Joint Petition to Adopt Joint Stakeholder Proposal As it Relates to the Rulemaking on Energy Conservation Standards for Electric Motors

Docket No. EERE–2010–BT–STD–0027

August 15, 2012

National Electrical Manufacturers Association
American Council for an Energy-Efficient Economy
Appliance Standards Awareness Project
Alliance to Save Energy
Earthjustice
Natural Resources Defense Council
Northwest Energy Efficiency Alliance
Northeast Energy Efficiency Partnerships
Northwest Power and Conservation Council

I. Introduction and Background

Pursuant to sections 325(p)(4) and 345(a) of the Energy Policy and Conservation Act, 42 U.S.C. §§ 6295(p)(4), 6316(a), and section 8 of DOE's Process Improvement Rule, 10 CFR Part 430, Subpart C, Appendix A, the parties listed above (the "Joint Stakeholders") respectfully offer this statement recommending specific energy conservation standards for electric motors. Several of the Joint Stakeholders, entities fairly representative of manufacturers of electric motors and efficiency advocates, have previously submitted in this rulemaking proceeding the substance of a proposal with respect to energy conservation standards for electric motors on behalf of the "Motor Coalition," and they are now joined in this petition by representatives of additional stakeholders to submit more detailed recommendations to the Secretary of Energy. In summary, the recommendations primarily, but not exclusively are aimed at expanding the coverage of types of electric motors not currently regulated under the Energy Policy and Conservation Act (EPCA) to achieve the maximum amount of energy savings that are technologically feasible and economically justified. Significantly, the recommended energy conservation standards will not require a change in existing test procedures.[1]

Energy conservation standards for electric motors were originally established by Congress in 1992 for certain types or configurations of single-speed, polyphase, "general purpose" induction motors meeting specifications found in NEMA Standards Publication MG1-1987 as defined in section 122 of the Energy Policy

[1] While no changes in the test procedures are required, some guidance should be included in an Appendix to the test procedures related to the configuration of some newly regulated electric motors during testing so that uniform practices are followed. Appendix B to this petition contains the petitioners' recommendations.

Act of 1992, Pub.L. 102-486. These EPAct 1992 provisions were subsequently amended by section 313 of the Energy Independence and Security Act of 2007, Pub.L. 110-140 (EISA 2007), which, among other things, deleted the definition of "electric motor" in EPAct 1992, and in its place inserted definitions of certain types of electric motors for which revised energy conservation standards were codified, including some new types of motors that were not previously subject to energy conservation standards. EISA 2007 raised the energy conservation standards for the types of electric motors covered in EPAct 1992 to levels depicted in NEMA MG-1, Table 12-12, while applying the EPAct 1992 energy conservation standard levels (NEMA MG-1, Table 12-11) to (a) "fire pump motors," (b) additional configurations of electric motors not previously regulated by EPAct 1992 (called "general purpose electric motor subtype II"), and (c) certain higher horsepower NEMA Design B, general purpose electric motors rated greater than 200 hp up to 500 hp for the first time.

The Motor Coalition's proposal incorporated the idea of adopting a very broad definition of electric motor that would be a "covered product," and identifying a small number of types of electric motors that would be excluded from energy conservation standards, primarily because of difficulties in applying test procedures, but also because of the much lower national energy consumption accounted for by those excluded motor types. Recently, on May 4, 2012, the Secretary of Energy adopted a Final Rule amending test procedures for electric motors and small electric motors, which adopted a broad definition of electric motor, amending 10 CFR 431.12 to read as follows: "Electric motor means a machine that converts electrical power into rotational mechanical power." 77 Fed. Reg. 26608, 26633 (May 4, 2012). This amendment is consistent with the proposal of the Motor Coalition in this proceeding, although we would recommend some further clarifying language so that it is understood that "partial motors" are included in this definition.

To understand the migration of energy conservation standards proposed by the Joint Stakeholders' recommendations, we refer to the following table that identifies where the improvements in energy savings would occur from our recommendations.

Motor Type	EISA-2007 Standards	Joint Stakeholders' Recommendations
General Purpose Electric Motor Subtype I (EPAct 1992 motors) 1-200 hp	NEMA MG-1, Table 12-12	Unchanged (but extend the application of Table 12-12 standards to motors up to 500 hp)
Fire pump electric motors 1-500 hp	NEMA MG-1, Table 12-11	Unchanged
General Purpose Electric Motor Subtype II (EISA 2007	NEMA MG-1, Table 12-11	Except for U-frame motors, increase efficiency to NEMA MG-1, Table 12-12 (and extend the

configurations) 1-200 hp		application of Table 12-12 standards to motors up to 500 hp)
U-frame motors	NEMA MG-1, Table 12-11 as included in Subtype II	Unchanged, but would now include U-frame motors up to 500 hp
NEMA Design B General Purpose motors, 201 – 500 hp	NEMA MG-1, Table 12-11	Increase efficiency to NEMA MG-1, Table 12-12
Other single-speed polyphase continuous duty (MG1) or duty type S1 (IEC), squirrel-cage (MG) or cage (IEC) induction electric motors previously excluded, including definite purpose, special purpose, '56' frame size motors that are not "small electric motors," 1-500 hp	Excluded and not regulated	Would now be covered at NEMA MG-1, Table 12-12.
Liquid-cooled electric motors Submersible electric motors Air-over electric motors Integral brake electric motors	Excluded and not regulated	Would remain excluded and not regulated

Appendix A to this Petition identifies the proposed changes to the current regulations at 10 CFR 431.12, 431.25, and 431.31 that the Joint Stakeholders believe would implement these recommendations, which the Joint Stakeholders submit is fully consistent with the requirements of the Energy Policy and Conservation Act.

We recommend that our proposed new and amended standards be applicable to covered equipment manufactured on or after January 1, 2015.

II. Identity of the Joint Stakeholders

The *American Council for an Energy-Efficient Economy* (ACEEE) is a nonprofit, non-partisan, organization dedicated to advancing energy efficiency as a means of promoting economic prosperity, energy security, and environmental protection. ACEEE fulfills its mission by conducting in-depth technical and policy assessments; advising policymakers and program managers; working collaboratively with businesses, public interest groups, and other organizations; publishing books, conference proceedings, and reports; organizing conferences and workshops; and educating consumers and businesses.

The *Appliance Standards Awareness Project* (ASAP) is a coalition group dedicated to advancing cost-effective energy efficiency standards for appliances and equipment. ASAP works at both the state and federal levels and is led by a Steering Committee with representatives from consumer groups, utilities, state government, environmental groups, and energy-efficiency groups.

The *Alliance to Save Energy* (Alliance) is a nonprofit organization that promotes energy efficiency worldwide through research, education and advocacy. The Alliance encourages business, government, environmental and consumer leaders to use energy efficiency as a means to achieve a healthier economy, a cleaner environment and greater energy security. The Alliance's Associates (members) include more than 160 organizations, composed of manufacturers, commercial, industrial, and utility users of energy, and associations representing these groups, committed to energy efficiency as a primary way to achieve the nation's environmental, economic, energy security and affordable housing goals. Associates work with the Alliance and each other on energy efficiency policy and programs.

Earthjustice is a non-profit public interest law firm dedicated to protecting the magnificent places, natural resources, and wildlife of this earth, and to defending the right of all people to a healthy environment.

The *National Electrical Manufacturers Association* (NEMA) is a not-for-profit trade association representing approximately 400 manufacturers of electrical equipment and medical imaging products, including all the major manufacturers of electric motors in the United States. The current membership of NEMA's Motor and Generator Section include the leading manufacturers of energy-efficient electric motors: Baldor Electric Company (an ABB Group member), Cummins, Inc., General Electric Company, Nidec Motor Corporation, Regal-Beloit Corporation, Schneider Electric, SEW Eurodrive, Inc., Siemens Industry, Inc., Sterling Electric, Inc., TECO-Westinghouse Motor Company, Toshiba International Corporation, and WEG Electric Corp. NEMA and its members who manufacture electric motors have been at the vanguard in promoting the use of energy efficient electric motors, establishing standards for a more energy-efficient class of motors known as NEMA Premium® together with a marketing campaign that has increased market penetration for those motors that met the higher standards. NEMA collaborates with other groups in the promotion of energy-efficient products. NEMA has been long-involved in the national appliance standards program in the development of energy conservation standards, test procedures, labeling and information requirements.

