[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE-2020-BT-STD-0007]

RIN 1904–AE63

Energy Conservation Program: Energy Conservation Standards for Electric Motors

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy ("DOE") is initiating an effort to determine whether to amend the current energy conservation standards for electric motors. DOE must review these standards at least once every six years and either propose new standards for electric motors or a notice of determination that the existing standards do not need amending. DOE is soliciting information from the public to help determine whether amending the current electric motor standards would produce significant energy savings while being technologically feasible and cost effective. Accordingly, DOE seeks information regarding any technological or market changes since the most recent standards update that would justify a new rulemaking to increase the stringency of the current standards consistent with these factors. DOE welcomes written comments from the public on any subject within the scope of this document (including those topics not specifically raised), as well as the submission of data and other relevant information.

DATES: Written comments and information will be accepted on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *http://www.regulations.gov*. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE-2020-BT-STD-0007, by any of the following methods:

1. *Federal eRulemaking Portal*: *http://www.regulations.gov*. Follow the instructions for submitting comments.
2. *E-mail*: *ElecMotors2020STD0007@ee.doe.gov* Include the docket number EERE-2020-BT-STD-0007 in the subject line of the message.
3. *Postal Mail*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1445. If possible, please submit all items on a compact disc ("CD"), in which case it is not necessary to include printed copies.
4. *Hand Delivery/Courier*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC, 20024. Telephone: (202) 287-1445. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

No telefacsimilies ("faxes") will be accepted. For detailed instructions on submitting comments and additional information on this process, see section III of this document.

Docket: The docket for this activity, which includes *Federal Register* notices, comments, and other supporting documents/materials, is available for review at *http://www.regulations.gov*.

All documents in the docket are listed in the *http://www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket web page can be found at *http://www.regulations.gov/#!docketDetail;D=EERE-2020-BT-STD-0007*. The docket web page contains instructions on how to access all documents, including public comments, in the docket. *See* section III for information on how to submit comments through *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Jeremy Dommu, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-9870. E-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

Michael Kido, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202) 586-8145. E-mail: *Michael.Kido@hq.doe.gov*.

For further information on how to submit a comment or review other public comments and the docket contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

SUPPLEMENTARY INFORMATION:

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I. Introduction

A. Authority and Background

The Energy Policy and Conservation Act, as amended ("EPCA"),[1] among other things, authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part C[2] of EPCA, added by Public Law 95-619, Title IV, section 441(a) (42 U.S.C. 6311-6317, as codified), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve the energy efficiency of certain types of industrial equipment, including electric motors, the subject of this RFI. (42 U.S.C. 6311(1)(A)) The Energy Policy Act of 1992 ("EPACT 1992") (Pub. L. 102-486 (October 24, 1992)) further amended EPCA by establishing energy conservation standards and test procedures for certain commercial and industrial electric motors that are manufactured alone or as a component of another piece of equipment. In December 2007, Congress enacted the Energy Independence and Security Act of 2007 ("EISA 2007") (Pub. L. 110-140). Section 313(b)(1) of EISA 2007 updated the energy conservation standards for those electric motors already covered by EPCA and established energy conservation standards for a larger scope of motors not previously covered by standards. (42 U.S.C. 6313(b)(2)) EISA 2007 also revised certain statutory definitions related to electric motors. *See* EISA 2007, sec. 313 (amending statutory definitions related to electric motors at 42 U.S.C. 6311(13))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and

[1] All references to EPCA in this document refer to the statute as amended through America's Water Infrastructure Act of 2018, Public Law 115–270 (October 23, 2018).
[2] For editorial reasons, upon codification in the U.S. Code, Part C was redesignated Part A-1.

enforcement procedures. Relevant provisions of EPCA include definitions (42 U.S.C. 6311), energy conservation standards (42 U.S.C. 6313), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

Federal energy efficiency requirements for covered equipment established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6316(a) and (b); 42 U.S.C. 6297(a)-(c)) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions set forth under EPCA. (*See* 42 U.S.C. 6316(a) *and* 42 U.S.C. 6297(d))

On October 5, 1999, DOE published a final rule to codify the EPACT 1992 electric motor requirements. 64 FR 54114. After EISA 2007's enactment, DOE updated, among other things, the corresponding electric motor regulations at 10 CFR part 431 by incorporating the new definitions and energy conservation standards that the law established. *See* 74 FR 12058 (March 23, 2009) (codifying various amendments enacted by Congress through EISA, including the adoption of specific energy conservation standards for certain classes of electric motors). DOE subsequently proposed new test procedures for small electric motors,[3] see 73 FR 78220 (December 22, 2008), and later finalized key provisions related to small electric motor testing. *See* 74 FR 32059 (July 7, 2009). Further updates to the test procedures for electric motors and small electric motors followed when DOE issued a rule that primarily focused on updating

[3] "Small electric motors" are addressed separately from "electric motors" in 10 CFR part 431 subpart X.

various definitions and incorporations by reference related to the current test procedure. *See* 77 FR 26608 (May 4, 2012). That rule defined the term "electric motor" to account for EISA 2007's removal of the previous statutory definition of "electric motor." DOE also clarified definitions related to those motors that EISA 2007 laid out as part of EPCA's statutory framework, including motor types that DOE had not previously regulated. *See generally*, 77 FR 26608, 26613-26619. DOE also published a new test procedure on December 13, 2013, that further refined various electric motor definitions and added certain definitions and test procedure preparatory steps to address a wider variety of electric motor types than are regulated, including those electric motors that are largely considered to be special-or definite-purpose motors. 78 FR 75962. On May 29, 2014, DOE published a final rule adopting new and amended energy conservation standards for electric motors that applied the standards to a wider scope of electric motors, required regulated motors, with the exception of fire pump electric motors, to satisfy the efficiency levels ("ELs") prescribed in Table 12-12 of National Electrical Manufacturers Association ("NEMA") Standards Publication MG 1-2011, "Motors and Generators," and retained the standards for fire pump motors. 79 FR 30934 (May 2014 Final Rule").

DOE must also periodically evaluate the energy conservation standards for each type of covered equipment, including those at issue here, after the issuance of any final rule establishing or amending a standard. *See* 42 U.S.C. 6316(a) *and* 42 U.S.C. 6295(m)(1) In doing so, DOE must issue (and have published) either a notice of determination that the standards do not need to be amended or a proposal that includes new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)) In making a determination that the standards do not need to be amended, DOE must evaluate whether amended standards (1) will result in significant conservation of energy, (2) are technologically feasible, and (3) are cost effective as described under 42 U.S.C. 6295(o)(2)(B)(i)(II). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)(A); 42 U.S.C. 6295(n)(2)) Under 42 U.S.C. 6295(o)(2)(B)(i)(II), DOE must determine whether the benefits of a standard exceed its burdens by, to the greatest extent practicable, considering the savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered products which are likely to result from the imposition of the standard. If DOE decides not to amend a standard based on the statutory criteria, not later than 3 years after that determination DOE must issue (and submit for publication) either a determination that the standards do not need to be amended or propose amended energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(3)(B)) DOE must make the analysis on which a determination is based publicly available and provide an opportunity for written comment. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(2))

In proposing new standards, DOE must evaluate that proposal against the criteria of 42 U.S.C. 6295(o), as described in the following section, and follow the rulemaking procedures set out in 42 U.S.C. 6295(p). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)(B) If DOE decides to amend the standard based on the statutory criteria, DOE must publish a final rule not later than two years after energy conservation standards are proposed. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(3)(A))

DOE is publishing this RFI to collect data and information to inform its decision consistent with its obligations under EPCA.

