0	0%
WE ARE GOING TO USE PUMPING COSTS IN THE NEAR FUTURE	6	14%
WE HAVE NO PLANS TO USE PUMPING COSTS	5	12%
NOT SURE	6	14%
DON'T KNOW	6	14%

Finally, Internet survey respondents were asked what other resources they might need for system assessment and optimization. Eleven respondents said that they needed no other resources, but eighteen said they did need additional resources and provided the following verbatim responses, a number of which mention more time and financial resources. The verbatim comments are listed below.

- *Site visits with real measurement taken and then plugging results into PSAT.*
- *More training.*
- *Money…My management is supportive of all efforts that will provide reduced costs and improved performance. We are, however, a very "appearance" sensitive industry. I have to compete with all the "new" hotels in order to maintain an image that is acceptable to our existing and prospective clients. Management has to walk a narrow expense path in balancing the needs for capital improvement and maintenance and the upkeep of the guest side of the facility.*
- *Just more time.*
- *Time to assess and implement the program.*

- *Support of management.*
- *Coordination of hundreds of small to large pumping systems scattered throughout the state. A management directive [would help].*
- *I need one or two more engineers and capital.*
- *Knowledgeable consultants and vendors.*
- *PSAT technical support.*
- *[Need] time to create analysis of complicated domestic hot water loop in our restaurant [and] water contaminant testing.*
- *Manpower and budget.*
- *A crystal ball.*
- *Besides a vision and mission statement around implementing a pumping system optimization program, I don't know!*
- *More utility money.*
- *More access to technical assistance other than vendors such as OIT or Don Casada.*
- *Technical support for preparing presentations and project justifications to management.*
- *Our company uses all resources that are already available to us.*

VII. Issues and Recommendations

These recommendations are listed in approximate order of their importance according to the evaluators.

Recommendation: Take the Most Motivated End-Users and MSCs to the Next Level

Issue: This recommendation from MPER #4 was to identify motivated end-users and motor service centers that are most likely to move forward with practice changes and upgrades of services.

The *Drive Power* work plan needs to include a list of *names of specific motor users* with whom each field consultant plans to continue to work. Field consultants then need to create a brief plan for each customer outlining what they will do to create a success. New candidates need to be evaluated carefully to assess potential as well.

Motor service centers can be taken to the next level, no matter where they may be in their support of good motor management practices. This should include some of the 40% of shops that are not EASA members.

In general, the Initiative needs to assess the degree to which they have already created a market infrastructure among motor service centers that can support and sustain market change in motor management services, and develop a plan for strengthening that infrastructure over the coming year. For those shops that are EASA members, the Initiative should develop an overall plan for using EASA more deliberately and strategically as a leverage point to move these shops forward as a group.

Recommendation: Update Existing Success Stories and Develop New Ones

Issue: Through May 2002, thirteen formal stories documenting motor management successes had been prepared; these vary in level of reported savings and marketability. In addition, they have not been updated and no new formal success stories have been developed. There is also no story focusing on a motor service center and targeted to that audience. However, there are eight prospective stories on end-users, and three additional "mini" success stories have been prepared.

Based on the evaluators' conversations with field consultants and results of participant surveys, there are many more successes that simply have not been documented. We recommend that the *Drive Power* team update the existing stories to document further progress as well as additional savings and achievements. They should develop more formal stories, and document more "mini" stories. These efforts should include descriptions of non-energy benefits, quantified where possible. Stories on end-users' facilities that have closed or where further savings or successes were not achieved should be set aside and not used for promotion of the Initiative.

The evaluators also recommend that a story be developed specifically focusing on one or more motor service centers' successes in expanding their services and/or upgrading their repair/rewind capabilities. For example, several shops have purchased core-loss testers as a result of being involved in EMM. They see them as important to providing good service and remaining competitive in the marketplace. At least one shop is now developing databases for its key customers and using them to help customers plan for their repair/replace needs.