The *Natural Resources Defense Council* (NRDC) is a national environmental advocacy organization with over 1.3 million members and online activists. NRDC has spent decades working to build and improve DOE's federal appliance standards programs because of the important energy, environmental, consumer, and reliability benefits of appliance efficiency standards. NRDC participated in the enactment of the first federal legislation establishing efficiency standards, and has been active in all significant rulemakings since then.

The *Northeast Energy Efficiency Partnerships* (NEEP) is a non-profit organization that transforms the way we use and think about energy, through advocacy, collaboration and education designed to accelerate energy efficiency and highlight its impacts on the region, the economy, and the planet.

The *Northwest Energy Efficiency Alliance* (NEEA) is a non-profit organization working to encourage the development and adoption of energy-efficient products and services. NEEA is supported by the region's electric utilities, public benefits administrators, state governments, public interest groups and efficiency industry representatives. This unique partnership has helped make the Northwest region a national leader in energy efficiency.

The *Northwest Power and Conservation Council* is an interstate compact between the states of Idaho, Montana, Oregon and Washington authorized by the Northwest Electric Power Planning and Conservation Act of 1980 (PL96-501). The Council's role is to ensure that the Northwest's electric power system will provide adequate and reliable energy at the lowest economic and environmental cost to its citizens. The U.S. Congress charged the Council with developing integrated electric power plans for the Northwest. These plans are to rely on cost-effective conservation as their first priority resource.

III. <u>Development of the Recommendations</u>

The rationale for the Joint Stakeholder recommendations was first presented to DOE in this proceeding in October 2010 by Dr. R. Neal Elliott, Associate Director for Research at ACEEE on behalf of ACEEE, NEMA, and ASAP:

> While there are many advanced motor types that aren't covered [by current DOE energy conservation standards], including motors using permanent magnet technology, electronically commutated motor technology, or switched reluctance motor technology, there are also many motors defined by NEMA as "definite purpose" or "special purpose" within the integral poly-phase category that could be covered with the current "general purpose" motors with efficiency levels as specified by NEMA Standard MG 1, Table 12-12. Previous rules have already increased standards for these covered motors upwards of 95%. Analysis by NEMA shows that increasing MEPS for covered, general-purpose motors would increase their efficiency by 0.7% on average. Expanding the definition of covered product to include many "definite purpose" and "special purpose" could increase the efficiency of these motors by 2.2% to 5.3%.
>
> In addition to resulting in greater energy savings, expanding coverage would dramatically simplify enforcement of standards by narrowing the scope of products not currently covered by MEPS. The current ambiguity in definition of covered products, combined with the large number of parameters that are used to determine whether a motor is covered by MEPS, has made the enforcement of the standards more difficult than it needs to be. We feel it is important to improve enforcement both because of the energy savings that are lost, but also

> out of a sense of fairness for the 14 NEMA manufacturers who make good-faith effort to comply and are undercut by manufacturers and importers who circumvent the standards. We thus encourage the Department to seek to simplify definitions of covered products in this coming rulemaking to make standards more easily enforced.
>
> We encourage DOE to approach the direction of this rulemaking carefully. Currently, most domestic manufacturers could produce the motors that would be covered by this proposed expansion in scope designing models at the MG 1, Table 12-12 level. Thus, while there would still be costs to manufacturers, it would not be an undue burden and standards could go into effect as soon as 18 months after the Department issues its rule. This period would be far shorter than would be undertaken with an approach that increased efficiency levels [above Table 12-12 for already regulated equipment], and would result in significant additional savings from the earlier implementation date, since motors typically have an operating life of approximately 25 years.
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> On the other hand, raising the efficiency levels above MG 1, Table 12-12 at this point could result in unintended market impacts that might actually result in increased energy consumption. The motor marketplace differs significantly from many other types of equipment covered by DOE standards. It is thus important to consider the market impacts of this rule, as well as the technical aspects of this rule.

Since October 2010, the Motor Coalition has continued to review and discuss the proposal and refine estimates of the energy savings and other impacts expected from their proposal as well as other technical aspects. Further information has been provided by the Motor Coalition to DOE since that time including joint comments filed in response to the March 2011 Request for Information (76 FR 17577). This Petition formalizes their petition for a direct final rule to DOE.

IV. <u>DOE's PTSD Analysis Validates the Motor Coalition's Proposed Approach</u>

At the Framework stage of this rulemaking, DOE outlined an analysis plan focused primarily on consideration of increased efficiency for existing covered motors. As described above, the Motor Coalition proposed another approach, focused instead on increasing scope of coverage and bringing the vast majority of motors up to the efficiency levels depicted in Table 12-12. This focus would drive large savings in two ways. First, the increase in per unit motor efficiency would be much greater for uncovered motors than any conceivable increase for most already-covered motors. Second, applying Table 12-12 levels nearly across the board to an expanded pool of covered motors would address the circumvention of existing standards achieved by slight alterations to motors which would otherwise be covered.

In response to the Motor Coalition comments, DOE began to investigate increased scope, leading to publication of the July 2012 Preliminary Technical Support Document (PTSD). Consistent with DOE's statutory obligations and past practice, DOE evaluated a wide range of efficiency levels (termed "Candidate Standards Levels" or CSLs), including the electric motors designated by DOE as maximum technologically feasible.

The DOE PTSD validates the recommendation of the Motor Coalition and this petition. The analysis shows that expanding the applicability of the Table 12-12 standards as we recommend would save about 4.4 quads of cumulative energy and yield life cycle cost savings for motor purchasers.[2] Had DOE adhered to its initial plan of focusing only on increasing efficiency requirements for already covered motors, achieving 4.4 quads of savings would likely have required the adoption of levels that the PTSD indicates are not cost-effective for the vast majority of motor purchasers.[3] The diminishing returns of further increases in efficiency for currently covered motors are illustrated by the fact that the Motor Coalition proposal saves more than twice as much energy as increasing the efficiency of subtype I motors from Table 12-12 levels to the higher levels depicted in CSL 3.[4]

Although the PTSD suggests that additional increases in efficiency beyond the Table 12-12 levels could be lifecycle cost effective for some motor purchasers, the PTSD fails to account for several factors that undercut the assumption that higher efficiency levels will lead to increased cost-effective energy savings. Raising levels beyond Table 12-12 would increase the first cost difference between covered and uncovered motors, fostering increased rates of circumvention. The higher initial costs would also encourage refurbishment of existing motors rather than replacement with more efficient new motors. Even more problematic, increasing efficiency

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[2] Section VII of this petition addresses scope and the petition's recommendations would slightly change these savings estimates.

[3] The PTSD projects that raising efficiency levels to CSL 3would yield energy savings of about 7.5 quads – roughly 3.1 quads more than the energy savings achieved by the standards recommended in this petition. However, these savings include the effect of an increase in efficiency for both currently covered motors and motors that are presently exempt from standards. The portion of CSL 3's projected energy savings attributable to already covered motors is likely much less than 4.4 quads, as discussed further in footnote 3 below. Therefore, matching the 4.4 quads of savings reached through this petition without expanding the scope of coverage would likely have necessitated moving currently covered motors up to the levels analyzed in CSL 4, which the PTSD shows are clearly not cost-effective.

[4] Because subtype I motors are already required to meet CSL 2 levels, it is possible to separate out the incremental energy savings projected for CSL 3 into (1) energy savings from subtype I motors and (2) energy savings from subtype II and newly covered motors. The incremental increase in energy savings from CSL1 (energy efficient) to CSL2 (premium) is about 4.4 - 1 = 3.4 quads. This corresponds to an average reduction in total losses of between 20% and 30% (or two to three NEMA bands). Assuming 25% (2.5 NEMA bands), then one NEMA band corresponds to an energy savings of 3.442/2.5 = 1.4 quads for subtype II and newly covered motors. The increase in energy savings from CSL 2 to CSL 3, one NEMA band, is 7.5 - 4.4 = 3.1 quads. Of this 3.1 quads, the increase related to the subtype II and newly covered motors is again about 1.4 quads. That leaves 3.1 - 1.4 = 1.7 quads as the result of increasing the efficiency level of subtype I.

levels beyond the Table 12-12 levels would impose unacceptable consequences for motor purchasers and motor manufacturers (see section VI below for more detail).

