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# Evaluation of Key Alliance Cost Effectiveness Model Assumptions for Motor Rewinds

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## Executive Summary

The Northwest Energy Efficiency Alliance (NEEA) engaged Cadmus in November 2014 to conduct research to update the key Alliance Cost Effectiveness (ACE) model assumptions for motor rewinds performed in 2014 in Idaho, Montana, Oregon, and Washington.

The Drive Power Initiative (DPI), via the Green Motor Initiative (GMI) and the Green Motors Practices Group (GMPG), encourages those in the Northwest's motor service center market to adopt green motor rewind practices. These practices reduce energy use for motors utilized in the agricultural and industrial sectors. Green motor rewinds require rigorous testing and offer greater energy savings compared to standard motor rewinds.

NEEA required a third-party evaluation of its ACE model assumptions for the motor rewind market as part of its long-term monitoring and tracking efforts to determine progress within the market. This evaluation required collection of a range of data to meet three major research objectives to update ACE model assumptions for motor rewinds: (1) determine the size of the motor rewind market in the Northwest; (2) establish the market share of green motor rewind practices; (3) calculate the regional savings for green motor rewinds. Cadmus also collected data to address a fourth supplementary objective to gather market intelligence about motor service centers' number of employees, awareness of the GMPG, and ways to improve future data collection efforts.

## Key Findings to Update ACE Model Assumptions

This section presents Cadmus' key findings, organized by major study objectives to update ACE model assumptions: market size, market share, and regional savings.

**Market Size.** In 2014, Cadmus determined the Northwest market comprised 83 motor service centers—33 GMPG members and 50 nonmembers. Cadmus lists the breakdown of performance by member and nonmember centers below:

- **Number of rewinds.** Motor service centers performed an estimated 3,505 motor rewinds in the Northwest in 2014. GMPG members performed 2,251 (64%) of those rewinds and nonmembers performed 1,254 (36%). The estimated number of rewinds performed by Northwest motor service centers decreased by more than 1,100 motor rewinds—from 4,631 motor rewinds in 2013 to 3,505 in 2014. This decrease in motor rewinds is most likely due to several reasons, including 1) a decline in the motor rewind industry, and 2) the enhancements Cadmus made in data collection, based on findings and recommendations from the 2013 study, and the subsequent changes in Cadmus' study sample between 2013 and 2014.
- **Total horsepower rewound.** Motor service centers rewound motors with a total value of 446,831 horsepower in the Northwest in 2014. GMPG members rewound 341,437 horsepower (76%) and nonmembers rewound 105,395 (24%).

- **Undocumented rewinds.** GMPG member service centers reported that an estimated 20% of all eligible green motor rewinds—constituting 24% of total horsepower rewind—went undocumented and, therefore, did not receive a utility incentive.
- **Application.** Overall, agricultural motors accounted for 54% of the total horsepower rewind at GMPG member motor service centers. Conversely, for nonmember centers, industrial motors accounted for 56% of all horsepower rewind in 2014.

**Market Share.** Cadmus found that GMPG member service centers performed 236 green motor rewinds, representing 50,035 horsepower in 2014. Nonmembers performed 25 green motor rewinds representing 4,435 horsepower in 2014. Green motor rewinds accounted for 21% of all rewinds performed by GMPG member service centers. Over 30% of all horsepower rewind by GMPG member service centers resulted from green motor rewinds.

**Regional Savings.** Green motor rewinds performed in 2014 resulted in an annual total of 1,771,055 (kilowatt hours (kWh) energy savings for member service centers and 84,558 kWh for nonmember service centers.

Table 1 provides the annual kWh energy savings from green motor rewinds by state for GMPG member and nonmember centers.

**Table 1. 2014 Annual kWh Savings from Green Motor Rewinds**

State	Green Motor Rewind Savings (Annual kWh)		
	GMPG Member	GMPG Nonmember	Total
Washington	926,125	0	926,125
Oregon	500,383	0	500,383
Idaho	388,739	0	388,739
Montana	34,463	84,558	119,022
Total	1,849,710	84,558	1,934,268

## Conclusions Regarding Market Intelligence

**Market Transformation.** Cadmus concludes that green motor rewinds have not become standard practice and, therefore, that the region's efforts have not transformed the market for green motor rewinds. GMPG members reported that green motor rewinds comprise 30% of all motors rewind, and a quarter (4 out of 16) of member respondents performed no green motor rewinds in 2014. Only one nonmember, previously a member of the GMPG, reported performing green motor rewinds, which comprised 11% of all nonmember horsepower rewind in 2014.

GMPG members perform more motor rewinds in compliance with green motor rewind standards than nonmembers. While awareness of the GMPG is increasing, surveyed nonmembers were reluctant to join the Green Motors Practices Group — one out of the 17 nonmember respondents who knew of the GMPG planned to join the group. Similarly, while 71% of nonmember respondents were aware of EASA accreditation, 12% (2 out of 17) of those who were aware of it were planning to seek EASA accreditation. Without intervention, the market penetration of green motor rewinds is not likely to increase.

The current study did not explore motor service center reasons for not planning to join the GMPG or seek EASA accreditation. However, in the 2013 study, nonmembers identified the following reasons for not joining the GMPG: lack of proper equipment (specifically, core loss test machines), lack of customer interest, paperwork hassles, a perception that green motor rewinds do not last as long, and lack of time to sign up. Additionally, in the 2013 study, stakeholder interviewees suggested that developing a customer awareness campaign and reducing paperwork burdens could help encourage motor service centers to offer green motor rewinds. While a deeper exploration of motor service center barriers and motivations was outside the scope of this study, these findings suggest that opportunities remain for NEEA to support interventions to transform the market for motor rewinds.

**Future Data Collection Improvements.** Additional engagement strategies and incentives may be necessary to encourage new and ongoing participation in future motor rewind data collection efforts. Thirty-five motor service centers (16 members and 19 nonmembers) completed the data collection forms in 2014, which was an increase from the 27 motor service centers that completed the form in 2013. Although the overall response rate was higher in 2014 than 2013, the number of member centers that participated in the survey decreased from 18 in 2013 to 16 in 2014. Additionally, seven member centers that provided sales data via the data collection form in 2013 declined to do so in 2014.

## Recommendations

Cadmus offers the following recommendations for NEEA's consideration.

- To fully understand the factors influencing the decline in the estimated number of motor rewinds:
  - Continue to collect motor rewind data on an annual basis to provide a time series of data points. More data over a longer period of time will allow for a deeper level of analysis and comparison to better understand the motor rewind market.
  - Continue to improve data collection methods to maintain and encourage participation by member and nonmember motor service centers.
  - Conduct additional research to further qualitatively explore changes and trends in the motor rewind industry.
- To maintain and improve participation in future data collection efforts:
  - Provide motor service centers with advance notification of research efforts and a copy of the data collection form.
  - Provide a financial incentive to members to participate in future motor rewinds studies (similar to the incentive offered to nonmembers).
  - Ask the GMPG administrator to contact member service centers several times throughout the year to encourage their participation.

## 1 Introduction

The Northwest Energy Efficiency Alliance (NEEA) engaged Cadmus in November 2014 to conduct research to update the key Alliance Cost Effectiveness (ACE) model assumptions for motor rewinds performed in 2014 in Idaho, Montana, Oregon, and Washington.

NEEA funded the Drive Power Initiative (DPI) between 1999 and 2004 as an effort to increase motor efficiency and transform the electric motor market. The Electric League of the Pacific Northwest provided the initial funding.

NEEA sought to achieve the following objectives through the DPI:

- Increase the region's overall motor fleet efficiency;
- Influence end users' decision-making processes to repair or replace motors and encourage consideration of life-cycle costing in investment decisions; and
- Help motor service centers improve their repair practices and expand their motor management services.

NEEA began tracking activities and trends in the drive power and motor rewinds markets in 2007 under its long-term monitoring and tracking (LTMT) efforts. Subsequent LTMT reports in 2009 and 2011 updated the ACE model assumptions for motor rewinds, as did NEEA's 2013 Evaluation Review of Key ACE Model Assumptions for Motor Rewinds.

In 2007, the Green Motors Practices Group (GMPG) submitted a request to the Regional Technical Forum (RTF) for approval of deemed savings for motors rewound by participating member centers. GMPG also requested that the RTF recognize and include green motor rewinds on the RTF's list of eligible energy efficiency measures. The RTF approved the green motor rewinds as an eligible energy efficiency measure in 2007. Shortly thereafter, a group of Northwest utilities convened to discuss an approach to support certified green motor rewinds at GMPG member service centers. This group of utilities decided to pursue a regional approach that focused on helping the GMPG, motor service centers, and utilities increase the number of certified green motor rewinds. The group recognized that success depended on agreeing to a simple, market-based approach (such as providing incentives for green motor rewinds), but also understood complete uniformity in executing the approach may not be possible due to utility-specific preferences.

With assistance from NEEA and the region's utilities, Bonneville Power Administration (BPA) formed the Green Motor Initiative (GMI) in 2008. The purpose of the GMI is to educate, train, and certify service centers on effective shop procedures and to offer incentives to service centers and end users for efficient motor rewinds.

Specific objectives of the GMI included the following:

- Grow the GMPG to be self-sustaining through membership and utility programs by 2010.
- Ensure motor service centers in the Northwest train personnel and adopt GMPG rewinding practices by 2010.
- Continue to promote customer motor management practices where all industrial customers demand GMPG-certified rewinds.

The Drive Power Initiative (DPI), via the Green Motor Initiative (GMI) and the Green Motors Practices Group (GMPG), encourages those in the Northwest's motor service center market to adopt green motor rewind practices. These practices reduce energy use for motors utilized in the agricultural and industrial sectors. Green motor rewinds require rigorous testing and offer greater energy savings compared to standard motor rewinds.

Service centers that offer these services must meet, at a minimum, the following GMPG specifications for green motor rewinds:

- There is no visible damage to the motor's core.
- The burn-off temperature does not exceed 385 degrees Celsius (720 degrees Fahrenheit) using verified water mist control.
- The motor must undergo two (or more) core loss tests before and after stripping. The final core's test watts loss per pound is no more than 20% greater than the first test.
- There are no hot spots greater than 10 degrees Celsius.
- The final core test is less than or equal to four watts loss per pound.
- The new winding must be equivalent to the manufacturer's original length and (may exceed) circular mils (voltage changes must be calculated to circular mil equivalent).

BPA, Energy Trust, and other regional investor-owned utilities provide incentives of \$2 per horsepower to GMPG member service centers for green motor rewinds. Nonmember service centers are ineligible to receive utility incentives. Each member service center keeps \$1 per horsepower rewind and passes the other \$1 per horsepower rewind directly to the customer as part of its GMPG member agreement. GMPG serves as the program administrator for each of the region's utilities and provides the documentation necessary for each utility to claim savings and pay incentives. GMPG collects this documentation from each of its member service centers on a monthly basis.

Although NEEA no longer provides funding, formation of the GMI would not have been possible without NEEA's initial funding of the DPI and subsequent funding to support the development of the GMPG and GMI. Because of its crucial role as regional collaborator, NEEA seeks to understand the current Northwest marketplace for motor rewinds and the underlying data and assumptions that will allow NEEA to claim savings from this market transformation initiative.



## 1.1 Research Objectives

Cadmus designed this study to meet three key research objectives to update NEEA's ACE model assumptions for motor rewinds: (1) determine the size of the motor rewind market in the Northwest, (2) establish the market share of green motor rewind practices, and (3) calculate the regional savings for green motor rewinds. Cadmus also collected data to address a fourth supplementary objective to gather market intelligence.

### 1.1.1 Market Size

To determine the motor rewind market size, Cadmus conducted the secondary and primary research described below:

- **Secondary Research:** This research determined the number of motor service centers in the Northwest and, among these, the number of GMPG members versus nonmembers.
- **Data Collection Forms:** This research collected the number of motor rewinds conducted at service centers to determine the total performed annually in the Northwest and the distribution among GMPG members and nonmember groups by horsepower. This research also collected the number of green motor rewinds documented by GMPG motor service centers that received utility incentives as well as the number of green motor rewinds that went undocumented and did not receive utility incentive.

### 1.1.2 Market Share

Using feedback from the data collection forms described in section 1.1.1 Market Size, Cadmus measured the market share of green motor rewind practices among motor service centers in the Northwest. Specifically, Cadmus determined the following:

- Granularity of data on rewinds to estimate the regional energy savings from motor rewinds;
- Number of rewinds in compliance with green motor rewinds specification; and
- Penetration of green motors practices among GMPG member and nonmember centers.