B. Rulemaking Process

DOE must follow specific statutory criteria when prescribing new or amended standards for covered equipment. EPCA generally requires that any new or amended energy conservation standard prescribed by the Secretary be designed to achieve the maximum improvement in energy or water efficiency that is technologically feasible and economically justified. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(A)) To determine whether a standard is economically justified, EPCA requires that DOE determine whether the benefits of the standard exceed its burdens by considering, to the greatest extent practicable, the following seven factors:

(1) The economic impact of the standard on the manufacturers and consumers of the affected products;

(2) The savings in operating costs throughout the estimated average life of the product compared to any increases in the initial cost, or maintenance expenses;

(3) The total projected amount of energy and water (if applicable) savings likely to result directly from the standard;

(4) Any lessening of the utility or the performance of the products likely to result from the standard;

(5) The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the standard;

(6) The need for national energy and water conservation; and

(7) Other factors the Secretary of Energy ("Secretary") considers relevant.

(42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

DOE fulfills these and other applicable requirements by conducting a series of analyses throughout the rulemaking process. Table I.1 shows the individual analyses that are performed to satisfy each of the requirements within EPCA.

Table I.1 EPCA Requirements and Corresponding DOE Analysis

EPCA Requirement	Corresponding DOE Analysis
Significant Energy Savings	• Shipments Analysis • National Impact Analysis • Energy and Water Use Determination
Technological Feasibility	• Market and Technology Assessment • Screening Analysis • Engineering Analysis
Economic Justification:	
1. Economic impact on manufacturers and consumers	• Manufacturer Impact Analysis • Life-Cycle Cost and Payback Period Analysis • Life-Cycle Cost Subgroup Analysis • Shipments Analysis
2. Lifetime operating cost savings compared to increased cost for the product	• Markups for Product Price Determination • Energy and Water Use Determination • Life-Cycle Cost and Payback Period Analysis
3. Total projected energy savings	• Shipments Analysis • National Impact Analysis
4. Impact on utility or performance	• Screening Analysis • Engineering Analysis
5. Impact of any lessening of competition	• Manufacturer Impact Analysis
6. Need for national energy and water conservation	• Shipments Analysis • National Impact Analysis
7. Other factors the Secretary considers relevant	• Employment Impact Analysis • Utility Impact Analysis • Emissions Analysis • Monetization of Emission Reductions Benefits • Regulatory Impact Analysis

As detailed throughout this RFI, DOE is publishing this document seeking input and data from interested parties to aid in the development of the technical analyses on which DOE will ultimately rely to determine whether (and if so, how) to amend the standards for electric motors.

II. Request for Information and Comments

In the following sections, DOE has identified a variety of issues on which it seeks input to aid in the development of the technical and economic analyses regarding whether amended standards for electric motors may be warranted.

As an initial matter, DOE seeks comment on whether there have been sufficient technological or market changes since the most recent standards update that may justify a new rulemaking to consider more stringent standards. Specifically, DOE seeks data and information to enable the agency to determine whether DOE should propose a "no new standard" determination because a more stringent standard: (1) would not result in a significant savings of energy; (2) is not technologically feasible; (3) is not economically justified; or (4) any combination of foregoing.

A. Equipment Covered by this Process

This RFI covers equipment meeting the electric motor definition codified at 10 CFR 431.12[4] and includes the different classes of electric motors that DOE currently regulates. DOE's definitions related to electric motors were most recently amended in May 2014. *See* 79 FR 30933 (May 29, 2014).

[4] This RFI does not address small electric motors, which are covered separately under 10 CFR part 431, subpart X. A small electric motor is "a NEMA general purpose alternating current single-speed induction motor, built in a two-digit frame number series in accordance with NEMA Standards Publication MG1-1987, including IEC metric equivalent motors." 10 CFR 431.442.

The term “electric motor” is broadly defined as “a machine that converts electrical power into rotational mechanical power.” 10 CFR 431.12. Currently, DOE regulates electric motors falling into the NEMA Design A, NEMA Design B, NEMA Design C, and fire pump motor categories and those electric motors that meet the criteria specified at 10 CFR 431.25(g). 10 CFR 431.25(h)-(j). Section 431.25(g) specifies that the relevant standards apply only to electric motors, including partial electric motors, that satisfy the following criteria:

(1) Are single-speed, induction motors;

(2) Are rated for continuous duty (MG 1) operation or for duty type S1 (IEC)

(3) Contain a squirrel-cage (MG 1) or cage (IEC) rotor;

(4) Operate on polyphase alternating current 60-hertz sinusoidal line power;

(5) Are rated 600 volts or less;

(6) Have a 2-, 4-, 6-, or 8-pole configuration;

(7) Are built in a three-digit or four-digit NEMA frame size (or IEC metric equivalent), including those designs between two consecutive NEMA frame sizes (or IEC metric equivalent), or an enclosed 56 NEMA frame size (or IEC metric equivalent);

(8) Produce at least one horsepower (0.746 kW) but not greater than 500 horsepower (373 kW), and

(9) Meet all of the performance requirements of one of the following motor types: A NEMA Design A, B, or C motor or an IEC Design N or H motor.

10 CFR 431.25(g).

NEMA Design A, B and C motors are all squirrel-cage motors. NEMA Design A and B motors are very similar, except one of the main differences between them is that NEMA Design

A motors have no locked-rotor current limits whereas NEMA Design B motors are required to stay below certain maximum locked-rotor current limits specified in NEMA MG 1-2009. Otherwise, NEMA Design A and NEMA Design B motors have similar requirements for locked-rotor, pull-up, and breakdown torque and are consequently used in many of the same applications. IEC Design N motors have similar locked-rotor, pull-up, and breakdown torque requirements except that these requirements are specified in IEC 60034-12 edition 2.1 rather than in NEMA MG 1-2009.

NEMA Design C motors, on the other hand, have higher torque requirements than NEMA Design A or B motors. The difference in torque requirements restrict which applications can use which NEMA design types. As a result, NEMA Design C motors will not always be replaceable with NEMA Design A or B motors, or vice versa. IEC Design H motors have similar torque requirements except these are specified in IEC 60034-12 edition 2.1.

Fire pump electric motors are motors with special design characteristics that make them more suitable for emergency operation. Such electric motors, per the requirements of National Fire Protection ("NFPA") standard NFPA 20, are required to be marked as complying with NEMA Design B performance standards and be capable of operating even if it overheats or may be damaged due to continued operation.

The definitions for NEMA Design A motors, NEMA Design B motors, NEMA Design C motors, fire pump electric motors, IEC Design N motor and IEC Design H motor are codified in 10 CFR 431.12.