V. Compliance of the Joint Stakeholder Proposal with the Energy Policy and Conservation Act Requirements

Any new or amended energy conservation standard prescribed by the Secretary under the Energy Policy and Conservation Act must be designed to achieve the maximum improvement in energy efficiency, which the Secretary determines is technologically feasible and economically justified. 42 U.S.C. § 6295(o).

A. Technical Feasibility

The Joint Stakeholders, which includes NEMA on behalf of its motor manufacturer members, represent that the recommended standards can be achieved based upon existing technology and motor design capability.

B. Economic Impact to Commercial and Industrial Consumers including Life Cycle Cost Impacts

Several of the Joint Stakeholders first recommended that DOE consider expanding scope of coverage nearly two years ago. Our recommendation at that time was and remains today based on an assessment that standards set at table 12-12 levels covering most motors would be cost-effective on average for purchasers. DOE's lifecycle cost and payback analyses published in the PTSD validate that assessment. We believe the DOE analyses provide a reasonable basis for decision-making.

The PTSD demonstrates that our recommended standards yield lifecycle cost savings for affected commercial and industrial customers. DOE estimates that operating cost savings over the average estimated life of the covered product exceed the burdens of increases in price. The table below reproduces DOE's estimates of the lifecycle cost impacts and payback periods (PTSD Tables ES.3.18 – ES.3.22) for the efficiency levels we recommend and DOE's estimated lifetimes (PTSD Table 8.2.31).

Representative Unit	Recommended CSL (i.e. NEMA Premium)	Average LCC savings	Median payback	Estimated product life
1 (5 hp, Design B)	2	$25	5.1 years	10.5 years
2 (30 hp, Design B)	2	$177	5.3 years	12.2 years
3 (75 hp, Design B)	2	$663	1.5 years	10.3 years
4 (5 hp, Design C)	1	$34	4.6 years	10.9 years
5 (50 hp, Design C)	2	$236	5.9 years	12.8 years

Our recommended standard levels yield average LCC savings for each of the representative units. In each case, the estimated incremental cost of efficiency pays back well within the lifetime of the affected electric motor. For representative units 3 - 5, our recommended levels minimize estimated lifecycle costs. For representative units 1 and 2, the recommended CSLs are the highest level with positive LCC impacts which would not result in unacceptably high costs to manufacturers, risk significant domestic job losses and, potentially, result in the unavailability of some motor types. Section VI below provides more detail on why going above the Table 12-12 levels would be contrary to EPCA even in those cases where the DOE's LCC analysis shows positive LCC results.

DOE calculates the net present value of the Joint Stakeholders' recommended standards at $18 billion using a 3% discount rate and more than $7 billion using a 7% discount rate. (We note that DOE found all evaluated levels for Fire Pump motors to increase lifecycle costs. Therefore, DOE's analysis supports our recommendation for no change to the Fire Pump motor standards.)

C. Economic Impact to Manufacturers

The Joint Stakeholders represent that the impacts of the recommended standards on motor manufacturers will be acceptable. This conclusion is endorsed by all of the manufacturers in the NEMA Motor and Generator Section. Some, but not all designs of presently covered electric motors which we are recommending should be subject to the energy conservation standards in NEMA MG 1, Table 12-12, are already designed and sold to Table 12-12 standards where the customer asks for it, so the fact that these designs already exist will mitigate some of the burden of shifting to a higher minimum standard.

The most significant impact on motor manufacturers will occur as a result of enlarging the number of different types of electric motors which would now be covered by new energy conservation standards. This will entail some new designs, retooling, and process changes to increase the efficiency of such designs not now subject to any energy conservation standards.

All electric motors impacted by the recommended standards will also require the use of higher grade electrical steels and other materials in order to meet the higher energy conservation standards recommended by the Joint Stakeholders. The supply of these electrical steels is an important issue for motor manufacturers, but it is believed that the steel and lamination manufacturers will be able to adjust their production and retool for steel and die changes within the 24-month period leading to the recommended compliance date.[5]

D. Energy Savings

[5] Assuming the proposed Direct Final Rule is published in the Federal Register no later than December 31, 2012.

The Joint Stakeholders' recommendations would result in total projected energy savings with benefits exceeding burdens to the greatest extent practicable. For the efficiency levels we recommend, the DOE PTSD estimates cumulative national savings of more than 4.4 quads of primary energy, considering motors sold over a thirty year period (Table ES.3.27). This estimate places this rulemaking in the top echelon of recent DOE rules in terms of energy savings delivered for the nation. For comparison purposes, the recent clothes washer standard will save 2 quads and the recent fluorescent ballast standard will save 2.7 – 5.6 quads according to DOE.

E. Lessening of Utility or Performance or Availability of Products

The Joint Stakeholders' recommendations will provide no significant lessening of utility or performance or availability of covered products as prohibited by the Energy Policy and Conservation Act. The primary impact will be the elimination of some SKUs that will not meet the higher energy conservation standards, but this does not mean a reduction in the performance or availability of electric motors.

F. Impact of Lessening of Competition

The Joint Stakeholders believe their recommendations would not support a Department of Justice determination that the standard would lead to the likelihood of reduced competition under the Energy Policy and Conservation Act. The recommendations were developed through a negotiation process that included the active participation of the manufacturers of electric motors and have been designed to mitigate any negative competitive impacts. The recommendations are not expected to eliminate any competitors.

G. Need of the Nation to Conserve Energy

Improved energy efficiency improves the nation's energy security, strengthens the economy, and reduces the environmental impact of energy production. As noted in Paragraph D. above, the energy savings from the Joint Stakeholders' recommendations will reach more than 4.4 quads considering motors sold over a thirty year period according to DOE. One of the most significant opportunities for further domestic energy savings is in the industrial sector, and the recommended standards are expected to have their greatest energy saving impact there.

H. Other Factors

Looking forward, one of the most exciting opportunities for further energy conservation in the industrial sector is expected to be derived from advanced motor technology systems such as a combination of a motor and any required associated electronic control, which offers variable or multiple speed operation, and uses permanent magnet technology, electronically commutated motor technology, or switched reluctance motor technology. Manufacturers are beginning to make significant investments in these advanced systems, and energy conservation standards above Table 12-12, in addition to imposing higher costs on motor customers and users with projected per unit energy savings significantly smaller than the energy savings projected from the Joint Stakeholders recommendations, would divert manufacturer resources available for development away from advanced motor technologies to compliance. The Joint Stakeholders' proposal will have the additional benefit of simplifying enforcement, because it substantially reduces the number of electric motors that are excluded from regulation and the time and effort in distinguishing covered from non-covered equipment.