### 1.1.3 Savings Rate

Cadmus estimated the regional savings from green motor rewinds for 2014 using several sources. One source was the data collection form described in section 1.1.1. Market Size. Another data source was the RTF workbooks, which recorded details and assumptions pertaining to green motor rewinds. The RTF maintains one workbook each for industrial and agricultural green motor rewinds. Motors in industrial applications typically operate for more hours within a year than do motors in agricultural settings, which means there are different assumptions for these two applications in terms of hours of operation, savings values, and measure lifetime.

The RTF workbooks also contain annual energy savings estimates for agricultural and industrial motors for a range of discrete horsepower values from 15 horsepower to 5,000 horsepower. Cadmus multiplied these savings estimates by the number of green rewinds for each horsepower level within each market sector to determine the total annual energy savings for green motor rewinds.

#### **1.1.4 Market Intelligence**

Cadmus surveyed staff at 50 motor service centers (26 member and 24 nonmember centers) to ascertain market intelligence for tracking motor service center awareness of and intentions to seek EASA accreditation and GMPG membership. Through the surveys, Cadmus also identified methods for improving future data collection response rates.

### **1.2 Organization of This Report**

Cadmus organized this report into the following sections:

- Methodology
- Findings
- Conclusions and Recommendations
- Appendices

The appendices include copies of the data collection form and survey questionnaires.

## 2 Methodology

Cadmus conducted secondary and primary research to meet the major study objectives. Table 2 lists these main study objectives, the associated research activities, and the respondents to the primary research activities: data collection forms and survey.

**Table 2. Key Study Objectives and Activities**

Study Objectives	Study Activities	Respondents (to primary research)
Market Size	Review GMPG membership list, survey, and data collection form	GMPG members and nonmembers
Market Share	Data collection form	GMPG members and nonmembers
Savings Rate	Data collection form and analysis	GMPG members and nonmembers
Market Intelligence	Survey	GMPG members and nonmembers

### 2.1 Secondary Research

Cadmus identified 83 active motor service centers in the Northwest in 2014, down from the 94 motor service centers identified in 2013. To determine the total number and membership status of motor service centers, Cadmus reviewed the GMPG's 2013 list of 94 motor service centers (35 GMPG members and 59 nonmembers). Upon reviewing the list, the GMPG administrator informed Cadmus that three members had left the GMPG and one nonmember joined the organization.

Through phone surveys (described in detail in the next section), Cadmus determined 11 nonmember motor service centers were either no longer in business, did not conduct motor rewinds, or had discontinued motor rewind services. This reduced the population from 94 to 83 service centers (33 member service centers and 50 nonmember service centers).

### 2.2 Primary Research

#### 2.2.1 Motor Service Center Survey

Cadmus surveyed GMPG member and nonmember service centers performing motor rewinds. The brief phone surveys allowed Cadmus to address the following research objectives:

- Assess motor service centers' awareness of the EASA accreditation program for motor service centers and respondents' intentions to seek EASA accreditation.
- Assess service centers' awareness of the GMPG and respondents' intentions to become GMPG members (nonmembers only).
- Identify methods for improving future data collection response rates, including evaluating service centers' interest in receiving advanced notification of data collection and a copy of the data collection form.

Cadmus fielded a more comprehensive survey with motor service centers in 2013 as a part of NEEA's 2013 evaluation review of key ACE model assumptions for motor rewinds. To track

service center awareness of the GMPG over time, in both the 2013 and 2014 surveys, Cadmus asked respondents from nonmember centers whether they were aware of the GMPG and the utility incentives available for GMPG members. Section 3.4.2 of this report presents multiyear findings.

Fifty motor service centers (26 member and 24 nonmember centers) completed the phone surveys in 2014. This is an increase from 36 surveys completed with motor service centers during the prior year's survey. Table 3 shows the population and completed surveys for member and nonmember motor service centers in 2013 and 2014.

**Table 3. Number of Motor Service Centers that Completed the NEEA Survey in 2013 and 2014**

State	Member			Nonmember		
	Population	Completed 2013 Survey	Completed 2014 Survey	Population	Completed 2013 Survey	Completed 2014 Survey
Idaho	10	7	7	14	7	8
Montana	3	3	3	9	1	5
Oregon	10	9	8	17	2	5
Washington	10	5	8	10	2	6
<b>NEEA Region Total</b>	<b>33</b>	<b>24</b>	<b>26</b>	<b>50</b>	<b>12</b>	<b>24</b>

### 2.2.2 Data Collection Forms

NEEA annually updates the key ACE model assumptions for estimating energy savings from motor rewinds. Cadmus used a data collection form to acquire data needed for these calculations (such as the number of motor rewinds performed annually in the Northwest and the distribution of rewinds between GMPG members and nonmembers by horsepower).

To ensure uniform data collection across study years, Cadmus used the same data collection form implemented in NEEA's 2013 evaluation of ACE model assumptions for motor rewinds. This form asked respondents to provide the following sales data for their service centers:

- The number of motor rewinds conducted in the Northwest in 2014, by horsepower and by state; and
- The number of green motor rewinds conducted in the Northwest in 2014, by horsepower and by state.

On December 1, 2014, the GMPG administrator sent e-mails to the 33 GMPG member and 24 nonmember service centers that had contact information available. The e-mails notified the contacts about this research project prior to the survey effort, included a Microsoft Excel attachment of the data collection form, and solicited their participation.

In the 2013 evaluation of NEEA's ACE model assumptions for motor rewinds, Cadmus observed that motor service centers in the Northwest preferred a wide variety of methods for providing

motor rewind data, and some motor service centers lacked the computer software necessary to complete electronic data-collection forms. To foster high response rates and accommodate various preferences and needs at the motor service centers, Cadmus provided service centers with four options for completing the form:

- **Electronic:** The GMPG administrator and/or Cadmus e-mailed the data collection form (in Excel format) to motor service centers.
- **Manual:** Cadmus faxed the data collection form to motor service centers. Respondents completed the form by hand and returned it to Cadmus by fax or e-mail.
- **Verbal:** For respondents who found it more convenient to complete the data collection form verbally, Cadmus helped them complete the form by phone.
- **In person:** One respondent located near Cadmus' Portland office was unwilling to complete the form, but offered to let Cadmus compile the data in person. As such, a Cadmus staff member visited the service center and gathered the necessary sales data from company records.

To increase response rates, Cadmus and NEEA offered nonmember service centers a \$150 incentive to complete the form (an increase from the \$100 Cadmus provided to service centers in 2013). From the 2013 study, Cadmus determined that follow-up phone calls from Cadmus staff were necessary to encourage interested respondents to complete the data-collection form (Cadmus received one-third of all the completed data-collection forms for the 2013 research effort after at least one follow-up call). As a result, Cadmus conducted all outreach and solicitation activities in house (for both surveys and data collection forms), using staff members familiar with the technical aspects of green motor rewinds. Cadmus attempted to contact each of the 83 motor service centers five times by phone. For those who indicated a willingness to provide data for the collection forms, Cadmus conducted up to five additional follow-up calls to encourage the contact to provide sales data.

Thirty-five motor service centers (16 members and 19 nonmembers) completed the data collection forms, an increase from the 27 motor service centers that completed the form in 2013. However, two fewer member motor service centers provided data in 2014 than in 2013, and seven members that provided sales data in 2013 declined to do so in 2014.<sup>1</sup> Table 4 shows the number of completed data collection forms for member and nonmember service centers by state and study year.

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<sup>1</sup> Although seven members who completed the data collection form in 2013 declined to do so in 2014, five additional members completed the form in 2014 who had declined in 2013. As a result, overall member participation in the data collection effort only decreased by two members between 2013 and 2014.

**Table 4. Completed Data Collection Forms by State and Study Year**

State	Member			Nonmember		
	Population (N)	2013 Sample (n)	2014 Sample (n)	Population (N)	2013 Sample (n)	2014 Sample (n)
Idaho	10	5	7	14	2	6
Montana	3	2	2	9	0	3
Oregon	10	4	4	17	6	5
Washington	10	7	3	10	1	5
<b>NEEA Region Total</b>	<b>33</b>	<b>18</b>	<b>16</b>	<b>50</b>	<b>9</b>	<b>19</b>

## 2.3 Savings Rate Analysis

Cadmus used the following savings calculation methodology:

$$Energy\ Savings = \sum_{ij} Savings\ Rate_{ij} \times Reported\ Units_{ij}$$

Where:

$i$	=	sector (agricultural or industrial).
$j$	=	motor rewind horsepower
Savings rate <sub>i</sub>	=	incremental per-unit savings (kWh per year) over baseline unit energy consumption
Reported units <sub>i</sub>	=	green motor compliant rewinds

The motor service centers recorded the number of rewinds (green or standard) by horsepower within either the agricultural or the industrial sector on the data collection forms. Cadmus built a table with these quantities and descriptions.

The RTF unit energy savings (UES) excel workbooks provide the savings rate for each of the horsepower values indicated on the data collection forms. Cadmus calculated the total regional savings for green motor rewinds by building a simple lookup function that multiplied the number of rewinds times the respective annual kWh savings for a given horsepower for motors in the agricultural and industrial sectors.

### 2.3.1 Savings Extrapolations

To estimate the total energy savings attributable to green motor compliant rewinds, Cadmus extrapolated the savings from the reported sample to the population. Cadmus explored multiple methods for creating these extrapolations. This section provides the statistical basis for the savings extrapolations.

For each motor service center, Cadmus calculated the energy savings resulting from the green motor rewinds as shown in section 2.3.3. The primary objective of determining regional savings included calculating the savings attributable to agricultural and industrial applications for both

members and nonmembers. The methods and objectives for determining regional savings were the same for the 2013 and 2014 evaluation studies.

Cadmus calculated the total savings estimate and its precision level using a standard, stratified mean estimation.

$$Total\ Savings_{i,h} = Savings_{i,h} \times N_h / n_h$$

Where:

i	=	motor service center
h	=	stratum
N	=	population
n	=	sample

Cadmus also used the same method for calculating the total energy savings for industrial and agricultural applications. Section 3.3 provides the results of these extrapolations,

Cadmus calculated the total number of rewinds, the total horsepower rewind, and their precision estimates using standard, stratified ration estimation.

### 2.3.2 Savings Confidence Interval

Extrapolating from a sample to a population introduces uncertainty into the population estimate. Therefore, it is necessary to build a confidence interval around an estimate to describe its level of uncertainty. The confidence interval contains two parts: the confidence level and precision level.

For this report, Cadmus presents the extrapolation results of motor rewinds, horsepower rewind, and savings at a confidence level of 90%. Precision is the radius of the confidence interval, as a percentage of the estimate itself. Precision can also be referred to as relative precision or relative error.

## 3 Findings

In this section, Cadmus describes its findings for each key study objective to update market size, market share, savings rate calculations, as well as the supplementary market intelligence findings. Specifically, Cadmus organizes the findings as follows:

- In section 3.1, Cadmus presents findings from primary and secondary research to determine market size.
- In section 3.2, Cadmus presents findings from the data collection forms. Cadmus distinguishes results between member and nonmembers for these market share objectives.
- Section 3.3 presents the estimates of regional savings from motor rewinds in 2014 using results from the electronic data collection efforts in combination with the savings values per horsepower rewind developed by the RTF.
- Finally, in section 3.4, Cadmus presents market intelligence findings from surveys with GMPG member and nonmember motor service centers. Where appropriate, Cadmus compares the current study findings to findings from NEEA's 2013 evaluation of key ACE model assumptions for motor rewinds.

### 3.1 Market Size

Cadmus assessed the size of the motor rewinds market using secondary research, phone surveys, and data collection forms. This section describes market size findings for these elements:

- Number of motor rewind service centers;
- Number of motor rewinds performed in 2014;
- Distribution of motor rewinds by horsepower;
- Number of green motor rewinds documented and incented; and
- Number of agricultural versus industrial rewinds by horsepower.

#### 3.1.1 Number of Motor Rewind Service Centers

As shown in Table 5, Cadmus determined the Northwest market consists of 83 motor service centers in 2014, a decrease from the 94 Cadmus originally estimated in 2013. Through the 2014 survey, Cadmus determined that 11 nonmember motor service centers either ceased to conduct business, did not conduct motor rewinds, or discontinued motor rewind services. Of these 83 motor service centers, 40% (33) are members of the GMPG. The market is concentrated in Washington, Oregon, and Idaho.