DOE has also exempted certain categories of motors from being regulated by its standards because of the current absence of a reliable and repeatable method to accurately measure their efficiency. *See* 79 FR 30934, 30945; *see also*, 78 FR 75962, 75974, 75987-75989). The current exemptions are as follows:

- Air-over electric motors;
- Component sets of an electric motor;
- Liquid-cooled electric motors;
- Submersible electric motors; and
- Inverter-only electric motors.

10 CFR 431.25(l)

In a recent test procedure notice of proposed rulemaking for small electric motors and electric motors, DOE did not propose to change the scope of the test procedure for electric motors. (84 FR 17004 (April 23, 2019)) DOE also requested comment in a test procedure RFI for electric motors published on November 2, 2017 (82 FR 50844) regarding the merits of revising the NEMA Design A, B, and C motor definitions, among others, and updating the current regulation's NEMA MG 1 references to the most recent edition of the standard, NEMA MG 1-2016. DOE notes that comments received on issues related to the scope and definitions for electric motors discussed in the April 2019 proposed test procedure rulemaking for small electric motors and electric motors will be addressed as part of that rulemaking.

In 2016, an updated version of the IEC 60034-12 was published that added new starting requirements to describe six new IEC motor designs in addition to the previously considered IEC Design N and H motors that DOE currently regulates: IEC Design NE, IEC Design HE, IEC Design NY, IEC Design NEY, IEC Design HY, and IEC Design HEY. All six additional categories are described as motors that are very similar in designs compared to the IEC Design N and H motors that DOE currently regulates, with the only differences being the locked rotor apparent power (indicated by the letter "E"), and starting configuration (star-delta starter indicated by the letter "Y"). DOE intends to review these additional IEC motor designs to determine whether these IEC designs are equivalent to the NEMA Design A, B, or C motors that DOE currently regulates.

Issue A.1 DOE requests comment on whether additional equipment definitions are necessary to clarify any potential definitional ambiguities between existing equipment class groups. DOE also seeks input on whether such equipment currently exist in the market or whether they are being planned for introduction. DOE also requests comment on opportunities to combine equipment class groups that could reduce regulatory burden.

Issue A.2 DOE requests input and comment on whether IEC Design NE, NEY, NY, HE, HEY, and HY motors are equivalent designs to NEMA Design A, B, or C motors, and if so, information and data to support such a consideration.

B. Market and Technology Assessment

The market and technology assessment that DOE routinely conducts when analyzing the impacts of a potential new or amended energy conservation standard provides information about the electric motors industry that will be used in DOE's analysis throughout the rulemaking process. DOE uses qualitative and quantitative information to characterize the structure of the industry and market. DOE identifies manufacturers, estimates market shares and trends, addresses regulatory and non-regulatory initiatives intended to improve energy efficiency or reduce energy consumption, and explores the potential for efficiency improvements in the design and manufacturing of electric motors. DOE also reviews equipment literature, industry publications, and company websites. Additionally, DOE conducts interviews with manufacturers to improve its assessment of the market and available technologies for electric motors.

1. Equipment Class Groups and Equipment Classes

When evaluating and establishing energy conservation standards, DOE may divide covered equipment into equipment classes by the type of energy used, or by capacity or other performance-related features that justify a different standard. (42 U.S.C. 6316(a); 42 U.S.C. 6295(q)) In determining whether capacity or another performance-related feature justifies a different standard, DOE must consider such factors as the utility of the feature to the consumer and other factors DOE deems appropriate. (*Id*.)

For electric motors, due to the large number of characteristics involved in electric motor design, DOE developed both "equipment class groups" and "equipment classes". With respect to class groups, the current energy conservation standards specified in 10 CFR 431.25 are based on three broad equipment groupings determined according to performance-related features that provide utility to the consumer and are described in terms of motor design (*i.e*. NEMA Design A and B, NEMA Design C, and Fire Pump Motors). Table II.1 lists the current three equipment class groups for electric motors.

Table II.1 Current Electric Motors Equipment Class Groups

Equipment Class Group	Electric Motor Design Type	Horsepower Rating	Pole Configuration	Enclosure
1	NEMA Design A & B*	1 – 500	2, 4, 6, 8	Open
				Enclosed
2	NEMA Design C*	1 – 200	4, 6, 8	Open
				Enclosed
3	Fire Pump Motors*	1 – 500	2, 4, 6, 8	Open
				Enclosed

*Including IEC equivalents.

"Design A", "Design B" and "Design C" are NEMA-developed designations that define a motor's performance characteristics such as the locked-rotor torque, pull-up torque, breakdown torque, inrush current, and locked-rotor current. The motors within the equipment class groups in Table II.1 were further divided into equipment classes based on pole-configuration, enclosure type, and horsepower rating.

<u>Issue B.1</u> DOE requests feedback on the current electric motors equipment class groups and whether changes to these individual equipment class groups and their descriptions should be made or whether certain class groups should be merged or separated. DOE also seeks feedback on whether combining certain class groups could impact product utility by eliminating any performance-related features or impact the stringency of the current energy conservation standard for this equipment. DOE also requests comment on whether it should consider separating any of the existing equipment class groups and whether such a change would impact

equipment utility by eliminating any performance-related features or reduce any compliance burdens.

Issue B.2 DOE seeks information regarding any other new equipment class groups it should consider for inclusion in its analysis. Specifically, DOE requests information on the performance-related features (*e.g.*, input power supply, operating speed, etc.) that provide unique consumer utility and data detailing the corresponding impacts on energy use that would justify separate equipment class groups (*i.e.*, explanation for why the presence of these performance-related features would increase energy consumption).

2. Technology Assessment

In analyzing the feasibility of potential new or amended energy conservation standards, DOE uses information about existing and past technology options and prototype designs to help identify technologies that manufacturers could use to meet and/or exceed a given set of energy conservation standards under consideration. In consultation with interested parties, DOE intends to develop a list of technologies to consider in its analysis. That analysis will likely include a number of the technology options DOE previously considered during its most recent rulemaking for electric motors. A complete list of those prior options appears in Table II.2. *See also* 79 FR 30934, 30959.

Table II.2 Technology Options Considered in the Development of the May 2014 Final Rule

Type of Loss to Reduce	**Technology Option**
Stator I^2R Losses	Increase cross-sectional area of copper in stator slots
	Decrease the length of coil extensions
Rotor I^2R Losses	Increase cross-sectional area of end rings
	Increase cross-sectional area of rotor conductor bars
	Use a die-cast copper rotor cage

Core Losses	Use electrical steel laminations with lower losses (watts/lb)
	Use thinner steel laminations
	Increase stack length (i.e., add electrical steel laminations)
Friction and Windage Losses	Optimize bearing and lubrication selection.
	Improve cooling system design
Stray-Load Losses	Reduce skew on rotor cage.
	Improve rotor bar insulation.

DOE is not aware of specific techniques manufacturers use to reduce stray-load losses, which are any losses that are not attributed to I^2R losses, core losses, or friction and windage losses, other than those already noted in Table II.2.