VI. Levels Higher Than the Joint Stakeholder Proposal Are Not Justified

Section V of this petition explains why the Joint Stakeholders' recommendation meets EPCA's criteria for new standards. Any energy efficiency level higher than the recommended levels is not economically justified for the following reasons:

A. Unacceptable impacts on manufacturers. The impacts of requiring manufacturers to produce electric motors to higher minimum energy efficiency standards than the levels recommended by the Joint Stakeholders' petition are substantial. While DOE's PTSD notes there are manufacturer catalogs that show general purpose motors with higher efficiency levels than those cited in Table 12-12 of NEMA MG-1, there is no manufacturer that makes a complete line of electric motors exceeding the standards in Table 12-12. The few cited examples are not generally representative of a given manufacturer's complete product line. The examples represent a small fraction of the product line and do not reflect the challenges to motor manufacturers of increasing efficiency more broadly across their product lines. To raise efficiency to CSL-3, every manufacturer will need to redesign a significant portion of their product line, either electrically, mechanically or both, in order to raise efficiency. The cost of the redesign and implementation of increasing energy conservation standards above Table 12-12 is estimated to be $80-$100 million per manufacturer, easily one billion dollars for the entire industry. Additionally, manufacturers will be forced to procure more expensive materials and would face additional direct labor costs (hand winding vs. machine winding) to manufacture these electric motors. This converts the acceptable burden of the Joint Stakeholders' proposal to an unacceptable burden that is economically unjustifiable. The motor manufacturers would require a much, much longer time to retool in order to meet the higher requirements than the January 1, 2015 effective date contemplated by the Joint Stakeholders' proposal, and in that case the earlier energy savings contemplated by the Joint Petition would be lost. Motor manufacturers conservatively estimate that the time needed to comply with efficiency standards above Table 12-12 is greater than five years and perhaps as much as seven years. Such extensive redesign and use of new materials would require extensive prototype testing as well as final design testing to be certain each redesign would meet the higher efficiency standard. The qualification testing of final designs for certification under the requirements in 10 CFR §§ 431.17 and 431.36 cannot be accomplished until after all the infrastructure is in place to produce the electric motors as general production units. In addition to the financial burden already mentioned, electrical and mechanical engineering resources are simply unavailable to accomplish such a challenge in a shorter amount of time, and the machine tool industry would not have the capacity to meet the retooling demands of motor manufacturers in a shorter period of time.

B. Unacceptable impacts on customers. If motor manufacturers have to redesign most of their product lines to higher efficiency levels, some if not many of those redesigns will present problems for OEM customers who will have to redesign their products in which motors are used because of the increase in frame size. In addition to the costs OEM customers would incur for product redesign, CSL 3 levels could impact the utility of replacement products for existing uses. This would also necessitate a substantial delay in the effective date of the standards as well.

C. Other factors in the national interest. The concern here is related to principles that underlie Executive Orders 13609, 77 Fed.Reg. 26413 (May 1, 2012), and 13563, 76 Fed.Reg. 3821 (January 8, 2011), where it is recognized that harmonization, rather than divergence among international standards can promote export sales. Domestic manufacturers of electric motors have been promoting improved energy conservation standards outside the United States harmonized with Table 12-12 standards in part as an export growth strategy. Domestic motor manufacturers who design and produce electric motors to meet US energy conservation standards have difficulty competing outside the US with motor manufacturers who build less efficient motors meeting the lower efficiency standards in other countries. Secondly, if US standards for induction motors are promulgated above Table 12-12 levels, it becomes very difficult to promote harmonization if the US should adopt a very expensive domestic standard that is not likely to be supported and adopted by other countries. For example, the IEC 60034-30[6] Standard defining the IE classification of efficiency levels referred to as the source of efficiency standard levels for induction motors in various countries states that “it is expected that technologies other than cage induction motors will be required to meet IE4 levels,” which are those values above the IE3 equivalent of Table 12-12 for 60 Hz. This is a significant factor that weighs in favor of the Joint Stakeholders’ proposal. Third, lack of harmonization may have an additional impact on US machinery manufacturers who are building equipment with compliant motors that compete against importers that bring in equipment that has much less expensive non-compliant motors because of enforcement limitations. Harmonization of standards reduces this risk. Fourth, harmonization enhances compliance and enforcement domestically.

VII. Integral Brake Motors, U-frame motors and Fire Pump Motors

The recommended scope of coverage provided in this petition is very close to that included in DOE’s PTSD analysis. In addition, DOE has generally proposed product classes that are consistent with our recommendations. In this section, we address our proposed treatment for three particular motor types, including where the DOE analysis diverges from the joint proposal.

[6] IEC 60034-30 (Edition 1.0, 2008-10, Part 30: Efficiency classes of single speed, three-phase, cage-induction motors (IE-code).

A. Integral brake motors. The Joint Stakeholder proposal includes an exclusion for integral brake motors. The primary reason for this exclusion is that there are compliance and enforcement complications for integral brake motors, because there are no test standards for this motor type. Removal of the integral brake parts for testing just the motor may leave the electric motor inoperable or may alter the physical arrangement of parts so as to affect severely the ability of the motor to dissipate heat in the motor at rated load. For example, removal of the brake components between an exterior fan and the motor endshield will leave a large empty void that inhibits effective distribution of the airflow from the fan over the motor frame. Losses would be specific to each manufacturer, and would not be uniformly comparable across the industry. The total losses of an integral brake motor differ by design, and removing the brake or building a motor without a brake, does not give an accurate result. Secondly, this motor type is a very small percentage of the market and has a *de minimis* impact on energy consumption. NEMA members estimate that the number of integral brake motors sold each year in the United States is no more than 150,000 units, representing no more than 0.9% of the connected horsepower of all covered equipment.

B. U-frame motors. The Joint Stakeholder proposal includes a proposal for maintaining U-frame motors at Table 12-11 nominal efficiency levels. The reason for maintaining U-frame motors at Table 12-11 is because the cost of redesigning this legacy product that is rapidly becoming obsolete is high relative to the potential savings,[7] and there is no likelihood of subversion of higher energy conservation standards applicable to other types of covered electric motors because of the availability of U-frame motors meeting lower energy conservation standards. Most of the customers who used U-frame motors in the past have transitioned to other motor types as substitutes and will not return to U-frame motors. The U-frame motor is no longer sold for OEM applications, but it is sold entirely as a replacement motor to the customer who has not transitioned to a T-frame motor or other substitute. The number of units of U-frame motors sold today is estimated to be under 0.2% of the market, and there is very little impact on overall energy consumption by applying Table 12-12 to these motors.

C. Fire pump electric motors. As summarized in the introduction to this petition, the Joint Stakeholders recommend no change to the existing standards for fire pump electric motors. DOE's analysis supports this recommendation, finding that no increase in efficiency yields lifecycle cost savings for most fire pump motor purchasers (PTSD Tables ES.3.23 and ES.3.24).[8] The Joint

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[7] NEMA manufacturers estimate the cost of re-design for U-frame motors to comply with Table 12-12 levels as follows: there are 18 horsepower ratings and 3 speeds (2-4-6 pole) to be evaluated = 54 ratings x 4 days (32 hours) of design and testing @ $85/hour = $146,880. Rather than incur the higher cost of compliant U-frame motors built to Table 12-12 standards, users may convert to T-frame motors with adaptor bases. This could reduce the number of sellers of U-frame motors to one or two.

[8] We believe that DOE's analysis for 75 hp fire pump motors, which does show some efficiency increase to be cost-effective is anomalous for two reasons: first, DOE found standards for smaller fire pump motors to be not cost effective and, second, DOE's results estimate significantly better cost effectiveness for 75 hp fire pump motors than all other 75 hp motors,

Stakeholder proposal would create unique marking requirements for fire pump electric motors so that they would be used only with fire pumps and require that they go through the special third-party conformity assessment and listing requirements for fire pump electric motors in NFPA 20. The Joint Stakeholders submit that these measures will discourage the subversion of energy conservation standards applicable to other electric motors. As the DOE's PTSD acknowledges, DOE is aware of the low volume and run-time (intermittent use) of fire pump electric motors. This means there is extremely low energy consumption associated with the use of this class of electric motors, and there is very little energy savings potential in increasing fire pump electric motor efficiency.

VIII. Definitions

The Joint Petitioners have recommended new definitions for types of electric motors specifically relating to new terms used in this proposal in the regulatory text contained in Appendix A to this petition. Where it was mutually acceptable, the Joint Petitioners have adopted the definitions from the PTSD. Where further technical clarification was appropriate, an additional word or words were added to improve some definitions proposed in the PTSD. *See* "liquid-cooled electric motor," "air-over electric motor," and "partial motor." In the case of "submersible electric motor," the Joint Petitioners did not mutually agree to add the second sentence of the definition proposed in the PTSD, and recommend slightly different wording for the first sentence. The Joint Petitioners may submit further comments explaining their recommendations with regard to the proposed definitions prior to the PTSD comment deadline.