**Table 5. Number of Motor Service Centers in the Northwest by Study Year**

State	2013			2014		
	Member	Nonmember	Total	Member	Nonmember	Total
Idaho	9	16	25	10	14	24
Montana	4	8	12	3	9	12
Oregon	10	18	28	10	17	27
Washington	12	17	29	10	10	20
<b>NEEA Region Total</b>	<b>35</b>	<b>59</b>	<b>94</b>	<b>33</b>	<b>50</b>	<b>83</b>

### 3.1.2 Number of Motor Rewinds Performed in 2014

Cadmus received 35 valid data collection forms from member and nonmember service centers, which provided the number of motor rewinds their shop performed in 2014 by state and by application (agricultural or industrial).

As shown in Table 6, the sample—comprising the data collection forms—shows that 16 GMPG member service centers performed 1,119 motor rewinds in 2014 and 19 nonmember service centers reported 526 motor rewinds in 2014. The table also shows population extrapolations within each state for members and nonmembers.

However, due to the low numbers of member and nonmember service centers in some states (as shown in Table 5), these within-state estimates are highly uncertain. The precision values for several of the within-state estimates are uncertain because their values are greater than 100%. In other words, the relative error of the rewinds-per-state estimates would mean that the confidence intervals would include zero.

**Table 6. Number of GMPG Member and Nonmember Motor Rewinds in 2014 by State**

State	Member		Nonmember		Total	
	Population	Sample	Population	Sample	Population	Sample
Washington	690	207	458	229	1,148	436
Oregon	593	237	184	54	776	291
Idaho	884	619	408	175	1,293	794
Montana	84	56	204	68	288	124
NEEA Region Total						
Number of Rewinds	2,251	1,119	1,254	526	3,505	1,645

Cadmus also extrapolated the sample number of rewinds within the member and nonmember populations to the regional level, as shown in Table 7. This method provides a more reliable estimate of the total number of rewinds while remaining indifferent about any differences between service centers due to location.

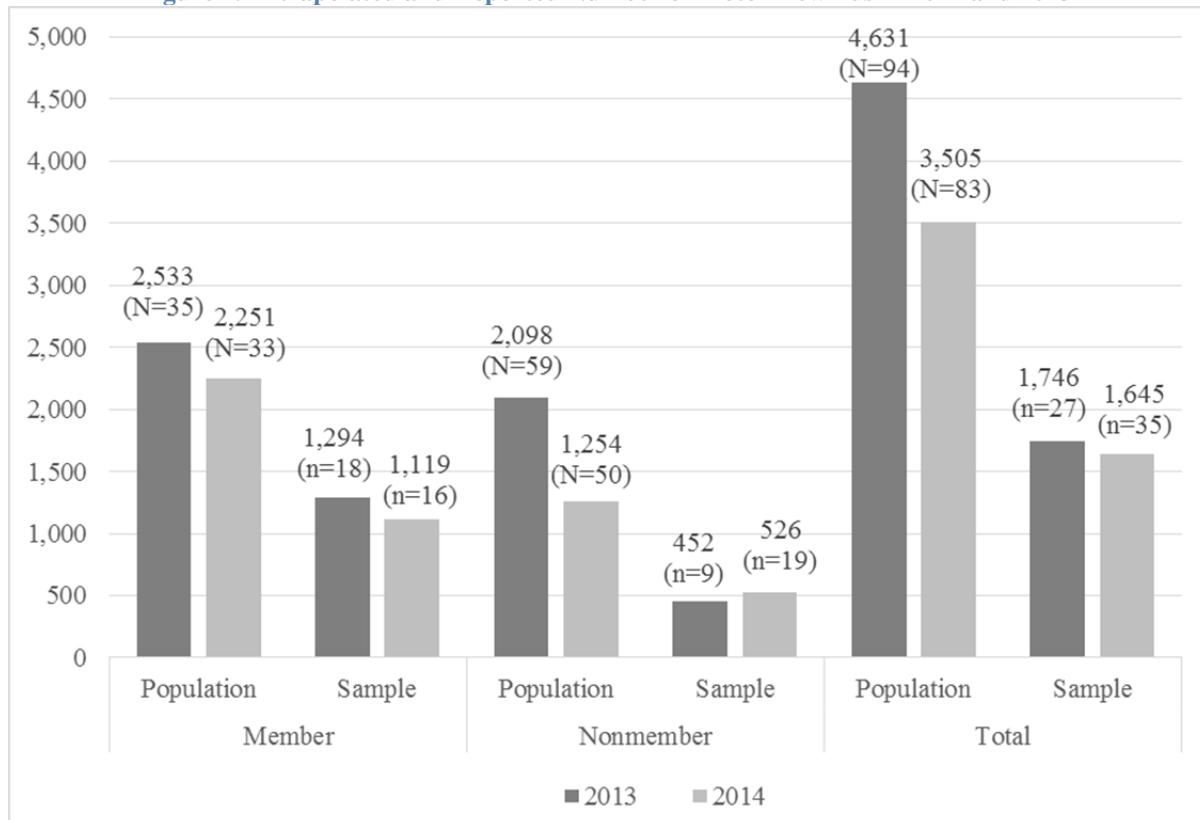
**Table 7. Number of GMPG Member and Nonmember Motor Rewinds in 2014 at the Regional Level**

	Member		Nonmember		Total	
	Population (N = 33)	Sample (n = 16)	Population (N = 50)	Sample (n = 19)	Population (N = 83)	Sample (n = 35)
Extrapolated Number of Rewinds to the Region	2,308	1,119	1,384	526	3,692	1,645

For member service centers, the estimated total rewinds in 2014 are 2,308 with a confidence level of 90% and relative precision of  $\pm 24\%$ . For nonmembers, the extrapolation results show 1,384 motor rewinds in 2014 with a confidence level of 90% and relative precision of  $\pm 34\%$ .

Figure 1 shows the extrapolated and reported number of member and nonmember motor rewinds by study year. The extrapolated number of rewinds decreased by 1,126 motor rewinds between 2013 and 2014, from 4,631 motor rewinds in 2013 to 3,505 in 2014.

**Figure 1. Extrapolated and Reported Number of Motor Rewinds in 2014 and 2013**



Notes: Cadmus used the total of within state extrapolations for motor rewinds.

To explore factors that may have contributed to the decrease in estimated motor rewinds between 2013 and 2014, Cadmus compared the number of reported motor rewinds from motor service centers that completed data collection forms in both 2013 and 2014. As Table 8 shows, of the 19 motor service centers that completed the data collection forms in both 2013 and 2014, members reported 144 fewer motor rewinds in 2014 and nonmembers reported 23 fewer motor rewinds, for a total of 167 fewer reported motor rewinds.

**Table 8. Number of Motor Rewinds Reported by Motor Service Centers that Provided Data in 2013 and 2014**

Number of Reported Motor Rewinds	2013 Sample			2014 Sample		
	Members (n=12)	Nonmembers (n=7)	Total (n=19)	Members (n=12)	Nonmembers (n=7)	Total (n=19)
	982	294	1276	838	271	1109

Prior market intelligence research suggests that the Northwest motor rewind market is contracting. In NEEA’s 2013 evaluation of ACE model assumptions for motor rewinds, Cadmus asked two stakeholder interviewees if they thought the market for motor rewinds would expand, shrink, or stay the same over the next five years. These stakeholders indicated that the motor rewind industry had been on a slow decline for the past several years and would probably continue in the same direction. They described the following reasons for believing that the motor rewind industry would continue to decline over the next five years:

- Less expensive motors
- Decline in the number of United States-based industrial plants because of the migration of manufacturing to foreign countries
- More durable motors due to better design and protection than motors made in the 1980s and 1990s
- Longer-lasting motors due to better customer education, and therefore better care for and maintenance of motors

Although the decrease in estimated motor rewinds is probably a result, in part, of an actual decrease in the Northwest motor rewind market, changes in the sample group may have also contributed to this estimated decrease. Of the 1,645 motor rewinds reported in 2014, 33%—comprising 29% of total horsepower—were reported by motor service centers that did not provide data in 2013. Similar, in 2013, 27% of motor rewinds—comprising 30% of total horsepower—were reported by motor service centers that did not provide data in 2014.

Cadmus reached 10 more nonmember motor service centers in 2014 than in 2013 and most likely overestimated the number of motor rewinds performed by nonmembers in 2013 due to the small sample size. Of those nonmember centers that provided data in both 2013 and 2014, the average number of reported motor rewinds was 42. However, the average number of reported motor rewinds of the 10 nonmembers motor service centers that provided data only in 2014 was lower—an average of 21 motor rewinds.<sup>2</sup> In 2014, Cadmus may have been more successful in

<sup>2</sup> All nonmembers who completed the data collection form in 2013 also did so in 2014.

encouraging participation from motor service centers that were less active in the motor rewind market, who were underrepresented in the 2013 study sample. For example, respondents from two nonmember motor service centers—which did not provide data in 2013—initially declined to provide motor rewind data, believing that because their shops conducted so few motor rewinds, their data were not relevant for the study. However, after an explanation and encouragement from Cadmus staff, these service centers provided data (one had conducted only one motor rewind in 2014; the other had conducted five motor rewinds in 2014).

### 3.1.3 Distribution of Motor Rewinds by Horsepower

Cadmus used a similar methodology to estimate the total horsepower rewound by member and nonmember service centers in 2014. Table 9 shows that 16 GMPG member service centers rewound over 165,000 total horsepower in 2014 and 19 nonmembers rewound over 40,000 horsepower. The table also shows population extrapolations within each state for members and nonmembers.

**Table 9. Horsepower Rewound by GMPG Members and Nonmembers by State in 2014**

State	Member		Nonmember		Total	
	Population	Sample	Population	Sample	Population	Sample
Washington	160,300	40,075	19,730	9,865	180,030	49,940
Oregon	75,000	30,000	8,500	2,500	83,500	30,000
Idaho	117,489	91,380	43,622	18,695	161,110	110,075
Montana	8,180	4,090	26,970	8,990	35,150	13,080
NEEA Region						
Total HP Rewound	360,969	165,545	98,822	40,050	459,790	203,095

Cadmus also extrapolated the sample horsepower within the member and nonmember populations at the regional level. This method provides a more reliable estimate of the total number of rewinds while remaining indifferent to any differences between service centers due to location. Table 10 shows the results of this extrapolation.

**Table 10. Total Member and Nonmember Horsepower Rewound at the Regional Level for 2014**

State	Member		Nonmember		Total	
	Population (N = 33)	Sample (n = 16)	Population (N = 50)	Sample (n = 19)	Population (N = 83)	Sample (n = 35)
Extrapolated HP to the Region	341,437	165,545	168,684	40,050	510,121	205,595

For member service centers, the estimated total horsepower rewound in 2014 is 341,437 horsepower with a confidence level of 90% and relative precision of  $\pm 24\%$ . For nonmembers, the extrapolation shows 168,684 horsepower rewound in 2014 with a confidence level of 90% and relative precision of  $\pm 39\%$ .