Issue B.3 DOE seeks information on the technologies listed in Table II.2 regarding their applicability to the current market and how these technologies may impact the efficiency of electric motors as measured according to the DOE test procedure. DOE also seeks information on how these technologies may have changed since their prior consideration during the May 2014 Final Rule analysis. Specifically, DOE seeks information on the range of efficiencies or performance characteristics that are currently available for each technology option.

Issue B.4 DOE seeks information on the technologies listed in Table II.2 regarding their market adoption, costs, and any concerns with incorporating them into products (e.g., impacts on consumer utility, potential safety concerns, manufacturing/production/implementation issues, *etc.*), particularly as to changes that may have occurred since the publication of the May 2014 Final Rule.

Issue B.5 DOE seeks comment on other technology options that it should consider for inclusion in its analysis and details regarding the extent to which these technologies may impact product features or consumer utility. DOE also seeks input regarding the cost-effectiveness of implementing these options.

C. Screening Analysis

The purpose of the screening analysis is to evaluate the technologies that improve equipment efficiency to determine which technologies will be eliminated from further consideration and which will be passed to the engineering analysis for further consideration.

DOE determines whether to eliminate certain technology options from further consideration based on the following criteria:

(1) *Technological feasibility*. Technologies that are not incorporated in commercial products or in working prototypes will not be considered further.

(2) *Practicability to manufacture, install, and service.* If it is determined that mass production of a technology in commercial products and reliable installation and servicing of the technology could not be achieved on the scale necessary to serve the relevant market at the time of the compliance date of the standard, then that technology will not be considered further.

(3) *Impacts on equipment utility or equipment availability.* If a technology is determined

to have significant adverse impact on the utility of the equipment to significant subgroups of consumers, or result in the unavailability of any covered equipment type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as equipment generally available in the United States at the time, it will not be considered further.

(4) *Adverse impacts on health or safety.* If it is determined that a technology will have significant adverse impacts on health or safety, it will not be considered further.

See 10 CFR part 430, subpart C, appendix A, sec. 4(a)(4) and 5(b).

Technology options identified in the technology assessment are evaluated against these criteria using DOE analyses and inputs from interested parties (*e.g.*, manufacturers, trade organizations, and energy efficiency advocates). Technologies that pass through the screening analysis are referred to as "design options" in the engineering analysis. Technology options that fail to meet one or more of the four criteria are eliminated from consideration.

Additionally, DOE notes that the four screening criteria do not directly address the proprietary status of technology options. DOE only considers potential efficiency levels achieved through the use of proprietary designs in the engineering analysis if they are not part of a unique pathway to achieve that efficiency level (*i.e.*, if there are other non-proprietary technologies capable of achieving the same efficiency level).

Table II.3 summarizes specific examples of design options that DOE screened out in the

May 2014 Final Rule, the type of loss reduced, and the applicable screening criteria.

Table II.3 Previously Screened Out Design Options from the May 2014 Final Rule

		EPCA Criteria (X = Basis for Screening Out)			
Screened Technology Option	**Type of Loss Reduced**	**Technological Feasibility**	**Practicability to Manufacture, Install, and Service**	**Adverse Impact on Product Utility**	**Adverse Impacts on Health and Safety**
Plastic Bonded Iron Powder (PBIP)	Core Losses	**X**			
Amorphous Steels	Core Losses	**X**			

Plastic Bonded Iron Powder ("PBIP") is a method that can be employed to reduce core losses. PBIP uses two main ingredients: metal powder and plastics. Combining the ingredients creates a material with low conductivity and high permeability. The metal particles are surrounded by an insulating plastic, which prevents electric current from developing in the material and helps to eliminate losses in the core due to eddy currents. Properties of PBIP can differ depending on the processing steps that are followed. If the metal particles are too closely compacted and begin to touch each other, the material will gain electrical conductivity, counteracting one of its most important features.

In the May 2014 Final Rule, DOE did not consider this technology option technologically feasible, because it had not been incorporated into a working prototype of an electric motor. 79 FR 30934, 30966. While DOE noted that a research team at Lund University in Sweden published a paper in 2007 about using PBIP in manufacturing, the same paper indicated that its study team produced inductors, transformers, and induction heating coils using PBIP, but has not yet produced a small electric motor.[5] (See chapter 4 of the May 2014 Final Rule TSD) Also, DOE was uncertain whether the PBIP material had the structural integrity to form into the necessary shape of an electric motor steel frame.

The use of amorphous metals in the rotor laminations is another method to improve the efficiency of electric motors by reducing core losses. Amorphous metal is extremely thin, has high electrical resistivity, and has little or no magnetic domain definition. Because of amorphous steel's high resistance, it exhibits a reduction in hysteresis and eddy current losses, which reduce overall losses in electric motors. However, amorphous steel is a very brittle material which makes it difficult to punch into motor laminations. In the May 2014 Final Rule, DOE did not consider this technology option technologically feasible because it had not been incorporated into a working prototype of an electric motor. 79 FR 30934, 30936. Furthermore, DOE was uncertain at the time whether amorphous metals are practicable to manufacture, install, and service, because a prototype amorphous metal electric motor had not been made.

Issue C.1 DOE requests feedback on what impact, if any, the four screening criteria described in this section would have on each of the technology options listed in Table II.2 with respect to electric motors. Similarly, DOE seeks information regarding how these same criteria would affect any other technology options not already identified in this document with respect to their potential use in electric motors.

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[5] Horrdin, H., and E. Olsson. Technology Shifts in Power Electronics and Electric Motors for Hybrid Electric Vehicles: A Study of Silicon Carbide and Iron Powder Materials. 2007. Chalmers University of Technology. Göteborg, Sweden.

Issue C.2 With respect to the screened-out design options listed in Table II.3, DOE seeks information on whether these options would, based on current and projected assessments regarding each of them, remain screened out under the four screening criteria described in this section. Also regarding each, what steps, if any, could be (or have already been) taken to facilitate the introduction of each method as a means to improve the energy performance of electric motors and, separately, what is the potential of each option to impact the consumer utility of an electric motor that uses it?

D. Engineering Analysis

The engineering analysis estimates the cost-efficiency relationship of equipment at different levels of increased energy efficiency ("efficiency levels"). This relationship serves as the basis for the cost-benefit calculations for consumers, manufacturers, and the Nation. In determining the cost-efficiency relationship, DOE estimates the increase in manufacturer production cost ("MPC") associated with increasing equipment efficiency above the baseline, up to the maximum technologically feasible ("max-tech") efficiency level for each equipment class.

DOE historically has used the following three methodologies to generate incremental manufacturing costs and establish efficiency levels ("ELs") for analysis: (1) the design-option approach, which provides the incremental costs of adding to a baseline model design options that will improve its efficiency; (2) the efficiency-level approach, which provides the relative costs of achieving increases in energy efficiency levels, without regard to the particular design options used to achieve such increases; and (3) the cost-assessment (or reverse engineering) approach, which provides "bottom-up" manufacturing cost assessments for achieving various levels of increased efficiency, based on detailed cost data for parts and material, labor, shipping/packaging, and investment for models that operate at particular efficiency levels.