Recommendation: Develop a Long-Term Plan for CAC, PSAT, and the EMM Seminars

Issue: A specific long-term plan for marketing the CAC, PSAT, and EMM seminars would help ensure that these trainings are as effective as possible as market transformation tools.

Towards this end, there are three specific suggestions:

- **Targeted Marketing:** Analysis of market penetration to date by sector and geographic area, as well as types of participants for each seminar would help inform how marketing should be targeted going forward. For example, the chemical, petroleum, and irrigation industries have so far been underrepresented at the PSAT seminars. These industries have very significant pumping energy and also typically have their own engineering staff that could benefit from the workshop. Regarding types of attendees, the proportion of compressed air end-users for CAC *Level 1* seminars could be higher.

- **Personal Marketing:** There should be a specific written plan for earlier involvement by the EMM field consultants, vendors, and utilities in personally marketing the seminars to targeted

end-users. Vendors should be interested in capitalizing on the potential to build customer relationships by promoting the training; surveys indicated that twelve percent of attendees contacted vendors for services after attending PSAT. Cancellation of the CAC seminar in Everett, Washington, for lack of registrants might have been avoided had there been more personal marketing earlier by both field consultants and the sponsoring utility.

- **Specific Long-Term Plan for CAC Seminars:** There should be a specific long-term plan for where and when *Level 1* and *2* seminars will be offered in the region through 2004, so the two courses can be coordinated. In particular, there has been interest in a *Level 2* course in Portland. In addition, the Alliance should expand the instructor pool for CAC as there are currently only two. The Alliance also may want to consider coordinating this training with a plan for offering the *AirMaster+* course in the region. This three-day systems-oriented course includes software training and an exam leading to formal certification. *AirMaster+* would help support the development of skilled and certified service providers and thus strengthen market infrastructure.

- **Continuing Education:** Arrange for the EMM seminar to qualify for continuing education for journeyman electricians and to meet continuing education requirements for professional engineers.

Recommendation: Develop an Advanced Seminar on Database Use and Simple Motor Systems Concepts

Issue: The basic EMM seminar continues to be a great success. There is now a pool of end-users and motors service centers that could benefit from a more advanced seminar that includes simple motor systems concepts. Introducing a new seminar east of the Cascades is also important as the field consultants in those areas report that the market for the basic EMM seminar is becoming saturated.

We recommend that the *Drive Power* team develop an advanced half-day seminar for end-users and motor service centers that covers the following topics:

- Tips for mining a motor management database to maximize plant reliability and energy savings over time.

- The benefits of a motor database for systems applications.

- An introduction to simple motor systems concepts including some, but probably not all of the following:

    - Simple motor monitoring to assess sizing (using recording clamp-on ammeter);

    - Reliability and efficiency benefits of cogged belt drives (and longer life benefits);

    - Basics of variable frequency drives and their use, specification and installation; and

    - Basics of centrifugal loads and cube laws.

Recommendation: Take a More Incremental Approach to Motor Systems Work Over the Coming Year

Issue: In addition to keeping an eye out for larger motor systems projects, more "incremental" efforts also have merit in moving Drive Power in the direction of systems work over the next year or so.

We have three specific recommendations:

- **Develop an advanced seminar** including simple motor systems concepts (see above recommendation).

- **"Mine" the PSAT attendees** following the trainings to reveal where opportunities are for motor systems work and case studies.

- **Focus on smaller pilot projects** than those pursued with Blue Heron and SP Newsprint. For example, develop a smaller project and associated case study on simple system changes and improvements relating to motor sizing or application.

Recommendation: Expand the Drive Power End-User Database and Make Data Collection Consistent

Issue: Development of a comprehensive database of Drive Power EMM participants has been a long-term recommendation. It has significant benefits for the Initiative in terms of understanding achievements and developing efficient and targeted marketing and contact strategies. The Alliance and the Initiative can use the database to make estimates of Initiative energy savings.