Cadmus created distributions of motor rewinds by horsepower performed by GMPG members and nonmembers. Table 11 shows the percentage of rewinds in six horsepower ranges for GMPG

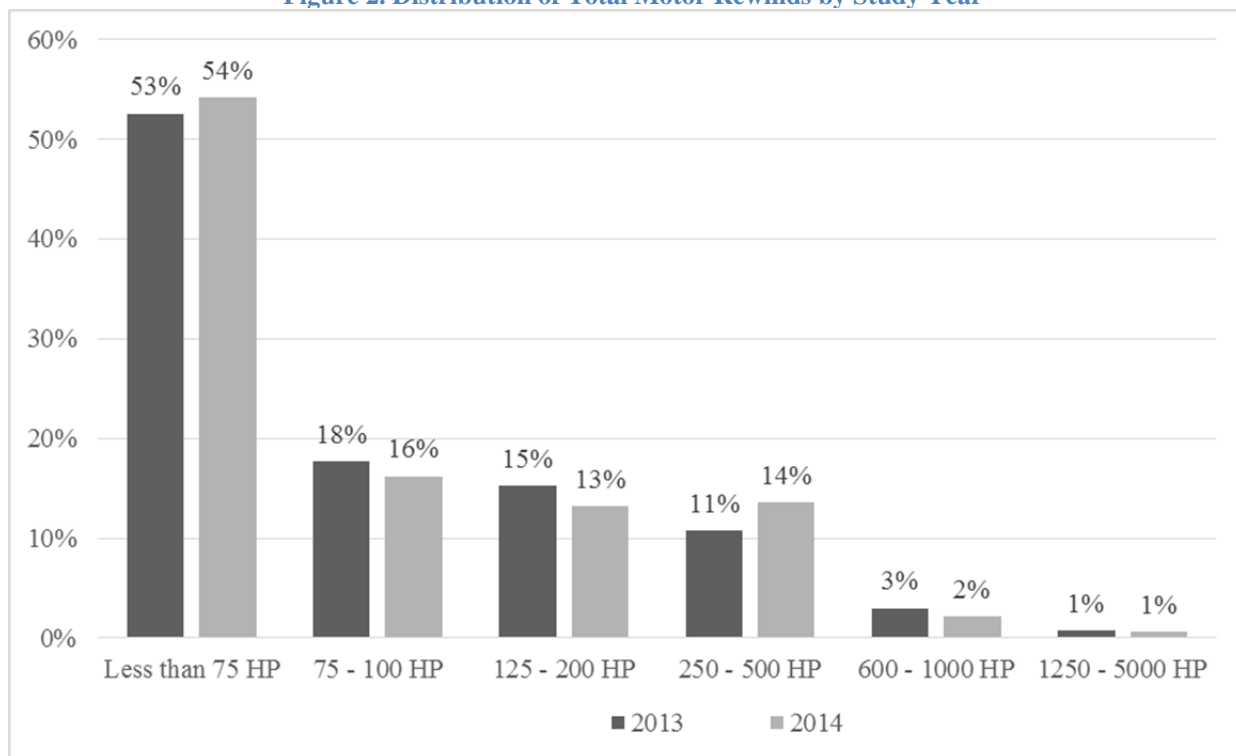
member, nonmembers, and in total. More than half of all motor rewinds are less than 75 horsepower, and 83% of all rewinds are less than 250 horsepower.

**Table 11. 2014 Distribution of Motor Rewinds for GMPG Members and Nonmember by Application**

HP Range	Number of Rewinds		
	Agricultural	Industrial	Total
Less than 75 HP	46%	60%	54%
75 - 100 HP	18%	15%	16%
125 - 200 HP	15%	12%	13%
250 - 500 HP	17%	11%	14%
600 - 1000 HP	3%	2%	2%
1250 - 5000 HP	1%	0%	1%
Total	100%	100%	100%

Figure 2 compares the distribution of total motor rewinds by study year. The distribution of motors rewinds across the six horsepower ranges was similar in 2013 and 2014, with over half of total motor rewinds in both years on motors less than 75 horsepower. In 2014, motor service centers rewound a slightly smaller proportion of 75-100 horsepower and 125-200 horsepower motors, however they rewound a slightly greater proportion of 250-500 horsepower motors that year.

**Figure 2. Distribution of Total Motor Rewinds by Study Year**



### 3.1.4 Documented and Incented Motor Rewinds

For GMPG members, Cadmus estimated the percentage of green motor rewinds that went unreported to GMPG and for which member service centers received no incentives in 2014. To receive utility incentives for green motor rewinds, member service centers must provide documentation to GMPG, which verifies and submits the paperwork to the service center's utility. The utility then provides the incentive to the member service center. A motor service center must be a registered GMPG member in order to receive a utility incentive for a green motor rewind.

The purpose of estimating the number of unreported green motor rewinds is to account for all the savings resulting from green motor rewinds—not only those that member service centers reported. The GMPG administrator provided Cadmus with the number of agricultural and industrial rewinds from 11 of the 16 motor service centers that Cadmus had already gathered data (11 centers provided this information on their data collection forms by the end of January 2015).<sup>3</sup>

Table 12 lists the number of rewinds that motor services centers reported to GMPG for incentive payment, reported to Cadmus, and the percentage that went undocumented by GMPG. Overall, motor service centers failed to report 20% of green motor rewinds that were eligible for incentives.

**Table 12. GMPG Green Motor Rewinds Documented and Undocumented for 2014**

Sector	Number of Rewinds		
	GMPG Documented (n = 11)	Reported to Cadmus (n = 11)	Percentage Not Documented by GMPG
Agricultural	43	86	50%
Industrial	114	111	-3%
Total	157	197	20%

Cadmus expected that the number of GMPG-documented green motor rewinds would be less than or equal to the number reported on the data collection forms. Although the number of GMPG-documented green motor rewinds overall was less than or equal to the number reported on the data collection forms, the number of GMPG documented industrial rewinds exceeds the number provided to Cadmus by three motor rewinds.

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<sup>3</sup> To comply with contractual obligations to keep trade data anonymous, the GMPG administrator is not able to provide Cadmus with a definitive count of motors rewound by horsepower for each member service center that provides GMPG with data. Therefore, GMPG agreed to provide Cadmus with this data at a level that maintains anonymity for GMPG members but allows for a summary comparison of results to the data received by Cadmus.

There are several possibilities that could explain this slight discrepancy in industrial rewinds:

- **Timing of reporting.** Cadmus began receiving data collection forms on December 1, 2014. GMPG provided the documented list of rewinds in late January 2015. Motor service centers might have performed additional in 2014 after submitting the data collection forms to Cadmus.
- **Timing of services provided.** Cadmus requested data for all motor rewinds performed in 2014. This discrepancy may also be explained by timing differences among motor service centers regarding the date the rewind was completed, the customer paid the invoice, the incentive was paid by the utility, and the documentation was received by GMPG.
- **General errors in reporting.** Discrepancies between the two sources of data could be due to general reporting errors.

These twelve GMPG members reported a significantly higher number of agricultural motor rewinds in the Cadmus data collection forms than what they reported to GMPG. The relatively smaller (in terms of horsepower) motors used in agricultural applications could be the reason for this discrepancy.

Cadmus also calculated undocumented horsepower. Table 13 provides the green motor rewind total horsepower GMPG documented, reported to Cadmus, and the percentage not documented.

**Table 13. Green Motor Rewind Horsepower GMPG Documented for 2014**

Sector	Horsepower Rewound		
	GMPG Documented (n = 11)	Reported to Cadmus (n = 11)	Percentage Not Documented By GMPG
Agricultural	10,910	19,825	45%
Industrial	19,920	21,005	5%
Total	30,830	40,830	24%

### 3.1.5 Agricultural Versus Industrial Rewinds by Horsepower

In the electronic data collection form, Cadmus requested information about which application—agricultural or industrial—customers used the rewind motors. GMPG and the region’s utilities also require this information to calculate savings because the RTF assumes different values for similar horsepower motors in different applications.

Motor service centers differentiated between the industrial and agricultural applications for every collection form. Table 14 shows the percentage of horsepower for the agricultural and industrial sectors for GMPG member and nonmember centers.

**Table 14. Percentage of GMPG Rewinds by Horsepower by Sector**

	GMPG Members		GMPG Nonmembers	
	Agricultural	Industrial	Agricultural	Industrial
NEEA Region Total	54%	46%	44%	56%

Overall, agricultural motors accounted for 54% of the total rewind horsepower at GMPG member motor service centers. Conversely, for nonmembers, industrial motors accounted for 56% of all horsepower rewind in 2014.

## 3.2 Market Share

Cadmus assessed the market share of the green motor rewinds market using secondary research and data collection forms. This section describes the market share findings for these aspects:

- Granularity of data;
- Number of green motor compliant rewinds; and
- Penetration of green motor rewinds practices.

### 3.2.1 Granularity of Data

Since it began collecting data from its members in 2009, GMPG has provided a template for categorizing the number of motor rewinds by state, horsepower, and application (agricultural or industrial). Cadmus made one modification to that template to account for the total rewinds needed to estimate the market share of green motor rewinds.

The GMPG members and nonmembers who responded provided data with the granular detail needed for Cadmus to estimate savings according to the RTF workbooks.

### 3.2.2 Number of Green Motor-Compliant Rewinds

Cadmus requested the number of green motor-compliant rewinds for both GMPG members and nonmembers in the data collection forms.

#### 3.2.2.1 GMPG Members

Table 15 shows the sample number of green motor rewinds performed by the 16 member service centers as reported to Cadmus for each state and agricultural or industrial motor application combination.

Table 15. Number of GMPG Green Motor Rewinds			
State	Number of Green Motor Rewinds		
	Agricultural	Industrial	Total
Washington	16	28	44
Oregon	28	44	72
Idaho	72	43	115
Montana	0	5	5
NEEA Region Total	116	120	236



Table 16 shows the within-state extrapolation of the sample green motor rewinds for the agricultural and industrial sectors for GMPG members.

**Table 16. Number of Extrapolated GMPG Member Motor Rewinds**

State	Number of Green Motor Rewinds		
	Agricultural	Industrial	Total
Washington	53	93	147
Oregon	70	110	180
Idaho	103	61	164
Montana	0	8	8
NEEA Region Total	226	272	498

Cadmus also extrapolated the sample green motor rewinds within the agricultural and industrial populations to the regional level for members. This method provides a more reliable estimate of the total number of rewinds while remaining indifferent to any differences among service centers for location. Table 17 shows the extrapolated green motor rewind results for members.

**Table 17. Extrapolated Member Green Motor Rewinds by Sector**

Region	Number of Green Motor Rewinds		
	Agricultural	Industrial	Total
NEEA Region Total	239	248	487

For member service centers, Cadmus estimated 239 agricultural green motor rewinds with a confidence level of 90% and relative precision of  $\pm 54\%$ , and 248 industrial green motor rewinds with a confidence level of 90% and relative precision of  $\pm 41\%$ .

### 3.2.2.2 Nonmembers

Table 18 shows the number of green motor rewinds performed by the nine nonmember service centers as reported to Cadmus for each state and by agricultural or industrial motor application.

**Table 18. Number of Nonmember Green Motor Rewinds**

State	Number of Green Motor Rewinds		
	Agricultural	Industrial	Total
Washington	0	0	0
Oregon	0	0	0
Idaho	0	0	0
Montana	11	14	25
NEEA Region Total	11	14	25

One nonmember service center, which had previously been a GMPG member, accounted for all 25 reported green motor compliant rewinds. Given that one former GMPG member motor service center performed all of these green motor rewinds, and most likely does not represent the population of nonmembers, Cadmus did not extrapolate the sample of green motor rewinds to the population of nonmember service centers.

### 3.2.3 Penetration of Green Motor Practices

Table 19 shows the penetration of green motor rewind practices among GMPG members. Overall, GMPG members perform green motor rewinds on 21% of all motors rewound in 2014. GMPG member service centers rewound 30% of total horsepower to green motor practice specifications.

**Table 19. Penetration of Green Motor Rewinds Practices in 2014**

GMPG Status	Number of Rewinds			Horsepower		
	Agricultural	Industrial	Total	Agricultural	Industrial	Total
GMPG Members	22%	21%	21%	30%	30%	30%
GMPG Nonmembers	6%	4%	5%	9%	13%	11%

Table 19 shows a higher penetration rate of green motor practices for GMPG members than nonmembers for both the number of rewinds and overall horsepower rewound in 2014. As with total green motor rewinds performed, due to the outlier of green motor rewinds performed by a single nonmember service center—Cadmus determined that extrapolating the penetration rate of green motor rewind practices to the population of nonmember service centers would lack the necessary and reasonable precision required.

## 3.3 Savings Calculations

Cadmus estimated the regional savings for GMPG member and nonmember motor service centers from green motor rewinds in 2014 using results from data collection efforts and per-unit energy savings from the RTF.

### 3.3.1 Members

Cadmus calculated the annual kWh savings resulting from green motor rewinds for GMPG members by sector (industrial or agricultural) and state for 2014. Table 20 shows the savings for the 16 member service centers that provided data collection forms.

**Table 20. 2014 Green Motor Rewind Savings for GMPG Member Sample**

State	Green Motor Rewind Savings (Annual kWh)		
	Agricultural	Industrial	Total
Washington	79,603	198,234	277,837
Oregon	42,908	157,245	200,153
Idaho	162,344	109,773	272,117
Montana	0	22,975	22,975
NEEA Region Total	284,856	488,228	773,083

Table 21 shows the within-state extrapolation of the sample green motor rewinds for the agricultural and industrial applications for the GMPG members.