1. Baseline Efficiency Levels

For each equipment class, DOE selects a baseline model as a reference point against which any changes resulting from new or amended energy conservation standards can be measured. The baseline model in each equipment class represents the characteristics of common or typical equipment in that class. Typically, a baseline model is one that meets the current minimum energy conservation standards and provides basic consumer utility.

If it determines that a rulemaking is merited, consistent with this analytical approach, DOE tentatively plans to consider the current minimum energy conservation standards (which went into effect June 1, 2016) to establish baseline efficiency levels for each equipment class group. The current standards for each equipment class, which are based on nominal full load efficiency, are found at 10 CFR 431.25.

Issue D.1 DOE requests feedback (including data) on whether using the current established energy conservation standards for electric motors are appropriate baseline efficiency levels for DOE to apply to each equipment class group in evaluating whether to amend the current energy conservation standards for these products.

Issue D.2 DOE requests feedback on the appropriate baseline efficiency levels for any newly analyzed equipment class groups that are not currently in place or for the contemplated combined equipment class groups, as discussed in section II.B.1 of this document. For newly analyzed equipment class groups or equipment classes, DOE requests energy use data to develop a baseline relationship between energy use, horsepower rating, number of poles, and enclosure type.

2. Maximum Available and Maximum Technologically Feasible Levels

As part of DOE's analysis, the maximum available efficiency level is the most efficient unit currently available on the market. For the May 2014 Final Rule, DOE did not directly analyze all 482 equipment classes. Rather, DOE selected and analyzed certain representative units from each equipment class group and based its overall analysis for all equipment classes with that equipment class group on those representative units. Results were then scaled to equipment classes that were not directly analyzed. The representative units from each equipment class group were determined based on the NEMA design type, horsepower rating, pole configuration and enclosure, in addition to corresponding shipment volumes, examining manufacturers' catalog data, and soliciting feedback from interested parties. For example, for equipment class group 1, which includes NEMA Design A and B motors, DOE selected only NEMA Design B motors as representative units to analyze in the engineering analysis. DOE chose NEMA Design B motors because NEMA Design B motors have slightly more stringent performance requirements – namely, their locked-rotor current has a maximum allowable level for a given rating. Consequently, NEMA Design B motors are slightly more restricted in terms of their maximum efficiency levels. By analyzing a NEMA Design B motor, DOE can ensure all designs covered in the equipment class group 1 analysis are technologically feasible. In addition, NEMA Design B units have much higher shipment volumes than NEMA Design A motors because most motor driven equipment is designed (and UL-listed) to run with NEMA Design B motors – which, as a result, is more likely to provide a broader picture of the impacts that would flow from amending the standards for electric motors. *See* 79 FR 30934, 30967 and chapter 5 of the technical support document ("TSD") for that rulemaking.[6]

DOE selected three representative units to analyze in equipment class group 1 ("ECG1") and two representative units in equipment class group 2 ("ECG2"). For equipment class group 3 ("ECG3"), DOE analyzed the same equipment classes as for ECG1 because fire pump electric motors are required to meet NEMA Design B performance standards as per NFPA 20, and ECG1 includes NEMA Design B motors. The current maximum available efficiencies for the representative units for each of the three equipment class groups are included in Table II.4.

Table II.4 Maximum Efficiency Levels Currently Available

ECG	Electric Motor Design Type	Pole Configuration	Enclosure Type	Horsepower Rating (hp)	Maximum Available Motor Efficiency (%)	Current Energy Conservation Standard (%)
1	NEMA Design B	4-pole	Enclosed	5	91.0	89.5
				30	94.5	93.6
				75	96.2	95.4
2	NEMA Design C	4-pole	Enclosed	5	91.0	89.5
				50	95.0	94.5
3*	NEMA Design B	4-pole	Enclosed	5	91.0	87.5
				30	94.5	92.4
				75	96.2	94.1

*DOE analyzed the same equipment classes from ECG1 for ECG3.

DOE defines a max-tech efficiency level to represent the theoretical maximum possible efficiency if all available design options are incorporated in a model. In applying these design

[6] The TSD is available at: *https://www.regulations.gov/document?D=EERE-2010-BT-STD-0027-0108*.

options, DOE would only include those that are compatible with each other that when combined, would represent the theoretical maximum possible efficiency. In many cases, the max-tech efficiency level is not commercially available because it is not economically feasible. In the May 2014 Final Rule, depending on the equipment class group, DOE determined max-tech efficiency levels using efficiencies for physical electric motors, energy modeling, and/or subject matter expert feedback. The energy models were based on using various technology (as discussed in section II.B.2), material (low loss electrical steel and increased stator copper), and geometry changes applicable to the specific equipment class groups. While all these product configurations had not likely been tested as prototypes available in the market, all the individual design options had been incorporated in available equipment, and therefore a compatible combination of the design options used for max-tech is theoretically possible.

Issue D.3 DOE seeks input on whether it is appropriate for ECG 1 and ECG 3 to use the same representative units for purposes of the engineering analysis.

Issue D.4 DOE seeks input on whether the maximum available efficiency levels discussed in this document are appropriate and technologically feasible for potential consideration as possible energy conservation standards for the products at issue – and if not, why not. DOE also requests feedback on whether the maximum available efficiencies presented in Table II.4 are representative of all other electric motor equipment classes not directly analyzed in the May 2014 Final Rule. If the range of possible efficiencies is different for the other equipment classes not directly analyzed, what alternative approaches should DOE consider using for those equipment classes and why?

Issue D.5 DOE seeks feedback on what design options would be incorporated at a max-tech efficiency level, and the efficiencies associated with those levels. As part of this request, DOE also seeks information as to whether there are limitations on the use of certain combinations of design options.

3. Manufacturer Production Costs and Manufacturing Selling Price

As described at the beginning of this section, the main outputs of the engineering analysis are cost-efficiency relationships that describe the estimated increases in manufacturer production cost associated with higher-efficiency products for the analyzed equipment classes. For the May 2014 Final Rule, DOE developed the cost-efficiency relationships by estimating the efficiency improvements and costs associated with incorporating specific design options into the assumed baseline model for each analyzed equipment class.

Issue D.6 DOE requests feedback on how manufacturers would incorporate the technology options listed in Table II.2 to increase the energy efficiency of electric motors beyond the baseline. This includes information on the order in which manufacturers would incorporate the different technologies to incrementally improve the efficiencies of equipment. DOE also requests feedback on whether increasing the energy efficiency of an electric motor would lead to other design changes that would not otherwise occur – and if so, what those changes would be. DOE is also interested in information regarding any potential impact of adopting a given design option on a manufacturer's ability to incorporate additional functions or attributes in response to consumer demand.

Issue D.7 DOE also seeks input on the increase in MPC associated with incorporating each design option. Specifically, DOE is interested in whether and how the design option cost estimates used in the May 2014 Final Rule have changed since the time of that analysis. DOE also requests information on the investments needed to incorporate specific design options (and combinations of options), including, but not limited to, costs related to new or modified tooling (if any), materials, engineering and development efforts to implement each design option (including combinations of options), and manufacturing/production impacts.