IX. Conclusion

The Joint Petitioners recommend that the DOE adopt the energy conservation standards in accord with the language contained in Appendix A. The Joint Petitioners' proposal would yield very large, economically justified energy savings on an accelerated schedule. The proposal is further designed to limit circumvention and facilitate enforcement. We ask that the proposal be adopted no later than December 17, 2012.

Respectfully submitted,

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despite an assumption of identical equipment costs and far lower annual operating hours for fire pump motors. It's not possible to have the same costs but lower benefits and have improved cost-effectiveness.

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Appliance Standards Awareness Project

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APPENDIX A

How the Joint Petitioners Envision the Rule Would Look on Effective Date Amending

10 CFR 431.12, 431.25, and 431.31

(Recommended Revisions Shown in Bold; Deletions Strikethrough)

§ 431.12 Definitions.

The following definitions apply for purposes of this subpart, and of subparts U and V of this part. Any words or terms not defined in this Section or elsewhere in this Part shall be defined as provided in Section 340 of the Act.

Accreditation means recognition by an accreditation body that a laboratory is competent to test the efficiency of electric motors according to the scope and procedures given in Test Method B of IEEE Std 112–2004 and CSA C390–10 (incorporated by reference, see 10 CFR §431.15.).

Accreditation body means an organization or entity that conducts and administers an accreditation system and grants accreditation.

Accreditation system means a set of requirements to be fulfilled by a testing laboratory, as well as rules of procedure and management, that are used to accredit laboratories.

Accredited laboratory means a testing laboratory to which accreditation has been granted.

Air-over electric motor means an electric motor which requires cooling provided by a ventilating means not supplied with the electric motor.

Alternative efficiency determination method or AEDM means, with respect to an electric motor, a method of calculating the total power loss and average full load efficiency.

Average full load efficiency means the arithmetic mean of the full load efficiencies of a population of electric motors of duplicate design, where the full load efficiency of each motor in the population is the ratio (expressed as a percentage) of the motor's useful power output to its total power input when the motor is operated at its full rated load, rated voltage, and rated frequency.

Basic model means, with respect to an electric motor, all units of a given type of electric motor (or class thereof) manufactured by a single manufacturer, and which have the same rating, have electrical characteristics that are essentially identical, and do not have any differing physical or functional characteristics which affect energy consumption or efficiency. For the purpose of this definition, “rating” means one of the ~~113~~ **184**combinations of an electric motor's horsepower (or standard kilowatt equivalent), number of poles, and open or enclosed construction, with respect to which § 431.25 prescribes nominal full load efficiency standards.

Certificate of conformity means a document that is issued by a certification program, and that gives written assurance that an electric motor complies with the energy efficiency standard applicable to that motor, as specified in § 431.25.

Certification program means a certification system that determines conformity by electric motors with the energy efficiency standards prescribed by and pursuant to the Act.

Certification system means a system, that has its own rules of procedure and management, for giving written assurance that a product, process, or service conforms to a specific standard or other specified requirements, and that is operated by an entity independent of both the party seeking the written assurance and the party providing the product, process or service.

CSA means Canadian Standards Association.

Definite purpose motor[9] means any motor that cannot be used in most general purpose applications and is designed either:

(1) To standard ratings with standard operating characteristics or standard mechanical construction for use under service conditions other than usual, such as those specified in NEMA MG1–2009, paragraph 14.3, “Unusual Service Conditions,” (incorporated by reference, see § 431.15); or

(2) For use on a particular type of application.

Electric motor means a machine that converts electrical power into rotational mechanical power, **including but not limited to partial motors.**

Enclosed motor means an electric motor so constructed as to prevent the free exchange of air between the inside and outside of the case but not sufficiently enclosed to be termed airtight.

Fire pump electric motor means an electric motor, including any IEC–equivalent, **that is marked in accordance with § 431.31(a)(iii) and** that meets the requirements of section 9.5 of NFPA 20 (incorporated by reference, see § 431.15**), including the requirement of being specifically listed for fire pump service.**

Fire pump motors [Reserved by 74 FR 12071].

General purpose electric motor[10] means any electric motor that is designed in standard ratings with either:

(1) Standard operating characteristics and mechanical construction for use under usual service conditions, such as those specified in NEMA MG1–2009, paragraph 14.2, “Usual Service Conditions,” (incorporated by reference, see § 431.15) and without restriction to a particular application or type of application; or

(2) Standard operating characteristics or standard mechanical construction for use under unusual service conditions, such as those specified in NEMA MG1–2009, paragraph 14.3, “Unusual Service Conditions,” (incorporated by reference, see § 431.15) or for a particular type of application, and which can be used in most general purpose applications.

General purpose electric motor (subtype I)[11] means a general purpose electric motor that:

(1) Is a single-speed, induction motor;

(2) Is rated for continuous duty (MG1) operation or for duty type S1 (IEC);

[9] Note: this definition will not be relevant after January 1, 2015.

[10] No longer relevant after January 1, 2015.

[11] No longer relevant after January 1, 2015.

(3) Contains a squirrel-cage (MG1) or cage (IEC) rotor;

(4) Has foot-mounting that may include foot-mounting with flanges or detachable feet;

(5) Is built in accordance with NEMA T–frame dimensions or their IEC metric equivalents, including a frame size that is between two consecutive NEMA frame sizes or their IEC metric equivalents;

(6) Has performance in accordance with NEMA Design A (MG1) or B (MG1) characteristics or equivalent designs such as IEC Design N (IEC);

(7) Operates on polyphase alternating current 60–hertz sinusoidal power, and:

(i) Is rated at 230 or 460 volts (or both) including motors rated at multiple voltages that include 230 or 460 volts (or both), or

(ii) Can be operated on 230 or 460 volts (or both); and

(8) Includes, but is not limited to, explosion-proof construction.

NOTE to Definition of General purpose electric motor (subtype I): References to "MG1" above refer to NEMA Standards Publication MG1–2009 (incorporated by reference in § 431.15). References to "IEC" above refer to IEC 60034–1, 60034–12, 60050–411, and 60072–1 (incorporated by reference in § 431.15), as applicable.

General purpose electric motor (subtype II)[12] means any general purpose electric motor that incorporates design elements of a general purpose electric motor (subtype I) but, unlike a general purpose electric motor (subtype I), is configured in one or more of the following ways:

(1) Is built in accordance with NEMA U–frame dimensions as described in NEMA MG1–1967 (incorporated by reference, see § 431.15) or in accordance with the IEC metric equivalents, including a frame size that is between two consecutive NEMA frame sizes or their IEC metric equivalents;

(2) Has performance in accordance with NEMA Design C characteristics as described in MG1 or an equivalent IEC design(s) such as IEC Design H;

(3) Is a close-coupled pump motor;

(4) Is a footless motor;

(5) Is a vertical solid shaft normal thrust motor (as tested in a horizontal configuration) built and designed in a manner consistent with MG1;

(6) Is an eight-pole motor (900 rpm); or

(7) Is a polyphase motor with a voltage rating of not more than 600 volts, is not rated at 230 or 460 volts (or both), and cannot be operated on 230 or 460 volts (or both).

[12] No longer relevant after January 1, 2015.

NOTE to Definition of General purpose electric motor (subtype II): With the exception of the NEMA Motor Standards MG1–1967 (incorporated by reference in § 431.15), references to "MG1" above refer to the 2009 NEMA MG1–2009 (incorporated by reference in § 431.15). References to "IEC" above refer to IEC 60034–1, 60034–12, 60050–411, and 60072–1 (incorporated by reference in § 431.15), as applicable.

IEC means the International Electrotechnical Commission.

IEEE means the Institute of Electrical and Electronics Engineers, Inc.

Integral brake electric motor means an electric motor containing a brake mechanism either inside of the motor endshield or between the motor fan and endshield such that removal of the brake component would require extensive disassembly of the motor or motor parts.

Liquid-cooled electric motor means an electric motor which is cooled by circulating liquid, with the liquid or liquid filled conductors coming in direct contact with the electric motor parts.

NEMA design B general purpose electric motor [Reserved].