**Table 21. 2014 Extrapolated Green Motor Rewind Savings for GMPG Members**

State	Green Motor Rewind Savings (Annual kWh)		
	Agricultural	Industrial	Total
Washington	265,343	660,781	926,125
Oregon	107,270	393,112	500,383
Idaho	231,921	156,818	388,739
Montana	0	34,463	34,463
NEEA Region Total	604,534	1,245,175	1,849,710

Cadmus also extrapolated the sample green motor rewind savings within the agricultural and industrial populations at the regional level for members. This method provides a more rigorous estimate of savings while remaining indifferent to any differences among service centers for location. Table 22 shows the extrapolated green motor rewind savings for member service centers.

**Table 22. 2013 GMPG Members Green Motor Rewind Savings Extrapolated to the Regional Level**

State	Green Motor Rewind Savings (Annual kWh)		
	Agricultural	Industrial	Total
NEEA Region Total	587,515	1,006,969	1,594,484

For member service centers, the estimated savings for agricultural green motor rewinds is 587,515 annual kWh with confidence level of 90% and relative precision of  $\pm 44\%$ . For industrial green motor rewinds, estimated savings is 1,006,969 annual kWh with a confidence level of 90% and relative precision of  $\pm 40\%$ .

### 3.3.2 Nonmembers

Cadmus calculated the annual kWh savings resulting from green motor rewinds for nonmembers by application (industrial or agricultural) and state for 2014. Table 23 shows the savings for the 19 nonmember service centers that provided data collection forms.

**Table 23. 2014 Green Motor Rewind Savings for Nonmember Sample**

State	Green Motor Rewind Savings (Annual kWh)		
	Agricultural	Industrial	Total
Washington	0	0	0
Oregon	0	0	0
Idaho	0	0	0
Montana	18,798	65,760	84,558
NEEA Region Total	18,798	65,760	84,558

Cadmus determined that extrapolations of the nonmember green motor rewind savings are not ideal because 18 of the 19 nonmember service centers in the sample reported no green motor rewinds and, therefore, all of the savings come from one service center.

### 3.4 Key Market Intelligence Findings

This section presents key market intelligence findings from the telephone survey. Where appropriate, Cadmus compares the current study findings to 2013 survey findings. Given the small sample sizes from the 2013 motor service center surveys, findings from those surveys only should be considered as directional and not representative of the entire Northwest motor service center population in 2013.

#### 3.4.1 Reported Number of Employees

As Figure 3 shows, member service centers reported a wider range in the number of employees and a larger maximum number of employees (min=3; max=72) than nonmembers (min=1; max=43). The median number of employees was also larger for members (median=13) than nonmembers (median=3).



*Notes: Boxplot of responses for members and nonmembers to the question B1: How many employees does your company have in the Northwest?*

Boxplots are used to visualize the distributional characteristics of a set of data points. This boxplot displays the number of employees at member and nonmember service centers. These data are divided into four quartiles, with 25% of data points in each group. The end points represent the low and high values, with black dots representing outliers—data points that fall abnormally far from the other values in the dataset.

### 3.4.2 Awareness of and Intentions to Seek EASA Accreditation and GMPG Membership

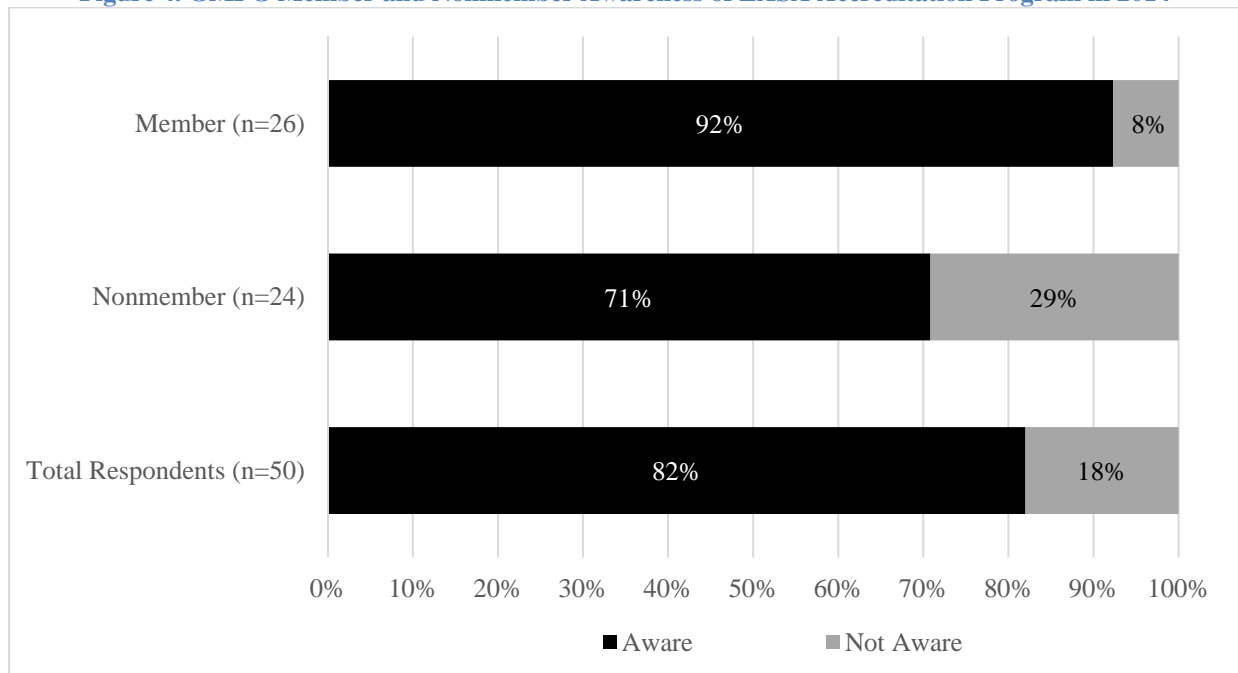
Two organizations promote motor rewind best practices in the Northwest: GMPG and EASA. The GMPG educates, trains, and certifies service centers on effective shop procedures and offers incentives to both GMPG member motor service centers and end users for efficient motor rewinds. EASA also promotes motor rewind best practices and recently introduced a nationwide accreditation program for motor service centers. Through this program, EASA evaluates motor service centers using a third-party auditor to ensure service centers use best practices for maintaining motor efficiency and reliability during motor repairs. Accredited service centers receive third-party verification and recognition on EASA's website.

To understand motor service centers' awareness of and intentions to participate in these offerings, Cadmus asked the following:

- Members' and nonmembers' awareness of and intentions in 2014 to seek accreditation through EASA.
- Nonmembers' awareness of the GMPG and utility incentives available for GMPG members and their intentions to join the group (asked in 2013 and 2014).

As shown in Figure 4, almost all of the member centers surveyed (92%; 24 out of 26) and the majority of nonmember centers (71%; 17 out of 24) knew of EASA's accreditation program for motor service centers. However, fewer nonmembers knew of the program.

**Figure 4. GMPG Member and Nonmember Awareness of EASA Accreditation Program in 2014**

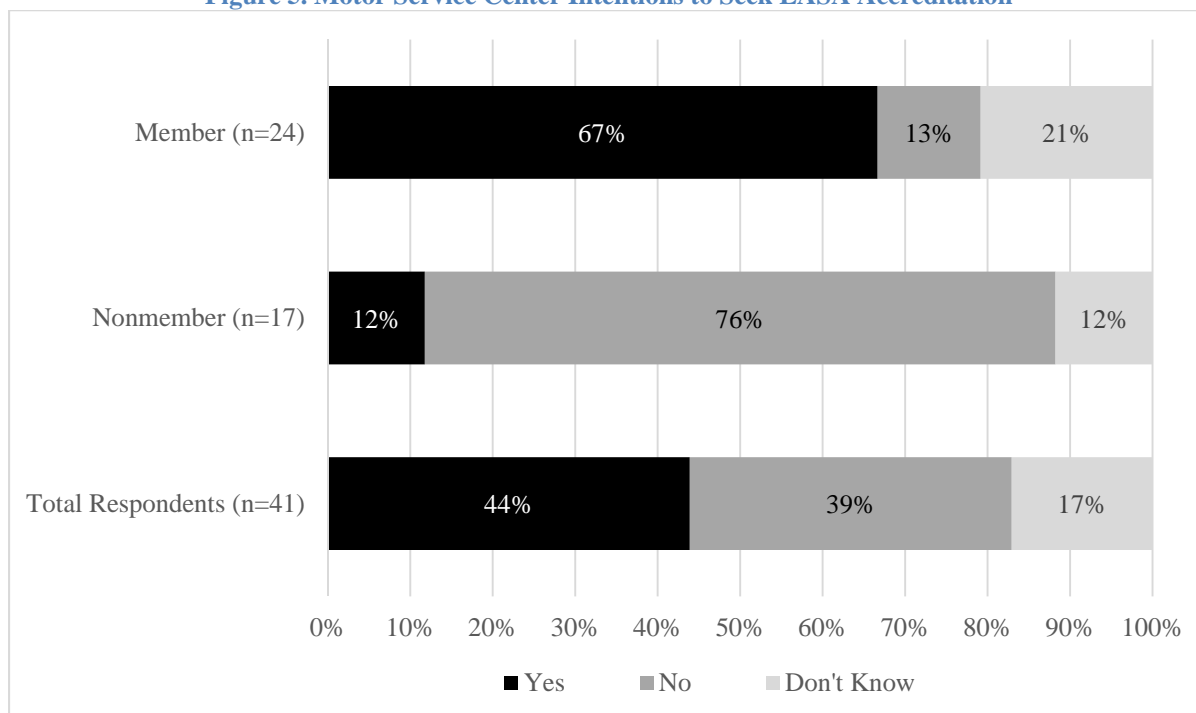


*Notes:* Results show responses to question B1: *Are you aware of Electrical Apparatus Service Association's accreditation program for motor service centers?*

Cadmus asked those aware of EASA's accreditation program if they planned to seek accreditation through EASA. Members and nonmembers differed in their responses. As shown in

Figure 5, while the majority of members (67%; 16 out of 26) said they planned to seek EASA accreditation, a minority of nonmembers (12%; 2 out of 24) said they planned to do so.

**Figure 5. Motor Service Center Intentions to Seek EASA Accreditation**



Notes: Results show responses to question B2: *Is your shop planning to seek EASA accreditation?* Cadmus only asked this question of motor service centers saying they knew of EASA's accreditation program.

Cadmus asked only nonmembers in the 2013 and 2014 evaluations about their awareness of the GMPG and of utility incentives available for green motor rewinds. As shown in Table 24, the majority of nonmember motor service centers in 2014 (71%, 17 out of 24) reported knowing about GMPG, while over one-half of nonmember service centers in 2013 (54%, 7 out of 13) reported knowing about the GMPG.

**Table 24. Nonmember Awareness of GMPG by Study Year**

Are you aware of the Green Motors Practices Group?	2013 (n=13)		2014 (n=24)	
	Frequency	Percentage	Frequency	Percentage
Yes	7	54%	17	71%
No	6	8%	7	29%

Notes: Results show responses from question B3 in the 2014 survey and question D1 in the 2013 survey: *Are you aware of the Green Motors Practices Group?* Cadmus only asked this question of nonmember motor service centers.

Of 17 nonmember respondents who knew of the GMPG in 2014, 11 (65%) knew of opportunities to receive utility incentives by joining the GMPG and offering green motor rewinds, as shown in Table 25. Although a smaller proportion (54%; 7 out of 13) of nonmembers knew of the GMPG in 2013, a greater proportion of those respondents also knew of utility incentives (86%; 6 out of 7).