We recommend that the database of EMM participants be expanded to include attendees of the EMM seminars, CAC and PSAT trainings, *EM2* software users, and recipients of the *Windings* newsletter. In addition, we have the following recommendations for making data collection and entry easier:

- The trip report form used by the consultants for end-user visits should be revised to include the same data points contained in the database. It must be electronic and the same version used by all parties. *Drive Power* should consider installing it on a *PalmPilot*™ for use in the field with customers and MSCs.

- For each training, data should be entered electronically as registrations come in, using the same *Excel* format each time. The *Excel* column headings should exactly match the data fields in *Access* so uploading the data is easy. Registration forms should include e-mail address and number of motors.

- At each training, a hard copy of the registration list should be provided to the on-site registration person. Attendees should check off their names as they arrive. Additional spaces should be provided at the bottom of the sheet for walk-ins, and the registration person should make sure the information is filled out completely. The registration list should be returned promptly to the staff person assigned to data entry. That person's name, address, and phone number should be provided on the registration form. The registration list should be returned with the completed exit surveys.

- Assignment of responsibilities for initial data entry of registrations, for on-site registration, and for recording of actual attendees should be clarified.

- Data collection for users of *EM2* also needs to be made consistent.

- The *Windings* mailing list should be culled and updated.

Recommendation: Involve Field Consultants in Initiative Planning

Issue: With their "on the ground" knowledge and their relationships with end-users and motor shops, the field consultants have a particular advantage to be able to assist the Alliance's market transformation efforts in motor management and motor systems. Taking advantage of this knowledge would benefit the Initiative.

It is recommended that the field consultants be involved in Initiative planning, with their suggested role being to review and comment. Besides the contributions they could make, particularly in helping shape the strategic direction of their own work, their involvement would help avoid a repeat of times in the past when they were unsure of what to tell end-users and shops. In addition, any exit strategy for the Initiative will need to include an approach for reduction of field consultant availability and a communications plan to end-users and motor shops.

Recommendation: Help the Field Consultants Better Understand Their Role in Market Transformation

Issue: Offering of seminars, working with end-users, and developing relationships with motor shops are important on-the-ground efforts, but it is not certain whether field consultants have a clear vision of how their work drives market transformation and what the relationship is between their work and the Initiative goals.

It would be useful to revisit any documentation of the *Drive Power* market transformation strategy and story, revise it as needed, and discuss it with the field consultants. It would also be important to include the market transformation piece in the *Drive Power* work plan.

Recommendation: Leverage EM2 Users Motor Fleet Data

Issue: Much of the evidence for market transformation has been limited to anecdotes. Concrete data for understanding market change is being developed in the overall Initiative database, but more data could be beneficial. Users of the EM2 software have documented their motor fleet – this may be useful information if it can be collected and analyzed.

We recommend that the Initiative obtain copies of *EM2* users' motor databases and analyze and evaluate them for potential recommendations to the customer. This analysis could reveal potential case studies for fan or pump systems improvements. Databases should be screened before extensive analysis is done to identify ones that have potential. Analysis methods and possible results should be worked out in advance to make certain that this effort has merit.

Recommendation: Revise and Regularly Update the Electric Motor Management Web Site

Issue: The EMM web site (www.drivesandmotors.com) should be a resource for current information on training opportunities and for information resources. However, updates and corrections to the EMM web site seem to be done only occasionally. In particular, the calendar of events is often out of date for long periods of time.

Develop a plan for regular update of the *Electric Motor Management* web site and implement it. This should particularly include the event calendar. The web site could also benefit from some changes in links and content, particularly regarding training costs and making registration forms available online. Tracking hits on the EMM web site could provide valuable feedback of interest and the value of that service. The evaluation team has detailed these in a separate memorandum.

Recommendation: Leverage Motor Rebates

Issue: Incentives or rebates for installation of efficient motors are often a driver for organizations to upgrade their motor fleet. Several entities are offering rebates for NEMA Premium efficient motors including the Energy Trust of Oregon, the Eugene Water and Electric Board, Seattle City Light, and Baldor Motors.