Issue D.8 DOE requests comment on whether certain design options (or combinations of options) may not be applicable to (or may be incompatible with) specific equipment class groups or equipment classes.

As described in section II.D.2 of this document, DOE analyzed five representative units in the May 2014 Final Rule. DOE developed cost-efficiency curves for each of the equipment classes that were used as the input for the downstream analyses conducted in support of that rulemaking. See chapter 5 of the May 2014 Final Rule TSD for the cost-efficiency curves developed in that rulemaking.

Issue D.9 DOE seeks feedback on whether its tentative approach of analyzing a sub-set of equipment classes is appropriate for a future electric motor energy conservation standards rulemaking. DOE seeks comment on whether its prior approach of analyzing particular equipment classes and applying those results to the remaining classes remains appropriate in principle – and if not, why not? For example, if it is necessary to individually analyze more than the five equipment classes used in the May 2014 Final Rule, please provide information on why aggregating certain equipment is not appropriate and suggestions on which additional classes that DOE should analyze. If the approach outlined in this document is not appropriate, what alternative approaches should DOE consider using as an alternative and why? If analyzing a different sub-set of electric motor classes is sufficient, which sub-sets should be analyzed, what minimum number of classes should be examined, and how should those selected classes be distributed among the 482 separate classes that DOE currently regulates?

To account for manufacturers' non-production costs and profit margin, DOE applies a non-production cost multiplier (the manufacturer markup) to the MPC. The resulting manufacturer selling price ("MSP") is the price at which the manufacturer distributes a unit into commerce. For the May 2014 Final Rule, DOE used three manufacturer markups to account for costs that are part of each motor leaving a manufacturer's facility:

- Handling and scrap factor: 2.5 percent markup. This markup was applied to the direct material production costs of each electric motor. It accounts for the handling of material and the scrap material that cannot be used in the production of a finished electric motor.
- Factory overhead: 17.5 or 18.0 percent markup. DOE applied factory overhead to the direct material production costs, including the handling and scrap factor, and labor estimates. For aluminum rotor designs a 17.5 percent markup was used, but for all copper rotor designs, an 18.0 percent markup was used to factor in

increased depreciation for the equipment.

- Non-production: 37- 45 percent markup. This markup reflects costs including sales and general administrative, research and development costs, interest payments, and profit factor. DOE applied the non-production markup to the sum of the direct material production, the direct labor, the factory overhead and the product conversion costs. For the analyzed electric motors at or below 30-horsepower this markup was 37 percent and for electric motors above 30-horsepower this markup was 45 percent. This increase accounted for the extra profit margin manufacturers may receive on larger electric motors that are sold in smaller volumes.

DOE developed these estimated markups based on corporate reports and conversations with manufacturers and experts. See chapter 5 of the May 2014 Final rule TSD for further detail.

Issue D.10 DOE requests feedback on whether the manufacturer markups used in the May 2014 final rule are still appropriate for DOE to use when evaluating whether to amend its current standards. If the markups require revision, what specific revisions are needed for each? Are there additional markups that DOE should also consider – if so, which ones and why?

E. Distribution Channels

In generating end-user price inputs for the life-cycle cost (“LCC”) analysis and national impact analysis (“NIA”), DOE must identify distribution channels (*i.e.*, how the products are distributed from the manufacturer to the consumer), and estimate relative sales volumes through each channel. In the May 2014 Final Rule, DOE accounted for seven main distribution channels for electric motors and estimated their respective shares of sales volume (see Table II.5). Should sufficient information become available, DOE may consider modifying these distribution channels and respective share of sales volume.

Table II.5 Fraction of Electric Motors Shipments by Distribution Channels

Distribution Channel	**Shipments (%)**
Manufacturer → OEM →End-user	25%
Manufacturer → OEM → Equipment Distributor → End-user	25%
Manufacturer → Retailers → End-User	24%
Manufacturer → Equipment Wholesaler → OEM →End-user	23%
Manufacturer → Contractor →End-user	0.75%
Manufacturer → Distributors or Retailers → Contractor → End-User	0.75%
Manufacturer → End-user	1.5%

In addition to these distribution channel markups, DOE estimated the shipping costs of the motors. More-efficient motors are often larger and heavier than less efficient motors and DOE also accounted for any increase in shipping costs due to changes in weight.

Issue E.1 DOE requests information on the existence of any distribution channels other than the seven channels that were identified in the May 2014 Final Rule and as described in section E. DOE also requests data on the fraction of sales that go through these channels and any other identified channels.

F. Energy Use Analysis

As part of the rulemaking process, DOE conducts an energy use analysis to identify how equipment is used by consumers, and thereby determine the energy savings potential of energy efficiency improvements. The energy use analysis is meant to represent the energy consumption of a given product or equipment when used in the field. In addition to the rated nominal full-load efficiency as determined by the DOE test procedure, DOE uses information related to motor annual operating hours, motor operating load, and part-load efficiency to characterize energy consumption in the field.

In the May 2014 Final Rule, DOE determined the annual energy consumption of electric motors by multiplying the power consumed by the electric motor while in operation by the annual hours of operation in various sectors and applications. The power consumed in operation was established as a function of the motor's load and of the part-load efficiency of electric motors as characterized in the engineering analysis. DOE also included a sensitivity analysis to analyze the impacts of varying nominal speeds across efficiency levels to account for the energy use impacts of having more efficient motors potentially run at slightly higher speeds.[7] DOE used data referenced in an Easton Consultants report to establish the share of electric motors by sector (commercial, industrial and agriculture).[8] For the industrial sector, DOE derived the share of each motor application, the distributions of operating hours and load using data from field surveys[9] and other sources.[10] For fire pumps, DOE assumed a uniform distribution of operating

[7] A more efficient motor can have less slip than a less efficient motor, an attribute that can result in a higher operating speed and a potential overloading of the motor.

[8] Easton Consultants, I. (2000), *Variable Frequency Drive*. Retrieved February 9, 2011, from *http://neea.org/research/reports/E00-054.pdf* .

[9] Database of motor nameplate and field measurement data compiled by the Washington State University Extension Energy Program ("WSU") and Applied Proactive Technologies ("APT") under contract with the New York State Energy Research and Development Authority ("NYSERDA"). 2011. This database is composed of information gathered by WSU and APT during 123 industrial motor surveys or assessments: 11 motor assessments were conducted between 2005 and 2011 and occurred in industrial plants; 112 industrial motor surveys were conducted between 2005 and 2011 and were funded by NYSERDA and conducted in New York State. *See also* Strategic Energy Group (January, 2008), Northwest Industrial Motor Database Summary. Regional Technical Forum. Available at ***http://rtf.nwcouncil.org/subcommittees/osumotor/Default.htm***

[10] U.S. Department of Agriculture (February 2010), 2007 Census of Agriculture Farm and Ranch Irrigation Survey, from *http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/Farm_and_Ranch_Irrigation_Survey/index.php*. *See also* Gallaher, M., Delhotal, K., & Petrusa, J. (2009), Estimating the potential CO_2 mitigation from agricultural energy efficiency in the United States, Energy Efficiency (2), 207-220.

hours between 0.5 hours and up to 6 hours.