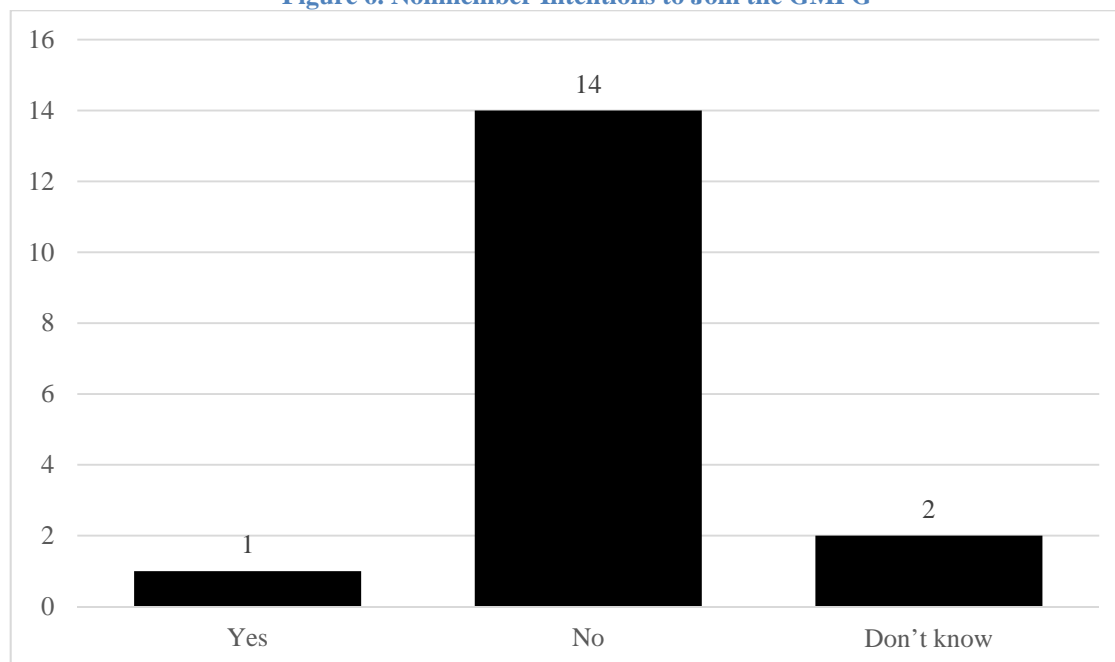
**Table 25. Nonmember Awareness of Utility Incentives for Green Motor Rewinds by Study Year**

Before this survey, were you aware of the opportunity to receive utility incentives via joining the Green Motors Practices Group?	2013 (n=7)		2014 (n=17)	
	Frequency	Percentage	Frequency	Percentage
Yes	6	86%	11	65%
No	1	14%	6	35%

*Notes:* Results show responses from question B4 in the 2014 survey and question D3 in the 2013 survey: *Before this survey, were you aware of the opportunity to receive utility incentives via joining the Green Motors Practices Group?* Cadmus only asked this question of nonmember motor service centers.

In 2014, Cadmus asked nonmember respondents who knew of the GMPG if their shop plans to become a member of the organization. Most nonmembers did not plan to join the GMPG—only one out of the 17 nonmembers who knew of the GMPG planned to join the group, as shown in Figure 6.

**Figure 6. Nonmember Intentions to Join the GMPG**



*Notes:* Results show responses from question B5: *Is your shop planning to become a member of the Green Motors Practices Group?* Cadmus only asked this question of nonmember motor service centers (n=17).

### 3.4.3 Future Data Collection Improvements

Through the 2013 evaluation of ACE model assumptions for motor rewinds, Cadmus determined that the process of compiling data on motor rewinds at the end of the year could be burdensome for motor service centers, many of which do not keep centralized records of their shops' motor rewinds. In 2013, two respondents (who declined to complete the form) stated that they needed advance notice of the motor rewind information request at the beginning of the year, which would allow staff to record information throughout the year as they complete jobs.

In exploring ways to engage motor service centers and reduce data collection burdens in the current evaluation study, Cadmus asked respondents if they preferred to receive the data collection form in advance for future data collection efforts.

Although Cadmus did not directly ask respondents who declined to participate why they were unwilling to complete the data collection forms, some offered the following explanations:

- Four respondents said they were unwilling to complete the form this year because compiling rewinds at the end of year would be too time intensive. However, they were willing to complete the form next year, provided they received the form in advance.
- Two respondents said their tracking systems do not distinguish motor rewinds from other types of motor repairs, so they could not reliably provide the necessary sales data.
- One respondent was concerned about the confidentiality of the data, and did not want to share data that might benefit their competitors.

As shown in Table 26, two-thirds of respondents said they wanted advance notice of the study at the beginning of the year and a copy of the data collection form, including 19 motor service centers that declined to provide data in 2014. Members indicated greater interest in advance notification of study efforts—the majority of members (85%, 22 out of 26) wanted the form in advance; however, less than one-half (11 out of 24) of nonmembers requested advance notice. Of the remaining 13 nonmembers, 11 said they did not need advance notice of data collection and two were unsure.

**Table 26. Member and Nonmember Interest in Advance Notification of Data Collection**

Starting in 2015, would you like to receive advance notice and a copy of the data collection form?	Member (n=26)		Nonmember (n=24)		Total Respondents (n=50)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	22	85%	11	46%	33	66%
No	3	12%	11	46%	14	28%
Don't Know	1	4%	2	8%	3	6%

Notes: Results show responses from question B6: *We need to collect this motor rewind information from service centers each year for the next three years. Starting in 2015, we are able to provide advance notice of these efforts. Would you like to receive advance notice and a copy of the data collection form in early 2015?*



## 4 Conclusions and Recommendations

Based on the study findings, Cadmus developed the following conclusions and recommendations.

### 4.1 Key ACE Model Assumptions

#### 4.1.1 Conclusions About Key ACE Model Assumptions

This study's major research objectives pertain directly to key ACE Model assumptions, as outlined below:

- **Market Size.** In 2014, 83 Northwest motor service centers performed over 3,500 motor rewinds, which amounted to over 446,000 horsepower. Agricultural application motors accounted for 52% of the total rewind horsepower in 2014. The estimated number of rewinds performed by Northwest motor service centers decreased by more than 1,100 motor rewinds—from 4,631 motor rewinds in 2013 to 3,505 in 2014. This decrease in motor rewinds is most likely due to a decline in the motor rewind industry, along with the improvements Cadmus made in data collection and the subsequent changes in Cadmus' study sample between 2013 and 2014.
- **Market Share.** In 2014, GMPG member service centers performed 753 green motor rewinds that represented 114,868 horsepower. Nonmembers performed 25 green motor rewinds that represented 4,435 horsepower. Green motor rewinds accounted for 21% of all motor rewinds performed by GMPG members. Over 30% of all horsepower rewind by GMPG members resulted from green motor rewinds.
- **Savings Calculations.** Cadmus estimated that the total, regional savings from green motor rewinds in 2014 was 1,934,268 annual kWh.

**Table 27. Total Regional Green Motor Rewinds Savings in 2014**

State	Green Motor Rewind Savings (Annual kWh)		
	GMPG Member	GMPG Nonmember	Total
Washington	926,125	0	926,125
Oregon	500,383	0	500,383
Idaho	388,739	0	388,739
Montana	34,463	84,558	119,022
Total	1,849,710	84,558	1,934,268

#### 4.1.2 Recommendations

It is likely that the number of estimated motor rewinds decreased in 2014 from that in 2013 due to a decline in the motor rewind industry and the changes in Cadmus' sample of motor service

centers. However, to fully understand the factors influencing the decline in the estimated number of motor rewinds, Cadmus recommends the following:

- Continue to collect motor rewind data on an annual basis to provide a time series of data points. More data over a longer period of time will allow for a deeper level of analysis and comparison to better understand the motor rewind market.
- Continue to improve data collection methods (described in more detail in the next section, 4.2 Data Collection Improvements) to maintain and encourage participation by member and nonmember motor service centers.
- Conduct additional research to further qualitatively explore changes and trends in the motor rewind industry.

## **4.2 Data Collection Improvements**

### **4.2.1 Conclusions About Data Collection Improvements**

Cadmus and NEEA may need additional engagement strategies and incentives to encourage new and ongoing participation in future data collection efforts. Thirty-five motor service centers (16 members and 19 nonmembers) completed the data collection forms, which was an increase from the 27 motor service centers that completed the form in 2013. Although the overall response rate was higher in 2014 than 2013, the number of member centers that participated in the survey decreased from 18 in 2013 to 16 in 2014. Additionally, seven member centers that provided sales data via the data collection form in 2013 declined to do so in 2014.

### **4.2.2 Recommendations**

In addition to providing motor service centers with advance notification of research efforts and a copy of the data collection form (85% of the surveyed members and 46% of the surveyed nonmembers wanted the form in advance), Cadmus recommends the following methods to increase participation in future data collection efforts:

- Provide a financial incentive to members to participate in future motor rewinds studies (similar to the incentive offered to nonmembers).
- Ask the GMPG administrator to contact member service centers several times throughout the year, such as:
  - At the beginning of the year to provide advance notification and an approximate timeline for the anticipated data collection;
  - At the end of the year before the survey and approximately one month before the data collection deadline; and
  - Two weeks before the data collection deadline.

Following completion of the 2014 evaluation study, Cadmus also intends to send summary findings to all motor service centers that participated in 2014.

## 4.3 Market Transformation

### 4.3.1 Conclusions About Market Transformation

Based on the study findings, green motor rewinds have not yet become standard practice in the Northwest, therefore, the region's efforts have not transformed the market for green motor rewinds. Regional stakeholders need to continue their efforts to transform the market for green motor rewinds.

GMPG members reported that green motor rewinds comprise only 30% of all motors rewound, and 25% (4 out of 16) of member respondents indicated performing no green motor rewinds in 2014. Only one nonmember, previously a member of the GMPG, reported performing green motor rewinds, which comprised 11% of all horsepower rewound in 2014.

GMPG members perform more motor rewinds in compliance with green motor rewind standards than nonmembers. While awareness of the GMPG is increasing, surveyed nonmembers were reluctant to join the Green Motors Practices Group—only one out of the 17 nonmember respondents who knew of the GMPG planned to join the group. Similarly, while 71% of nonmember respondents were aware of EASA accreditation, only 12% (2 out of 17) of those who were aware of it were planning to seek EASA accreditation.

NEEA, the GMPG, and EASA have made significant progress in encouraging motor service centers to perform green motor rewinds. However, without additional intervention, the market penetration of green motor rewinds is not likely to increase.

The current study did not explore motor service center reasons for not planning to join the GMPG or seek EASA accreditation. However, in the 2013 study, nonmembers identified the following reasons for not joining the GMPG: lack of proper equipment (specifically, core loss test machines), lack of customer interest, paperwork hassles, a perception that green motor rewinds do not last as long, and lack of time to sign up. Additionally, in the 2013 study, stakeholder interviewees suggested that developing a customer awareness campaign and reducing paperwork burdens could help encourage motor service centers to offer green motor rewinds. While a deeper exploration of motor service center barriers and motivations was outside the scope of this study, these findings suggest that opportunities remain for NEEA to support interventions to transform the market for motor rewinds.

## 5 Appendices

### Appendix A. Data Collection Form



CADMUS

Motor Rewind Data Sheet Directions
<b>Section A</b>
Record a count of <u>all</u> 15 to 5,000 HP motor rewinds (green motor rewinds <b>and</b> standard motor rewinds) in 2014. In the data sheet, record the number of motor rewinds for each sector (agriculture or industrial), state, and HP.
<b>Section B</b>
Record a count of <u>Green Motor</u> rewinds for 15 to 5,000 HP motors in 2014. (NOTE: If your company is a member of the Green Motors Practices Group, this includes both green motor rewinds you have reported and received an incentive for, as well as those you have <u>not</u> reported or received an incentive for.)
<b>Important Definitions</b>
<b>Green Motor Rewinds</b> , in contrast to standard motor rewinds, refer to motors that are rewound to their original nominal efficiency. The Green Motors Initiative rewind specifications require several criteria for a motor rewind to be considered a green rewind. The minimum criteria are as follows:
a. There must be no visible damage to the core
b. The burn-off temperature should not exceed 725 degrees F using verified water mist control
c. Service center must conduct two (or more) core-loss tests before and after stripping with the final core test watts loss per pound no more than 20% greater than the first test
d. There must be no hot spots greater than 10 degree C
e. The final core test must be less than or equal to 4 watts loss per pound
f. The new winding must be equivalent to the manufacturer's original length and (may exceed) circular mils (voltage changes must be calculated circular mil equivalent)
<b>Contact Information and Form Submittal</b>
For questions about this form or project, please contact Hanna Lee at the Cadmus Group, at hanna.lee@cadmusgroup.com or (503) 467-7110. Please also email completed forms to Hanna Lee at the email address above, or fax to: (503) 575-4710 by <b>December 15, 2014</b>
Name:
Company:
Address:

Rewind Type	Section A: Count of <u>all</u> Motor Rewinds								Section B: Count of <u>Green Motor</u> Rewinds							
End Use	Agriculture				Industrial				Agriculture				Industrial			
State	ID	MT	OR	WA	ID	MT	OR	WA	ID	MT	OR	WA	ID	MT	OR	WA
15 HP																
20 HP																
25 HP																
30 HP																
40 HP																
50 HP																
60 HP																
75 HP																
100 HP																
125 HP																
150 HP																
200 HP																
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700 HP																
800 HP																
900 HP																
1000 HP																
1250 HP																
1500 HP																
2000 HP																
2250 HP																
2500 HP																
3000 HP																
3500 HP																
4000 HP																
4500 HP																
5000 HP																

## Appendix B. 2014 Motor Service Center Survey

Hi, my name is \_\_\_\_\_ and I'm calling from Cadmus on behalf of the Northwest Energy Efficiency Alliance, or, NEEA. May I please speak with [NAME]? [IF NO NAME AVAILABLE SAY]: with the owner or manager of your business? [IF NOT AVAILABLE, SCHEDULE CALL BACK]

[IF NEEDED, REPEAT WHEN OWNER/MANAGER IS ON THE PHONE]: Hi, my name is \_\_\_\_\_ and I'm calling from Cadmus on behalf of the Northwest Energy Efficiency Alliance, or, NEEA.