NEMA Design B **electric** motor means a squirrel-cage motor that is:

(1) Designed to withstand full-voltage starting;

(2) Develops locked-rotor, breakdown, and pull-up torques adequate for general application as specified in sections 12.38, 12.39 and 12.40 of NEMA MG1–2009 (incorporated by reference, see § 431.15);

(3) Draws locked-rotor current not to exceed the values shown in section 12.35.1 for 60 hertz and 12.35.2 for 50 hertz of NEMA MG1–2009; and

(4) Has a slip at rated load of less than 5 percent for motors with fewer than 10 poles.

NEMA means the National Electrical Manufacturers Association.

Nominal full-load efficiency means, with respect to an electric motor, a representative value of efficiency selected from the "nominal efficiency" column of Table 12–10, NEMA MG1–2009, (incorporated by reference, see § 431.15), that is not greater than the average full-load efficiency of a population of motors of the same design.

Open motor means an electric motor having ventilating openings which permit passage of external cooling air over and around the windings of the machine.

Partial electric motor means an assembly necessitating only the addition of one or two endshields with bearings to create an operable electric motor. Included under this definition are integral motors and partial ¾ motors.

Special purpose motor[13] means any motor, other than a general purpose motor or definite purpose motor, which has special operating characteristics or special mechanical construction, or both, designed for a particular application.

[13] Not relevant after January 1, 2015.

Submersible electric motor means an electric motor designed for operation while continuously submersed in a liquid.

Total power loss means that portion of the energy used by an electric motor not converted to rotational mechanical power, expressed in percent.

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§ 431.25 Energy conservation standards and effective dates.

(a) Except as provided for fire pump electric motors in paragraph (b) of this section, each general purpose electric motor (subtype I) with a power rating of 1 horsepower or greater, but not greater than 200 horsepower, including a NEMA Design B or an equivalent IEC Design N motor that is a general purpose electric motor (subtype I), manufactured (alone or as a component of another piece of equipment) on or after December 19, 2010, shall have a nominal full-load efficiency that is not less than the following:

Table 1--Nominal Full-Load Efficiencies of General Purpose Electric Motors (Subtype I), Except Fire Pump Electric Motors

Motor horsepower/standard kilowatt equivalent	Nominal full-load efficiency					
	Open motors (number of poles)			Enclosed motors (number of poles)		
	6	4	2	6	4	2
1/.75	82.5	85.5	77.0	82.5	85.5	77.0
1.5/1.1	86.5	86.5	84.0	87.5	86.5	84.0
2/1.5	87.5	86.5	85.5	88.5	86.5	85.5
3/2.2	88.5	89.5	85.5	89.5	89.5	86.5
5/3.7	89.5	89.5	86.5	89.5	89.5	88.5
7.5/5.5	90.2	91.0	88.5	91.0	91.7	89.5
10/7.5	91.7	91.7	89.5	91.0	91.7	90.2
15/11	91.7	93.0	90.2	91.7	92.4	91.0
20/15	92.4	93.0	91.0	91.7	93.0	91.0
25/18.5	93.0	93.6	91.7	93.0	93.6	91.7
30/22	93.6	94.1	91.7	93.0	93.6	91.7
40/30	94.1	94.1	92.4	94.1	94.1	92.4
50/37	94.1	94.5	93.0	94.1	94.5	93.0
60/45	94.5	95.0	93.6	94.5	95.0	93.6
75/55	94.5	95.0	93.6	94.5	95.4	93.6
100/75	95.0	95.4	93.6	95.0	95.4	94.1
125/90	95.0	95.4	94.1	95.0	95.4	95.0
150/110	95.4	95.8	94.1	95.8	95.8	95.0
200/150	95.4	95.8	95.0	95.8	96.2	95.4

(b) Each fire pump electric motor that is a general purpose electric motor (subtype I) or general purpose electric motor (subtype II) manufactured (alone or as a component of another piece of equipment) on or after December 19, 2010, shall have a nominal full-load efficiency that is not less than the following:

Table 2--Nominal Full-Load Efficiencies of Fire Pump Electric Motors

Motor horsepower/ standard kilowatt equivalent	Nominal full-load efficiency							
	Open motors (number of poles)				Enclosed motors (number of poles)			
	8	6	4	2	8	6	4	2
1/.75	74.0	80.0	82.5		74.0	80.0	82.5	75.5
1.5/1.1	75.5	84.0	84.0	82.5	77.0	85.5	84.0	82.5
2/1.5	85.5	85.5	84.0	84.0	82.5	86.5	84.0	84.0
3/2.2	86.5	86.5	86.5	84.0	84.0	87.5	87.5	85.5
5/3.7	87.5	87.5	87.5	85.5	85.5	87.5	87.5	87.5
7.5/5.5	88.5	88.5	88.5	87.5	85.5	89.5	89.5	88.5
10/7.5	89.5	90.2	89.5	88.5	88.5	89.5	89.5	89.5
15/11	89.5	90.2	91.0	89.5	88.5	90.2	91.0	90.2
20/15	90.2	91.0	91.0	90.2	89.5	90.2	91.0	90.2
25/18.5	90.2	91.7	91.7	91.0	89.5	91.7	92.4	91.0
30/22	91.0	92.4	92.4	91.0	91.0	91.7	92.4	91.0
40/30	91.0	93.0	93.0	91.7	91.0	93.0	93.0	91.7
50/37	91.7	93.0	93.0	92.4	91.7	93.0	93.0	92.4
60/45	92.4	93.6	93.6	93.0	91.7	93.6	93.6	93.0
75/55	93.6	93.6	94.1	93.0	93.0	93.6	94.1	93.0
100/75	93.6	94.1	94.1	93.0	93.0	94.1	94.5	93.6
125/90	93.6	94.1	94.5	93.6	93.6	94.1	94.5	94.5
150/110	93.6	94.5	95.0	93.6	93.6	95.0	95.0	94.5
200/150	93.6	94.5	95.0	94.5	94.1	95.0	95.0	95.0
250/186	94.5	95.4	95.4	94.5	94.5	95.0	95.0	95.4
300/224		95.4	95.4	95.0		95.0	95.4	95.4
350/261		95.4	95.4	95.0		95.0	95.4	95.4
400/298			95.4	95.4			95.4	95.4
450/336			95.8	95.8			95.4	95.4
500/373			95.8	95.8			95.8	95.4

(c) Except as provided for fire pump electric motors in paragraph (b) of this section, each general purpose electric motor (subtype II) with a power rating of 1 horsepower or greater, but not greater than 200 horsepower, including a NEMA Design B or an equivalent IEC Design N motor that is a general purpose electric motor (subtype II), manufactured (alone or as a component of another piece of equipment) on or after December 19, 2010, shall have a nominal full-load efficiency that is not less than the following:

Table 3--Nominal Full-Load Efficiencies of General Purpose Electric Motors (Subtype II), Except Fire Pump Electric Motors

Motor horsepower/ standard kilowatt equivalent	Nominal full-load efficiency							
	Open motors (number of poles)				Enclosed motors (number of poles)			
	8	6	4	2	8	6	4	2
1/.75	74.0	80.0	82.5		74.0	80.0	82.5	75.5
1.5/1.1	75.5	84.0	84.0	82.5	77.0	85.5	84.0	82.5
2/1.5	85.5	85.5	84.0	84.0	82.5	86.5	84.0	84.0
3/2.2	86.5	86.5	86.5	84.0	84.0	87.5	87.5	85.5
5/3.7	87.5	87.5	87.5	85.5	85.5	87.5	87.5	87.5
7.5/5.5	88.5	88.5	88.5	87.5	85.5	89.5	89.5	88.5
10/7.5	89.5	90.2	89.5	88.5	88.5	89.5	89.5	89.5
15/11	89.5	90.2	91.0	89.5	88.5	90.2	91.0	90.2
20/15	90.2	91.0	91.0	90.2	89.5	90.2	91.0	90.2
25/18.5	90.2	91.7	91.7	91.0	89.5	91.7	92.4	91.0
30/22	91.0	92.4	92.4	91.0	91.0	91.7	92.4	91.0
40/30	91.0	93.0	93.0	91.7	91.0	93.0	93.0	91.7
50/37	91.7	93.0	93.0	92.4	91.7	93.0	93.0	92.4
60/45	92.4	93.6	93.6	93.0	91.7	93.6	93.6	93.0
75/55	93.6	93.6	94.1	93.0	93.0	93.6	94.1	93.0
100/75	93.6	94.1	94.1	93.0	93.0	94.1	94.5	93.6
125/90	93.6	94.1	94.5	93.6	93.6	94.1	94.5	94.5
150/110	93.6	94.5	95.0	93.6	93.6	95.0	95.0	94.5
200/150	93.6	94.5	95.0	94.5	94.1	95.0	95.0	95.0