Issue F.1 DOE seeks input on data sources to help characterize the variability in annual energy consumption for electric motors. Specifically, DOE is requesting data and information (by application and sector) related to: (1) the distribution of operating hours; (2) the distribution of motor average annual loads; and (3) applicable load profiles (*i.e.*, percentage of annual operating hours spent at specified load points), including the distribution of those profiles.

G. Life-Cycle Cost and Payback Period Analysis

DOE conducts the LCC and payback period ("PBP") analysis to evaluate the economic effects of potential energy conservation standards for electric motors on individual customers. For any given efficiency level, DOE measures the PBP and the change in LCC relative to an estimated baseline level. The LCC is the total customer expense over the life of the equipment, consisting of purchase, installation, and operating costs (expenses for energy use, maintenance, and repair). Inputs to the calculation of total installed cost include the cost of the equipment—which includes MSPs, distribution channel markups, and sales taxes—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy prices and price projections, repair and maintenance costs, equipment lifetimes, discount rates, and the year that compliance with new and amended standards is required. In this section, DOE discusses specific inputs to the LCC and PBP analysis for which it requests comment and feedback.

1. Installation, Repair and Maintenance Costs

In the May 2014 Final Rule, DOE reviewed motor installation cost data from RS Means Electrical Cost Data 2013 which showed a variation in installation costs by horsepower (for three-phase electric motors), but not by efficiency. Therefore, DOE assumed there was no variation in installation costs between a baseline efficiency electric motor and a higher efficiency electric motor. 79 FR 30934, 30978. DOE reviewed repair and maintenance cost data from Vaughen's Price Publishing Company,[11] which publishes an industry reference guide on motor repair and maintenance pricing. The price of replacing bearings, which is the most common maintenance practice, was found to be the same at all efficiency levels. Therefore, DOE did not consider variations in maintenance costs by efficiency levels for electric motors in its analysis. DOE accounted for the differences in repair costs of a higher efficiency motor compared to a baseline efficiency motor.[12] Based on data from Vaughen's, DOE derived a model to estimate repair costs by horsepower, enclosure and pole, for each efficiency level. As part of a potential energy conservation standards rulemaking, should one be conducted, DOE would review available motor installation, maintenance and repair cost information and update these inputs as appropriate.

Issue G.1 DOE requests feedback and data on whether installation and maintenance costs at higher efficiency levels differ in comparison to the baseline installation and maintenance costs for any of the specific technology options listed in Table II.2. To the extent that these costs differ, DOE seeks supporting data and the reasons for those differences.

[11] Vaughen's (2011, 2013), Vaughen's Motor & Pump Repair Price Guide, 2011, 2013 Edition. *http://www.vaughens.com/*

[12] DOE considered a repair as including a rewind and reconditioning of the motor.

Issue G.2 DOE requests information and data on the frequency of repair and repair costs by equipment class for the technology options listed in Table II.2. While DOE is interested in information regarding each of the listed technology options, DOE is also interested in whether consumers simply replace the equipment when it fails as opposed to repairing it.

2. Lifetime

The equipment lifetime is the age at which given equipment is retired from service. In the May 2014 Final Rule, DOE estimated the mechanical lifetime of electric motors in hours (i.e., the total number of hours an electric motor operates throughout its lifetime), depending on its horsepower size and sector of application. DOE then developed Weibull distributions of mechanical lifetimes. The lifetime in years for a sampled electric motor was then calculated by dividing the sampled mechanical lifetime by the sampled annual operating hours of the electric motor.

In the May 2014 Final Rule, DOE established sector-specific motor lifetime estimates to account for differences in maintenance practices and field usage conditions. DOE consulted a subject matter expert to obtain lifetime information for the industrial sector. For the agricultural and commercial sector, DOE referred to published average lifetimes cited in previous publications.[13] See Chapter 8 of the May 2014 Final Rule TSD for further discussion of the

[13] Nadel, Steven et al. (2002), Energy Efficient Motor Systems: A Handbook on Technology, Program, and Policy Opportunities, American Council for an Energy-Efficient Economy, Washington, D.C. See also Gallaher, M., Delhotal, K., & Petrusa, J. (2009), Estimating the potential CO_2 mitigation from agricultural energy efficiency in the United States, Energy Efficiency (2), 207-220.

lifetime estimate.

Issue G.3 DOE seeks data and input on the appropriate equipment lifetimes for electric motors both in years and by sector and in lifetime mechanical hours that DOE should apply when performing its analysis.

3. Efficiency Distribution in the No-New Standards Case

To accurately estimate the share of consumers that would be affected by a potential energy conservation standard at a particular efficiency level, DOE's LCC analysis considers the projected distribution (market shares) of equipment efficiencies in the no-new-standards case (*i.e.*, the case without amended or new energy conservation standards) in the compliance year.

In the May 2014 Final Rule, DOE used the number of models meeting the requirements of each efficiency level from six major manufacturers and one distributor's catalog data to develop the "no new standards" case efficiency distributions in the base year (2012). The distribution was estimated separately for each equipment class group and horsepower range. Beyond 2012, for NEMA Design A and B motors, DOE assumed the efficiency distributions varied over time based on historical data[14] for the market penetration of more efficient motors. For other equipment class groups, DOE did not find sufficient data to develop efficiency trends for them – and as a result, DOE kept the base case efficiency distributions in the compliance year

[14] Robert Boteler, USA Motor Update 2009, Energy Efficient Motor Driven Systems Conference 2009, Proceedings of the 6th International Conference eemods '09 - Energy Efficiency in Motor Driven Systems, Nantes, FRANCE, 14-17 September 2009 (Volume 1) . Available at: *https://ec.europa.eu/jrc/en/publication/books/proceedings-6th-international-conference-eemods-09-energy-efficiency-motor-driven-systems-nantes*.

equal to 2012 levels.

Issue G.4 DOE seeks data and input on the appropriate efficiency distribution in the no-new standards case for electric motors.

H. Shipments

DOE develops shipments forecasts of electric motors to calculate the national impacts of potential amended energy conservation standards on energy consumption, net present value ("NPV"), and future manufacturer cash flows. DOE shipments projections are based on available historical data broken out by equipment class, horsepower, and efficiency. Current sales estimates allow for a more accurate model that captures recent trends in the market.

In the May 2014 Final Rule, DOE's shipments projection assumed that electric motor sales are driven by machinery production growth for equipment, including motors. DOE estimated that growth rates for total motor shipments correlate to growth rates in fixed investment in equipment and structures including motors, as provided by the U.S. Bureau of Economic Analysis.[15] The base year market distributions were maintained over the 30-year analysis period. See Chapter 9 of the 2014 May Final Rule TSD for further discussion of the prior shipments analysis. DOE may consider using a similar approach if it undertakes an energy conservation standards rulemaking.

[15] Bureau of Economic Analysis (March 01, 2012), Private Fixed Investment in Equipment and Software by Type and Private Fixed Investment in Structures by Type (Available at: *http://www.bea.gov/iTable/iTable.cfm?ReqID=12&step=1*).