### A. Introduction

**[NOTE TO REVIEWERS]**: Since we are conducting these interviews in-house, we'd like these interactions to have a more conversational flow. Therefore, we intend for the introductory text below to serve as a guide for the interviewer rather than a script to be read verbatim.]

#### **[IF MEMBER]**

NEEA has contracted with my company to continue the Northwest Green Motor Rewind study that began in 2013.

[IF THEY PROVIDED DATA IN 2013: Thank you again for taking the time last year to participate in the study and contribute to this project's success.]

We're contacting you to request your participation in this year's research. You may have already received an e-mail from Dennis Bowns, Executive Director of the Green Motors Practices Group, about this important study. Does this sound familiar?

The study involves answering a few brief questions over the phone, and afterwards, sending us some information about the motor rewinds your company performed in 2014. We'll ask you for the number of rewinds by horsepower and if the motor was used in either an agricultural or industrial application. It will take you about a half hour to complete that spreadsheet and you can complete it via e-mail, fax, or phone. All of the data that you provide will remain confidential; we are only using it to combine with other data in the Northwest region so we can get an accurate and comprehensive picture of the motor rewinds market.

[IF THEY MENTION THEY REQUESTED ADVANCE NOTIFICATION IN 2013: Several motor service centers requested advance notification of data collection efforts last year. I want to assure you that your voice was heard. Starting in 2015, if requested, we will provide advance notice and a copy of the data collection form to track motor rewinds throughout 2015 and each year research continues.]

In return for your participation, we will share a summary of research findings with you each year that this research continues.

So to begin, I just have a few short questions for you.

[IF NEEDED: Answering these few questions over the phone should take no more than five minutes of your time.]

**[IF A NONMEMBER WHO RECEIVED A PRIOR E-MAIL FROM GMPG]**

NEEA has contracted with my company to continue the Northwest motor rewind study that began in 2013, and we are offering a \$150 visa gift card to mechanical contractors who participate this year.

[IF THEY PROVIDED DATA IN 2013: Thank you again for taking the time last year to participate in the study and contribute to this project's success.]

We're contacting you to request your participation in this year's research. You may have already received an e-mail from Dennis Bowns, who is the former President of the Northwest Chapter of EASA and Executive Director of the Green Motors Practices Group, about this important study. Does this sound familiar?

The study involves answering a few brief questions over the phone, and afterwards, sending us some information about the motor rewinds your company performed in 2014. We'll ask you for the number of rewinds by horsepower and if the motor was used in either an agricultural or industrial application. It will take you about a half hour to complete that spreadsheet and you can complete it via e-mail, fax, or phone. When we receive your data, we will mail you a \$150 gift card. All the data will remain confidential; we are only using it to combine with other data in the Northwest region so we can get an accurate and comprehensive picture of the motor rewinds market.]

[IF THEY MENTION THEY REQUESTED ADVANCE NOTIFICATION IN 2013: Several motor service centers requested advance notification of data collection efforts last year. I want to assure you that your voice was heard. Starting in 2015, if requested, we will provide advance notice and a copy of the data collection form to track motor rewinds throughout 2015 and each year research continues.]

In return for your participation, we will also share a summary of research findings with you each year that this research continues.

So to begin, I just have a few short questions for you.

[IF NEEDED: Answering these few questions over the phone should take no more than 5 minutes of your time.]

**[IF A NONMEMBER WHO DID NOT RECEIVE A PRIOR E-MAIL FROM GMPG]**

NEEA is conducting a study about motor rewinds, and we are offering a \$150 visa gift card to mechanical contractors who participate. NEEA has contracted with my company to continue this Northwest motor rewind study that began in 2013.

[IF THEY PROVIDED DATA IN 2013: Thank you again for taking the time last year to participate in the study and contribute to this project's success.]

We're contacting you to see if you would like to participate in this year's research and receive the incentive. First, let me tell you a little about the study. It involves answering a few brief questions over the phone, and afterwards, sending us some information over e-mail, fax, or phone about the motor rewinds your company performed in 2014.

The purpose of the research is to help NEEA understand more about the motor rewinds industry in the Pacific Northwest. We'll ask you for the number of rewinds by horsepower and if the motor was used in either an agricultural or industrial application. All the data will remain completely confidential; we are only using it to combine with other data in the Northwest region so we can get an accurate and comprehensive picture of the motor rewinds market.

[IF THEY MENTION THEY REQUESTED ADVANCE NOTIFICATION IN 2013: Several motor service centers requested advance notification of data collection efforts last year. I want to assure you that your voice was heard. Starting in 2015, if requested, we will provide advance notice and a copy of the data collection form to track motor rewinds throughout 2015 and each year research continues.]

Once we send you the form to collect the information we need, we expect it to take about a half hour of your time. After we receive your data about motor rewinds, we'll put a gift card in the mail. In return for your participation, we will also share a summary of research findings with you each year that this research continues.

So to begin, I just have a few short questions for you.

[IF NEEDED: Answering these few questions over the phone should take no more than five minutes of your time.]

- A1. To start with, how many employees does your company have in the Northwest? [IF NEEDED: We are only interested in the number of employees your company has in Idaho, Montana, Washington, and Oregon.]
1. [RECORD NUMBER; SPECIFY IF THESE EMPLOYEES ARE AT A SINGLE LOCATION OR MULTIPLE LOCATIONS]
  98. Don't know
  99. Refused

## **B. EASA and GMPG Awareness and Interest**

[ASK IF NOT EASA ACCREDITED]

- B1. Are you aware of Electrical Apparatus Service Association, or EASA, accreditation program for motor service centers? [IF NEEDED: The EASA accreditation program evaluates motor service centers using a third-party auditor to ensure service centers are using best practices for maintaining



motor efficiency and reliability during motor repairs. In return, accredited service centers receive third-party verification and recognition on EASA's website.]

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[ASK IF B1=1]

B2. Is your shop planning to seek EASA accreditation?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[ASK IF GMPG NONMEMBER]

B3. Are you aware of the Green Motors Practices Group?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[ASK IF B3=1]

B4. Before this conversation, were you aware of the opportunity to receive utility incentives via joining the Green Motors Practices Group?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[ASK IF B3=1]

B5. Is your shop planning to become a member of the Green Motors Practices Group?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

## C. Data Collection Forms

C1. How would you prefer to receive the data collection form I mentioned earlier?

- 1. E-mail
  - C1a. [COLLECT E-MAIL]\_\_\_\_\_
- 2. Fax
  - C1b. [COLLECT FAX NUMBER]\_\_\_\_\_
- 3. Phone
  - C1c. [COLLECT PHONE NUMBER]\_\_\_\_\_
- 4. Other [SPECIFY]\_\_\_\_\_
- 98. Don't know
- 99. Refused

[SAY IF GMPG NONMEMBER AND C1=99]

- C2. Unfortunately, I am unable to provide you with an incentive for participating in the study if you do not complete the data collection form.
- C3. We need to collect this motor rewind information from service centers each year for the next three years. Starting in 2015, we will provide advance notice of these efforts. Would you like to receive advance notice and a copy of the data collection form in early 2015?
1. (Yes)
  2. (No)
  98. (Don't know)
  99. (Refused)

[If C3=1]

- C4. How would you like to receive the data collection form in 2015?
1. E-mail  
C4a. [COLLECT E-MAIL IF DIFFERENT FROM C1]\_\_\_\_\_
  2. Fax  
C4b. [COLLECT FAX IF DIFFERENT FROM C1]\_\_\_\_\_
  3. Other [SPECIFY]\_\_\_\_\_
  98. Don't know
  99. Refused

## D. Closing

Great. Thanks again. You should expect to receive the form shortly. There will be more detailed directions on how to complete it on the form itself. It will also have contact information for someone to call if you have any questions, and it will have instructions on how to submit it.

[SAY IF GMPG NONMEMBER]: Once we receive the form, we will mail you your \$150 gift card.

Thank for your time, have a great day!

## Appendix C. 2013 Nonmember Motor Service Center Survey

Research Objectives	Item
Determine number of motor rewinds performed annually by non-GMPG service centers	Data Collection Form
Determine the distribution of motor rewinds by horsepower	Data Collection Form
Determine the percentage of rewinds completed by horse power for the agricultural market vs. the rest of market (ROM)	Data Collection Form
Evaluate the number of motor rewinds compliant with Green Motor Rewinds specification	Data Collection Form
Gauge the natural adoption of Green Motor Rewinds practices without NEEA or utilities' influence	D1-D5; F1-F2
Determine the number of motors that are replaced with new motors instead of rewind	C1-C4
Identify new and salient market barriers and possible intervention strategies	E1-E7
Explore potential ways to engage with the market more effectively	E8-E12
Assess how green motor rewind market penetration has changed over time and how it is anticipated to change in the future	G1-G8
Understand motor service shop characteristics (# of employees, primary customer types)	A1-A2, B1-B7

**NOTE: Answer options in parentheses or instructions in brackets are never read by the interviewer.**

Hi, my name is \_\_\_\_\_ and I'm calling from RDD Services on behalf of the Northwest Energy Efficiency Alliance, or, NEEA. May I please speak [NAME]? [IF NO NAME AVAILABLE SAY]: with the owner or manager of your business? [IF NOT AVAILABLE, SCHEDULE CALL BACK]

[IF NEEDED, REPEAT WHEN OWNER/MANAGER IS ON THE PHONE]: Hi, my name is \_\_\_\_\_ calling from RDD Services on behalf of the Northwest Energy Efficiency Alliance, or, NEEA.

### A. Introduction

[IF RECEIVED PRIOR E-MAIL FROM CADMUS/NEEA]

NEEA is conducting a study about motor rewinds, and we are offering mechanical contractors who participate in our study a \$100 visa gift card. We're contacting you to see if you would like to participate in the research. You may have already received an e-mail from Dennis Bowns, who is the President of the Northwest Chapter of EASA [PRONOUNCED EEESA] and Executive Director of the Green Motors Practices Group, about this important study. Does this sound familiar?

[IF NEEDED: The purpose of the research is to help NEEA understand more about the motor rewinds industry and about companies like yours that provide these services.]

The study involves answering a few questions over the phone, and afterwards, sending us some information over e-mail about the motor rewinds your company performed in 2013. We'll ask you for the number of rewinds by horsepower and if the motor was used in either an agricultural or industrial application. Once we send you the form to collect the information we need, we expect it to take about a half hour of your time. When we receive your data, we will mail you a \$100 gift card. All the data will remain confidential; we are only using it to combine with other data in the Northwest region so we can get an accurate and comprehensive picture of the motor rewinds market.]

So to begin, I have a few questions for you. [SKIP TO A1]

[IF CALLER DID NOT RECEIVE PRIOR E-MAIL FROM CADMUS/NEEA]

NEEA is conducting a study about motor rewinds, and we are offering mechanical contractors who participate in our study a \$100 visa gift card. We're contacting you to see if you would like to participate in the research and receive the incentive. First, let me tell you a little about the study.

It involves answering a few questions over the phone, and afterwards, sending us some information over e-mail about the motor rewinds your company performed in 2013.