(d) Each NEMA Design B or an equivalent IEC Design N motor that is a general purpose electric motor (subtype I) or general purpose electric motor (subtype II), excluding fire pump electric motors, with a power rating of more than 200 horsepower, but not greater than 500 horsepower, manufactured (alone or as a component of another piece of equipment) on or after December 19, 2010, shall have a nominal full-load efficiency that is not less than the following:

Table 4--Nominal Full-Load Efficiencies of NEMA Design B General Purpose Electric Motors (Subtype I and II), Except Fire Pump Electric Motors

Motor horsepower / standard kilowatt equivalent	Nominal full-load efficiency							
	Open motors (number of poles)				Enclosed motors (number of poles)			
	8	6	4	2	8	6	4	2
250/186	94.5	95.4	95.4	94.5	94.5	95.0	95.0	95.4
300/224		95.4	95.4	95.0		95.0	95.4	95.4
350/261		95.4	95.4	95.0		95.0	95.4	95.4
400/298			95.4	95.4			95.4	95.4
450/336			95.8	95.8			95.4	95.4
500/373			95.8	95.8			95.8	95.4

(e) For purposes of determining the required minimum nominal full-load efficiency of an electric motor that has a horsepower or kilowatt rating between two horsepower or two kilowatt ratings listed in any table of energy conservation standards in ~~paragraphs (a) through (d) of~~ this section, each such motor shall be deemed to have a listed horsepower or kilowatt rating, determined as follows:

(1) A horsepower at or above the midpoint between the two consecutive horsepowers shall be rounded up to the higher of the two horsepowers;

(2) A horsepower below the midpoint between the two consecutive horsepowers shall be rounded down to the lower of the two horsepowers; or

(3) A kilowatt rating shall be directly converted from kilowatts to horsepower using the formula 1 kilowatt = (1/0.746) horsepower. The conversion should be calculated to three significant decimal places, and the resulting horsepower shall be rounded in accordance with paragraph (e)(1) or (e)(2) of this section, whichever applies.

(f) ~~This section does~~**The requirements of paragraphs (a) through (d) of this section do** not apply to definite purpose motors, special purpose motors, or those motors exempted by the Secretary.

(g) Each NEMA Design A, B, or C type (MG1), or IEC Design H or N type (IEC), single-speed, polyphase, continuous duty (MG1) or duty type S1 (IEC), squirrel-cage (MG1) or cage (IEC) induction electric motor with a rating of 1 horsepower or greater, but not greater than 500 horsepower, rated for operation directly on

nominal 60 Hertz sinusoidal power and rated 600 volts or less, manufactured (alone or as a component of another piece of equipment) on or after January 1, 2015, except ---

(i) electric motors listed for use with fire pumps covered by paragraph (h) of this section,

(ii) electric motors constructed in U-frames covered by paragraph (i) of this section,

(iii) electric motors identified in paragraph (j) of this section, and

(iv) electric motors exempted by the Secretary --- ---

shall have a nominal full load efficiency that is not less than as shown in the following table:

Motor horsepower/standard kilowatt equivalent	Nominal full-load efficiency							
	Open motors (number of poles)				Enclosed motors (number of poles)			
	8	6	4	2	8	6	4	2
1/.75	75.5	82.5	85.5	77.0	75.5	82.5	85.5	77.0
1.5/1.1	77.0	86.5	86.5	84.0	78.5	87.5	86.5	84.0
2/1.5	86.5	87.5	86.5	85.5	84.0	88.5	86.5	85.5
3/2.2	87.5	88.5	89.5	85.5	85.5	89.5	89.5	86.5
5/3.7	88.5	89.5	89.5	86.5	86.5	89.5	89.5	88.5
7.5/5.5	89.5	90.2	91.0	88.5	86.5	91.0	91.7	89.5
10/7.5	90.2	91.7	91.7	89.5	89.5	91.0	91.7	90.2
15/11	90.2	91.7	93.0	90.2	89.5	91.7	92.4	91.0
20/15	91.0	92.4	93.0	91.0	90.2	91.7	93.0	91.0
25/18.5	91.0	93.0	93.6	91.7	90.2	93.0	93.6	91.7
30/22	91.7	93.6	94.1	91.7	91.7	93.0	93.6	91.7
40/30	91.7	94.1	94.1	92.4	91.7	94.1	94.1	92.4
50/37	92.4	94.1	94.5	93.0	92.4	94.1	94.5	93.0
60/45	93.0	94.5	95.0	93.6	92.4	94.5	95.0	93.6
75/55	94.1	94.5	95.0	93.6	93.6	94.5	95.4	93.6
100/75	94.1	95.0	95.4	93.6	93.6	95.0	95.4	94.1
125/90	94.1	95.0	95.4	94.1	94.1	95.0	95.4	95.0
150/110	94.1	95.4	95.8	94.1	94.1	95.8	95.8	95.0
200/150	94.1	95.4	95.8	95.0	94.5	95.8	96.2	95.4
250/186	95.0	95.4	95.8	95.0	95.0	95.8	96.2	95.8
300/224	95.0	95.4	95.8	95.4	95.0	95.8	96.2	95.8
350/261	95.0	95.4	95.8	95.4	95.0	95.8	96.2	95.8
400/298	95.0	95.8	95.8	95.8	95.0	95.8	96.2	95.8
450/336	95.0	96.2	96.2	95.8	95.0	95.8	96.2	95.8
500/373	95.0	96.2	96.2	95.8	95.0	95.8	96.2	95.8

(h) FIRE PUMP ELECTRIC MOTORS.--- Each fire pump electric motor with a horsepower rating of 1 horsepower or greater, but not greater than 500 horsepower, manufactured (alone or as a component of another piece of equipment) on or after January 1, 2015, shall have a nominal full load efficiency that is not less than as shown in the following table:

Motor horsepower/standard kilowatt equivalent	Nominal full-load efficiency							
	Open motors (number of poles)				Enclosed motors (number of poles)			
	8	6	4	2	8	6	4	2
1/.75	74.0	80.0	82.5		74.0	80.0	82.5	75.5
1.5/1.1	75.5	84.0	84.0	82.5	77.0	85.5	84.0	82.5
2/1.5	85.5	85.5	84.0	84.0	82.5	86.5	84.0	84.0
3/2.2	86.5	86.5	86.5	84.0	84.0	87.5	87.5	85.5
5/3.7	87.5	87.5	87.5	85.5	85.5	87.5	87.5	87.5
7.5/5.5	88.5	88.5	88.5	87.5	85.5	89.5	89.5	88.5
10/7.5	89.5	90.2	89.5	88.5	88.5	89.5	89.5	89.5
15/11	89.5	90.2	91.0	89.5	88.5	90.2	91.0	90.2
20/15	90.2	91.0	91.0	90.2	89.5	90.2	91.0	90.2
25/18.5	90.2	91.7	91.7	91.0	89.5	91.7	92.4	91.0
30/22	91.0	92.4	92.4	91.0	91.0	91.7	92.4	91.0
40/30	91.0	93.0	93.0	91.7	91.0	93.0	93.0	91.7
50/37	91.7	93.0	93.0	92.4	91.7	93.0	93.0	92.4
60/45	92.4	93.6	93.6	93.0	91.7	93.6	93.6	93.0
75/55	93.6	93.6	94.1	93.0	93.0	93.6	94.1	93.0
100/75	93.6	94.1	94.1	93.0	93.0	94.1	94.5	93.6
125/90	93.6	94.1	94.5	93.6	93.6	94.1	94.5	94.5
150/110	93.6	94.5	95.0	93.6	93.6	95.0	95.0	94.5
200/150	93.6	94.5	95.0	94.5	94.1	95.0	95.0	95.0
250/186	94.5	95.4	95.4	94.5	94.5	95.0	95.0	95.4
300/224		95.4	95.4	95.0		95.0	95.4	95.4
350/261		95.4	95.4	95.0		95.0	95.4	95.4
400/298			95.4	95.4			95.4	95.4
450/336			95.8	95.8			95.4	95.4
500/373			95.8	95.8			95.8	95.4