The *EMM Initiative* should use their web site, field consultants, EMM and PSAT seminars, and *Windings* to inform motor users of incentives. A uniform list of motor rebates offered by various entities would be helpful. The field consultants should leverage the availability of these rebates wherever possible, since rebates may make some motor replacements economically attractive that otherwise might not be. (It is also important to emphasize that end-users should still consider operating costs in their decisions, not just the availability of incentives.) The field consultants might also use the rebates to encourage industries to establish guidelines for purchase of NEMA Premium motors, a more effective way to achieve broad practice change than influencing single purchase decisions.

Recommendation: Add One More Tool to the EMM Toolkit

Issue: In MPER #4 we recommended providing a written description of how to formulate a repair/replace guideline, along with several examples. This recommendation still holds.

One solution to this would be to incorporate some of the materials from the *Motor Decisions Matter's 1-2-3 Approach* when it is finalized.

Recommendation: Address Concerns and Misunderstandings about Premium Efficient Motors

Issue: The evaluators have observed that both customers and shops continue to express various concerns about premium motors, including their reliability, availability, application, and how the motor is classified.[26]

We recommend that these concerns be directly addressed in both the *Electric Motor Management* seminars and in field consultants' work with customers. The Initiative should also make sure it consistently uses the term "NEMA Premium" efficient motors to clearly distinguish this official trademark and efficiency rating.

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[26] For example, in an EASA meeting in Roseburg, Oregon, in the spring of 2003, an EASA shop said they had replaced all the motors in a hospital with premium efficiency motors and that energy usage had increased. It turned out that the problem was that the motors were running faster and the fan systems were not retrofitted to account for this.

Recommendation: Install EM2 on a *PalmPilot™* and Market Them Together as a Package

Issue: For some potential EM2 users, the incremental step in technology is significant. Installation of software and purchase of computer hardware may be a barrier to some. An organization's policies may more easily allow for the purchase of a dedicated "motor inventory device" whereas the purchase of a PalmPilots™ as a calendar and address book might not be supported.

The Initiative might consider installing *EM2* on *PalmPilots™* and marketing them together as a package. This would likely increase the number of customers using this convenient data collection approach and would resolve any customer or MSC concerns about installing the software.

Recommendation: De-Emphasize "Free" In the Drive Power Marketing

Issue: Some of the Initiative materials, the web site, and occasionally the field consultants describe the "free services" that are available through EMM to assist end-users with their motor management. Not charging for the services probably overcomes some of the barriers. However, this emphasis may make it more difficult to eventually transition to a situation where the market offers some of these services for a fee and customers are willing to pay for them. In particular, it is important that the field consultants never be perceived by motor service centers as a disincentive to offer motor management services since the program can offer them free of charge. There may also be some potential users getting impressions that the Drive Power services are not valuable because they need to be given away.

We recommend toning down the mention of free services, given the Alliance's goal of market transformation. Alternative language could be used such as "funded by the Northwest Energy Efficiency Alliance, a non-profit group of electric utilities, state governments, public interest groups, and industry representatives." In fact, the Alliance should consider the possibility of moving towards charging a modest fee for at least some of their services. This might be considered for the EMM seminars and the *EM2* software.

Recommendation: Create an On-Line EMM Seminar

Issue: Some end-users and shops may not be able to attend an on-site seminar because of time, expense, logistics, or other reasons.

The Initiative should consider creating an electronic version of the EMM seminar that could be accessed via Internet so students could learn about motor management at their convenience. The course could include exercises and an exit survey like the in-person version. Students would be asked to provide company information, including number of motors, just as they do when attending an on-site seminar. Students would be encouraged to contact the field consultants by email or telephone with any questions about the course or motor management in their plants. Field consultants could also do follow-up with students as time allowed. This Internet-based course is intended as a supplement, not to replace the existing EMM seminar. While creation of such a course would involve some initial investment, it would be particularly useful for continued market change if/when the in-person EMM seminars are discontinued in the future. It would also enable the Initiative to tap into markets and audiences that may not have been reached so far.