The purpose of the research is to help NEEA understand more about the motor rewinds industry and your company's practices. So, we'll ask you for the number of rewinds by horsepower and if the motor was used in either an agricultural or industrial application. All the data will remain completely confidential; we are only using it to combine with other data in the Northwest region so we can get an accurate and comprehensive picture of the motor rewinds market.

Once we send you the form to collect the information we need, we expect it to take about a half hour of your time. After we receive your data about motor rewinds, we'll put a gift card in the mail.

So to begin, I have a few questions for you.

[CONTINUE UNLESS THEY DO NOT WANT TO PARTICIPATE].

[IF NEEDED: The study is about motor rewind practices.]

- A1. First, can you please tell me the primary service or services your business provides?  
[OPEN END]
- A2. And for my records, can you please tell me your title at the company?  
[OPEN END]

## B. Business Information

B1. Does your company have service locations in more than one state?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

**[[IF B1=1]**

B2. In which states are your company's service centers located? **[MARK ALL THAT APPLY]**

1. (Idaho)
2. (Montana)
3. (Oregon)
4. (Washington)
5. (Other) **[SPECIFY: \_\_\_\_\_]**
98. (Don't know)
99. (Refused)

**[IF B2=5]**

Even though your company has motor service centers in more than one state, NEEA is only gathering information about motor rewinds conducted in Idaho, Montana, Oregon, and Washington. For the purposes of this survey, please provide answers only for your company's motor service centers in Idaho, Montana, Oregon, and Washington.

B3. What types of customers does your business rewind motors for?

**[MARK ALL THAT APPLY]**

1. (Agricultural)
2. (Commercial)
3. (Industrial: Pulp and Paper)
4. (Industrial: Wood products manufacturing)
5. (Industrial: Food processing)
6. (Industrial: Fabricated metal manufacturing)
7. (Industrial: Waste-water treatment)
8. (Industrial: Chemical)
9. (Other) **[SPECIFY \_\_\_\_\_]**
98. (Don't know)
99. (Refused)

- B4. In addition to motor rewinds, what other types of services does your company provide for customers? **[MARK ALL THAT APPLY. DO NOT READ]**
1. Pump rebuilds
  2. Compressor rebuilds
  3. Vibration testing
  4. Shaft alignment
  5. Controls and instrumentation
  6. Piping
  7. General maintenance
  8. General preventative monitoring of equipment
  9. (Other) **[SPECIFY:\_\_\_\_\_]**
  98. (Don't know)
  99. (Refused)
- B5. Does your shop provide regular preventative maintenance to identify problems, or do most of your customers call you when a motor needs repair?
1. (Preventative maintenance)
  2. (Customer calls us when needed)
  3. (A combination of both)
  98. (Don't know)
  99. (Refused)
- B6. Who at your shop is responsible for interacting with customers? Would you say... **[READ LIST. MARK ALL THAT APPLY]**
1. Sales staff,
  2. Dedicated account representatives,
  3. The first person who answers a customer's call,
  4. Any available technician on staff, or
  5. Business owner
  6. (Other) **[SPECIFY:\_\_\_\_\_]**
  98. Don't know
  99. Refused
- B7. How many employees does your company have in the Northwest? **[IF NEEDED: We are only interested in the number of employees your company has in Idaho, Montana, Washington, and Oregon]**  
**[NUMERIC OPEN-END]**

### **C. Motor Replacements**

- C1. About what percentage of motors were replaced rather than rewound in 2013?  
**[RECORD NUMBER]**  
**[IF RESPONDENT SAYS 0% SKIP TO C4]**
98. (Don't know)
  99. (Refused)

- C2. In most cases, what are the reasons that a customer would replace a motor as opposed to rewinding the motor?
1. (Damage to core)
  2. (Motor size: if the motor is too small)
  3. (Too expensive to rewind; better value to buy a new one)
  4. (Customer preference)
  5. (Motor age or motor vintage)
  6. (Other) [SPECIFY:\_\_\_\_\_]
  98. (Don't know)
  99. (Refused)
- C3. Of the motors you replaced, what was the approximate horsepower range for these motors?  
[DO NOT READ; CHECK ALL THAT APPLY]
1. (<15 HP)
  2. (15 to 500)
  3. (501-1000)
  4. (1001 to 2000)
  5. (2001 to 3000)
  6. (3001 to 4000)
  7. (4001 to 5000)
  8. (>5000)
  9. (Other)
  98. (Don't know)
  99. (Refused)
- C4. If utility incentives became available to replace core damaged motors with new motors, how likely would your company be to participate? Would you say...[READ LIST]
10. Very likely
  11. Somewhat likely
  12. Not too likely
  13. Not at all likely
  98. (Don't know)
  99. (Refused)

## **D. Green Motor Rewinds Practices and Program Influence**

- D1. Are you aware of the specifications for Green Motor rewinds? [NOTE: IF RESPONDENT SAYS "Sort of..." or, "I think so..." THIS SHALL BE MARKED AS YES.]
1. (Yes)
  2. (No)
  98. (Don't know)
  99. (Refused)
- [IF D1=1]
- D2. What have you heard about Green Motor rewinds?  
[OPEN END]

[EVERYONE]

Green Motor Rewinds, in contrast to standard motor rewinds, refer to motors that are rewound to their original nominal efficiency. The Green Motors Initiative rewind specifications require several criteria for a motor rewind to be considered a green rewind, such as no damage to the motor core, water mist controlled burn-off temperatures of less than 720<sup>0</sup> F, core-loss test before and after stripping, limited hot spot allowance, and other criteria.

[SKIP IF D1=1]

D3. Before this survey, had you heard of Green Motor Rewinds?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[SKIP IF D1=2, 98, or 99 AND D3=2, 98, or 99]

D4. Does your company make a distinction between a standard rewind and a Green Motor rewind?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[ASK EVERYONE]

D5. Would you say your company performed any green motor rewinds in 2013, according to the green motors specifications or the criteria I just mentioned?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[IF D5=1]

D6. About what percent of your total rewinds would you say were performed in 2013 according to green motor rewind specs?

[OPEN END NUMERIC]

**E. Market Barriers and Interventions**

E1. Are you aware of the Green Motors Practices Group? [NOTE: IF RESPONDENT SAYS "Sort of..." or, "I think so..." THIS SHALL BE MARKED AS YES.]

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)



[SKIP IF E1=2, 98, or 99]

E2. According to my understanding, to be eligible for an incentive from your utility for performing green motor rewinds, service centers must be members of the Green Motors Practices Group. My records show that your business is not a member, do I have that right?

1. (Yes, correct, we are not a member)
2. (No, incorrect. We are a member)
98. (Don't know)
99. (Refused)

[SKIP IF E1=2, 98, or 99]

E3. Before this survey, were you aware of the opportunity to receive utility incentives via joining the Green Motors Practices Group?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

[SKIP IF E1=2, 98, or 99, OR E2=2, 98, or 99]

E4. What are the main reasons that your business isn't a member of the Green Motors Practices Group?

[DO NOT READ, MARK ALL THAT APPLY]

1. (I don't know how to become a member)
2. (I just haven't had time to sign up yet)
3. (I do not have the proper equipment to conduct green motor rewinds)
4. (Paperwork hassle)
5. (Incentive is too low, it does not cover the costs of a green motor rewind)
6. (I do not like the Green Motors Practices Group) [RECORD VERBATIM WHY\_\_\_\_\_]
7. (It's my boss's decision)
8. (Customers don't care about green motor rewinds)
9. (Other) [SPECIFY:\_\_\_\_\_]
98. (Don't know)
99. (Refused)

[ASK If D5=2]

E5. What are the main reasons your business does not conduct green motor rewinds? [OPEN END]

[SKIP IF D1=2, 98, or 99]

E6. Are there any challenges with conducting rewinds in accordance with green motor rewind specifications? [OPEN END; 2=No, 98=DON'T KNOW, 99=REFUSED]

[SKIP IF D1=2, 98, or 99 OR E6=2, 98, or 99]

E7. What could be done to help you overcome those challenges? [OPEN END]

E8. How helpful would it be for you or your employees to receive more information or training about conducting green motor rewinds? Would you say more information or training would be... [READ LIST]

1. Very helpful
2. Somewhat helpful

- 3. Not very helpful
- 4. Not at all helpful
- 98. (Don't know)
- 99. (Refused)

[IF E8=1 OR 2]

E9. What types of information or training would you like to receive about conducting green motor rewinds? [OPEN END]

[SKIP IF D1=2, 98, or 99, D3=2, , 98, or 99 or D4=2, 98, or 99]

E10. About what percent of your customers request or require green motor rewinds?  
[OPEN END NUMERIC; 96 = N/A (no customers), 98=Don't know, 99=Refused)

[SKIP IF D1=2, 98, or 99, D3=2, 98, or 99, or D4=2, 98, or 99]

E11. How often do you recommend green motor rewinds to your customers? Would you say...[READ LIST]

- 1. Very often,
- 2. Sometimes,
- 3. Not too often, or
- 4. Never
- 98. (Don't know)
- 99. (Refused)

[ASK IF E11=3 OR 4]

E12. What makes you say that?  
[OPEN END]

[ASK SECTION F IF D5=1]

## **F. Program Influence**

F1. You mentioned that you performed some green motor rewinds in 2013, but did not receive any incentive for them. Do I have that right?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[ASK IF F1=1]

F2. What are the main reasons why your company performed green motor rewinds?  
[OPEN END]

## G. Historical and Future Trends

[ASK IF D5=1]

- G1. Earlier, you mentioned that about [INSERT ANSWER FROM D6] of your rewinds in 2013 were green motor rewinds in 2013. Thinking about the rewinds your company performed 5 years ago, would you say the percentage of green motor rewinds you performed in 2013 is ... [READ LIST]

1. About the same as it was five years ago,
2. Lower than five years ago, or
3. Higher than five years ago?
98. (Don't know)
99. (Refused)

[ASK IF G1=1,2, or 3]

- G2. Using your best estimate, about what percentage of your motor rewinds were green motor rewinds five years ago?

[OPEN END NUMERIC]

[ASK IF G1=2]

- G3. What are the reasons that your company performs fewer green motor rewinds now?

[OPEN END]

[ASK IF G1=3]

- G4. What are the reasons that your company performs more green motor rewinds now?

[OPEN END]

[SKIP IF D3=2 OR D5=2]

- G5. In the next five years, would you say that the percentage of green motor rewinds that you will conduct will be ... [READ LIST]

1. About the same as it is now,
2. Lower than it is now, or
3. Higher than it is now?
98. (Don't know)
99. (Refused)

[SKIP IS G5=98 or 99]

- G6. What are the reasons you think the percentage of green motor rewinds you conduct in five years will be [INSERT ANSWER FROM G5]?

[OPEN END]

[ASK ALL]

- G7. Thinking about motor rewinds in general, not just green motor rewinds, where do you see the industry heading in the next five years? Would you say that you expect business to...[READ LIST]

1. Grow a lot,
2. Grow somewhat,
3. Stay about the same,
4. Slow down somewhat, or
5. Slow down a lot?

- 98. (Don't know)
- 99. (Refused)

G8. What makes you say that?  
[OPEN END]

## H. Closing

Thank you, those are all the questions I have for you today. If you'd like to provide me with your e-mail address now, I will send you a form that we need for the second stage of this study.

- H1. 1. [COLLECT E-MAIL\_\_\_\_\_]  
2. (Do not have an e-mail)  
99. (Refused) [Thank you for your time. Unfortunately I am unable to provide you with an incentive for participating in the study if you do not complete the 2<sup>nd</sup> stage, but I appreciate your feedback today.]

[ASK IF H1=2]

- H2. Do you have a fax number so that I could fax it to you instead?  
1. [COLLECT FAX NUMBER\_\_\_\_\_]  
99. (Refused)

Great. Thanks again. You should expect to receive the form shortly. There will be more detailed directions on how to complete it on the form itself. It will also have contact information for someone to call if you have any questions, and it will have instructions on how to submit it. Once NEEA receives the form, they will mail you a gift card.

Thank for your time, have a great day!

[IF NEEDED: The form will ask you for the number of rewinds your company performed by horsepower in 2013 and if the motor was used in either an agricultural or industrial application.]

[IF NEEDED: All the data will remain completely confidential; we are only using it to combine with other data in the Northwest region so we can get an accurate and comprehensive picture of the motor rewinds market.]