(i) U-FRAME ELECTRIC MOTORS.--- Each electric motor as described in paragraph (g) of this section, constructed in a U-frame with a horsepower rating of 1 horsepower or greater, but not greater than 500 horsepower, manufactured (alone or as a component of another piece of equipment) on or after January 1, 2015, shall have a nominal full load efficiency that is not less than as shown in the following table:

Motor horsepower/standard kilowatt equivalent	Nominal full-load efficiency							
	Open motors (number of poles)				Enclosed motors (number of poles)			
	8	6	4	2	8	6	4	2
1/.75	74.0	80.0	82.5		74.0	80.0	82.5	75.5
1.5/1.1	75.5	84.0	84.0	82.5	77.0	85.5	84.0	82.5
2/1.5	85.5	85.5	84.0	84.0	82.5	86.5	84.0	84.0
3/2.2	86.5	86.5	86.5	84.0	84.0	87.5	87.5	85.5
5/3.7	87.5	87.5	87.5	85.5	85.5	87.5	87.5	87.5
7.5/5.5	88.5	88.5	88.5	87.5	85.5	89.5	89.5	88.5
10/7.5	89.5	90.2	89.5	88.5	88.5	89.5	89.5	89.5
15/11	89.5	90.2	91.0	89.5	88.5	90.2	91.0	90.2
20/15	90.2	91.0	91.0	90.2	89.5	90.2	91.0	90.2
25/18.5	90.2	91.7	91.7	91.0	89.5	91.7	92.4	91.0
30/22	91.0	92.4	92.4	91.0	91.0	91.7	92.4	91.0
40/30	91.0	93.0	93.0	91.7	91.0	93.0	93.0	91.7
50/37	91.7	93.0	93.0	92.4	91.7	93.0	93.0	92.4
60/45	92.4	93.6	93.6	93.0	91.7	93.6	93.6	93.0
75/55	93.6	93.6	94.1	93.0	93.0	93.6	94.1	93.0
100/75	93.6	94.1	94.1	93.0	93.0	94.1	94.5	93.6
125/90	93.6	94.1	94.5	93.6	93.6	94.1	94.5	94.5
150/110	93.6	94.5	95.0	93.6	93.6	95.0	95.0	94.5
200/150	93.6	94.5	95.0	94.5	94.1	95.0	95.0	95.0
250/186	94.5	95.4	95.4	94.5	94.5	95.0	95.0	95.4
300/224		95.4	95.4	95.0		95.0	95.4	95.4
350/261		95.4	95.4	95.0		95.0	95.4	95.4
400/298			95.4	95.4			95.4	95.4
450/336			95.8	95.8			95.4	95.4
500/373			95.8	95.8			95.8	95.4

(j) EXCLUSIONS.--- The following electric motors are excluded from the standards under this section:

(i) Liquid-cooled electric motors;

(ii) Submersible electric motors;

(iii) Small electric motors defined in 10 CFR 431.442 and covered by the energy conservation standards in 10 CFR 431.446

(iv) Air-over electric motors;

(v) Integral brake electric motors; and

(vi) Any other electric motors exempted by the Secretary.

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§ 431.31 Labeling Requirements.

(a) Electric motor nameplate--

(1) Required information. The permanent nameplate of an electric motor for which standards are prescribed in § 431.25 must be marked clearly with the following information:

(i) The motor's nominal full load efficiency (as of the date of manufacture), derived from the motor's average full load efficiency as determined pursuant to this subpart; ~~and~~

(ii) A Compliance Certification number ("CC number") supplied by DOE to the manufacturer or private labeler, pursuant to § 431.36(f), and applicable to that motor. Such CC number must be on the nameplate of a motor beginning 90 days after either:

(A) The manufacturer or private labeler has received the number upon submitting a Compliance Certification covering that motor, or

(B) The expiration of 21 days from DOE's receipt of a Compliance Certification covering that motor, if the manufacturer or private labeler has not been advised by DOE that the Compliance Certification fails to satisfy § 431.36~~.~~**; and**

(iii) Each fire pump electric motor to which standards apply pursuant to § 431.25(h), manufactured (alone or as a component of another piece of equipment) on or after January 1, 2015, shall be marked "For Use with a Fire Pump Only."

(2) Display of required information. All orientation, spacing, type sizes, type faces, and line widths to display this required information shall be the same as or similar to the display of the other performance data on the motor's permanent nameplate. The nominal full-load efficiency shall be identified either by the term "Nominal Efficiency" or "Nom. Eff." or by the terms specified in paragraph 12.58.2 of NEMA MG1–2009, (incorporated by reference, see § 431.15) as for example "NEMA Nom. Eff.__." The Compliance Certification number issued pursuant to § 431.36 shall be in the form "CC__."

(3) Optional display. The permanent nameplate of an electric motor, a separate plate, or decalcomania, may be marked with the encircled lower case letters "ee", for example,

or with some comparable designation or logo, if the motor meets the applicable standard prescribed in § 431.25, as determined pursuant to this subpart, and is covered by a Compliance Certification that satisfies § 431.36.

(b) Disclosure of efficiency information in marketing materials.

(1) The same information that must appear on an electric motor's permanent nameplate pursuant to paragraph (a)(1) of this section, shall be prominently displayed:

(i) On each page of a catalog that lists the motor; and

(ii) In other materials used to market the motor.

(2) The “ee” logo, or other similar logo or designations, may also be used in catalogs and other materials to the same extent they may be used on labels under paragraph (a)(3) of this section.

APPENDIX B

General: All testing of electric motors for compliance and enforcement will be conducted in accordance with the prescribed DOE test procedures with the electric motor in a horizontal position. Motor manufacturers testing for initial compliance will configure test motors such that lab testing conforms to DOE test procedures. This may include and is not limited to changing bearings, removing seals, installing shafts, etc.

For enforcement testing, the lab and DOE will be responsible for any reconfiguration of an electric motor which may be required such that all testing can be performed with the electric motor mounted in a horizontal position and connected to a dynamometer in accordance with the approved DOE test procedures. If a motor manufacturer has a concern regarding the impact of this reconfiguration on motor efficiency test results the manufacturer shall have the right to challenge. The manufacturer shall bare all expenses associated with the challenge including any additional reconfiguration work or testing. The DOE contractor selecting motors for enforcement testing from the marketplace shall do all they can to mitigate the need for reconfiguration. When reconfiguration is required the lab may utilize local motor service centers that are equipped to return a motor to the lab configured to be mounted and tested horizontally. The lab or service center may request test fixtures or adaptors from the motor manufacturer if necessary. The enforcement budget from DOE must consider and bear reasonable reconfiguration costs.

Specific Motor Configurations:

Shielded Bearings	Test per standard with shielded bearing in place – no reconfiguration required
Sealed Bearings	Remove bearing seals and test per standard
Thrust Bearings/Angular Contact	Remove thrust bearing replacing with a suitable 6000 series ball bearings and test per standard
Sleeve bearings	Test per standard with sleeve bearing in place – no reconfiguration required
Contact Seals	Remove contact seal and test per standard (current EPCA)
Partial motors	Reconfigure motor to include 6000 series bearing and endplate necessary to connect test equipment and test per standard
Close Coupled Motors	Connect to test equipment using a coupling adapter if required and test per standard

Immersible	Remove contact seal and test in a horizontal position per test standard
Vertical Pump Motor (P-base)	Replace thrust bearing with 6000 series, add a shaft extension to connect to test equipment if necessary and test per standard in horizontal position.
Gear Motors	Remove gear box and reconfigure motor to include 6000 series bearing and endplate necessary to connect to test equipment and test per standard