Issue H.1 DOE requests 2019 annual sales data (or the most recent year available) --*i.e.*, number of shipments -- for electric motors by equipment class. If disaggregated data of annual sales are not available at the equipment class level, DOE requests more aggregated data of annual sales at the equipment class group level.

Issue H.2 DOE requests 2019 data (or the most recent year available) on the fraction of sales in the industrial, agriculture, and commercial sectors for electric motors by equipment class group.

Issue H.3 DOE requests information on the rate at which annual sales (*i.e.*, number of shipments) of electric motors is expected to change in the next 5-10 years. If possible, DOE requests this information by equipment class. If disaggregated data of annual sales are not available at the equipment class level, DOE requests more aggregated data of annual sales at the equipment class group level.

Issue H.4 DOE requests data and information on any trends in the motor market that could be used to forecast expected trends in market share by efficiency levels for each equipment class. If disaggregated data are not available at the equipment class level, DOE requests aggregated data at the equipment class group level.

I. Manufacturer Impact Analysis

The purpose of the manufacturer impact analysis ("MIA") is to estimate the financial impact of amended energy conservation standards on manufacturers of electric motors, and to evaluate the potential impact of such standards on direct employment and manufacturing capacity. The MIA includes both quantitative and qualitative aspects. The quantitative part of the MIA primarily relies on the Government Regulatory Impact Model ("GRIM"), an industry cash-flow model adapted for electric motors included in this analysis, with the key output of industry net present value ("INPV"). The qualitative part of the MIA addresses the potential impacts of energy conservation standards on direct employment and manufacturing capacity, as well as factors such as product characteristics, impacts on particular subgroups of firms, industry competition, and important market and product trends.

As part of the MIA, DOE intends to analyze impacts of amended energy conservation standards on subgroups of manufacturers of the covered equipment, including small business manufacturers. DOE uses the Small Business Administration's ("SBA") small business size standards to determine whether manufacturers qualify as small businesses, which are listed by the applicable North American Industry Classification System ("NAICS") code.[16] Manufacturing of consumer electric motors is classified under NAICS 335312, "Motor and Generator Manufacturing" and the SBA sets a threshold of 1,250 employees or less for a domestic entity to be considered as a small business. This employee threshold includes all employees in a business' parent company and any other subsidiaries.

One aspect of assessing manufacturer burden involves examining the cumulative impact of multiple DOE standards and the product-specific regulatory actions of other Federal agencies that affect the manufacturers of a covered product or equipment. While any one regulation may

[16] Available online at *https://www.sba.gov/document/support--table-size-standards*.

not impose a significant burden on manufacturers, the combined effects of several existing or impending regulations may have serious consequences for some manufacturers, groups of manufacturers, or an entire industry. Assessing the impact of a single regulation may overlook this cumulative regulatory burden. In addition to energy conservation standards, other regulations can significantly affect manufacturers' financial operations. Multiple regulations affecting the same manufacturer can strain profits and lead companies to abandon product lines or markets with lower expected future returns than competing products. For these reasons, DOE conducts an analysis of cumulative regulatory burden as part of its rulemakings pertaining to appliance efficiency.

Issue I.1 To the extent feasible, DOE seeks the names and contact information of any domestic or foreign-based manufacturers that distribute electric motors in the United States.

Issue I.2 DOE identified small businesses as a subgroup of manufacturers that could be disproportionally impacted by amended energy conservation standards. DOE requests the names and contact information of small business manufacturers, as defined by the SBA's size threshold, of electric motors that distribute equipment in the United States. In addition, DOE requests comment on any other manufacturer subgroups that could be disproportionally impacted by amended energy conservation standards. DOE requests feedback on any potential approaches that could be considered to address adverse impacts on manufacturers, including small businesses.

Issue I.3 DOE requests information regarding the cumulative regulatory burden impacts on manufacturers of electric motors associated with (1) other DOE standards applying to different products that these manufacturers may also make and (2) product-specific regulatory actions of other Federal agencies. DOE also requests comment on its methodology for evaluating cumulative regulatory burden and whether there are any flexibilities it can (and should) consider that would reduce this burden while remaining consistent with the requirements of EPCA.

J. Other Energy Conservation Standards Topics

1. Market Failures

In the field of economics, a market failure is a situation in which the market outcome does not maximize societal welfare. Such an outcome would result in unrealized potential welfare. DOE welcomes comment on any aspect of market failures, especially those in the context of amended energy conservation standards for electric motors.

2. Emerging Smart Technology Market

DOE published an RFI on the emerging smart technology appliance and equipment market. 83 FR 46886 (Sept. 17, 2018). In that RFI, DOE sought information to better understand market trends and issues in the emerging market for appliances and commercial equipment that incorporate smart technology. DOE's intent in issuing the RFI was to ensure that DOE did not inadvertently impede such innovation in fulfilling its statutory obligations in setting efficiency standards for covered products and equipment. DOE seeks comments, data and information on the issues presented in the RFI as they may be applicable to energy conservation standards for electric motors.

3. Other Issues

Additionally, DOE welcomes comments on other issues relevant to the conduct of this rulemaking that may not specifically be identified in this document. In particular, DOE notes that under Executive Order 13771, "Reducing Regulation and Controlling Regulatory Costs," Executive Branch agencies such as DOE are directed to manage the costs associated with the imposition of expenditures required to comply with Federal regulations. *See* 82 FR 9339 (Feb. 3, 2017). Consistent with that Executive Order, DOE encourages the public to provide input on measures DOE could take to lower the cost of its energy conservation standards rulemakings, recordkeeping and reporting requirements, and compliance and certification requirements applicable to electric motors while remaining consistent with the requirements of EPCA.

III. Submission of Comments

DOE invites all interested parties to submit in writing by the date specified previously in the **DATES** section of this document, comments and information on matters addressed in this document and on other matters relevant to DOE's consideration of amended energy conservations standards for electric motors. After the close of the comment period, DOE will review the public comments received and may begin collecting data and conducting the analyses discussed in this document.

Submitting comments via http://www.regulations.gov. The *http://www.regulations.gov* web page requires you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies Office staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *http://www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information ("CBI")). Comments submitted through *http://www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through *http://www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that www.regulations.gov provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or postal mail. Comments and documents submitted via email, hand delivery/courier, or postal mail also will be posted to *http://www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via postal mail or hand delivery/courier, please provide all items on a CD, if feasible. It is not necessary to submit printed copies. No telefacsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English and free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. According to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

DOE considers public participation to be a very important part of the process for developing energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in each stage of the rulemaking process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the rulemaking process.

Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this process or would like to request a public meeting should contact Appliance and Equipment Standards Program staff at (202) 287-1445 or via e-mail at *ApplianceStandardsQuestions@ee.doe.gov*.

Signing Authority

This document of the Department of Energy was signed on March 10, 2020, by Alexander N. Fitzsimmons, Deputy Assistant Secretary for Energy Efficiency, Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on May 6, 2020

Treena V. Garrett
Federal Register Liaison Officer,
U.S. Department of Energy

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