DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE–2019–BT–STD–0008]

RIN 1904–AD29

Energy Conservation Program: Energy Conservation Standards for Small Electric Motors

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

ACTION: Notification of proposed determination and request for comment.

SUMMARY: The Energy Policy and Conservation Act of 1975, as amended, prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including small electric motors. EPCA also requires the Secretary of Energy to periodically determine whether more-stringent, amended standards would be technologically feasible and cost effective, and would result in significant conservation of energy. In this document, DOE has tentatively determined that more stringent small electric motors standards would not be cost effective, and, thus, is not proposing to amend its energy conservation standards for this equipment. DOE requests comment on this proposed determination and associated analyses and results.

DATES: DOE will accept comments, data, and information regarding this notification of proposed determination before, but no later than June 29, 2020. See section VII, ''Public Participation,'' for details.

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–2019–BT–STD–0008, by any of the following methods:

(1) *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments.

(2) *Email: SmallElecMotors2019STD0008@ee.doe.gov.* Include the docket number EERE–2019–BT–STD–0008 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) 586–6636. 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 the rulemaking process, see section VII 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, not all documents listed in the index may be publicly available, such as information that is exempt from public disclosure.

The docket web page can be found at: *https://www.regulations.gov/docket?D=EERE-2019-BT-STD-0008.* The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section VII for information on how to submit comments through *http://www.regulations.gov.*

FOR FURTHER INFORMATION CONTACT: Mr. 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. Email: *ApplianceStandardsQuestions@ee.doe.gov.*

Mr. 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. Email: *Michael.Kido@hq.doe.gov.*

For further information on how to review the docket, contact the Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *ApplianceStandardsQuestions@ee.doe.gov.*

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Synopsis of the Proposed Determination

Title III, Part C [1] of the Energy Policy and Conservation Act, as amended (''EPCA''),[2] established the Energy Conservation Program for Certain Industrial Equipment, (42 U.S.C. 6311–6317), which includes small electric motors, the subject of this notification of proposed determination (''NOPD'').

DOE is issuing this NOPD pursuant to EPCA's requirement that not later than 6 years after issuance of any final rule establishing or amending a standard, DOE must publish either a notification of determination that standards for the product do not need to be amended, or a notice of proposed rulemaking (''NOPR'') including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m))

For this proposed determination, DOE analyzed the small electric motors currently subject to the standards found at title 10 of the Code of Federal Regulations (''CFR'') part 431. See 10 CFR 431.446. Of these motors, DOE first analyzed the technological feasibility of more efficient small electric motors. For currently available small electric motors with efficiencies exceeding the levels of the current energy conservation standards, DOE preliminarily determined that more stringent standards would be technologically feasible. For these small electric motors, DOE evaluated whether more stringent standards would also be cost effective by conducting preliminary life-cycle cost (''LCC'') and payback period (''PBP'') analyses.

Based on these analyses, as summarized in section V of this document, DOE has preliminarily determined that more stringent energy conservation standards would not be cost effective. Therefore, DOE has tentatively determined that the current standards for small electric motors do not need to be amended.

II. Introduction

The following section briefly discusses the statutory authority underlying this proposed determination, as well as some of the relevant historical background related to the establishment of standards for small electric motors.

A. Authority and Background

EPCA authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part C of EPCA includes the small electric motors that are the subject of this proposed determination. (42 U.S.C. 6311(13)(G)) As discussed in the following paragraphs, EPCA directed DOE to establish test procedures and prescribe energy conservation standards for small electric motors. (42 U.S.C. 6317(b))

The energy conservation program under EPCA consists essentially of four parts: (1) Testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of the Act specifically 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).

EPCA directed DOE to establish a test procedure for those small electric motors for which DOE determined that energy conservation standards would (1) be technologically feasible and economically justified and (2) result in significant energy savings. (42 U.S.C. 6317(b)(1)) Manufacturers of covered equipment must use the Federal test procedures as the basis for: (1) Certifying to DOE that their equipment complies with the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6316(a); 42 U.S.C. 6295(s)), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). The DOE test procedures for small electric motors appear at 10 CFR part 431, subpart X.

EPCA further directed DOE to prescribe energy conservation standards for those small electric motors for which test procedures were established. (42 U.S.C. 6317(b)(2)) Additionally, EPCA prescribed that any such standards shall not apply to any small electric motor which is a component of a covered product under 42 U.S.C. 6292(a) or covered equipment under 42 U.S.C. 6311 of EPCA. (42 U.S.C. 6317(b)(3)) Federal energy efficiency requirements for covered equipment established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (See 42 U.S.C. 6316(a) and (b); 42 U.S.C. 6297(a)–(c)).

EPCA requires that, not later than 6 years after the issuance of any final rule establishing or amending a standard, DOE evaluate the energy conservation standards for each type of covered equipment, including those at issue here, and publish either a notification of determination that the standards do not need to be amended, or a NOPR 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)). EPCA further provides that, not later than 3 years after the issuance of a final determination not to amend standards, DOE must make a new determination not to amend the standards or issue a NOPR including new proposed energy conservation standards. (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 making a determination that the standards do not need to be amended, DOE must evaluate under the criteria of 42 U.S.C. 6295(n)(2) 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) and 42 U.S.C. 6295 (n)(2)) Under 42 U.S.C. 6295(o)(2)(B)(i)(II), an evaluation of cost effectiveness requires DOE to consider 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.

DOE is publishing this document in accordance with its authority under EPCA, and in satisfaction of its statutory requirement under EPCA.

1. Current Standards

The current energy conservation standards for small electric motors are located in title 10 CFR 431.446, and are presented in Table II–1 and Table II–2.

[1] For editorial reasons, upon codification in the U.S. Code, Part C was re-designated Part A–1.

[2] 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).

TABLE II–1—FEDERAL ENERGY CONSERVATION STANDARDS FOR POLYPHASE SMALL ELECTRIC MOTORS

Motor horsepower/standard kilowatt equivalent	Average full load efficiency		
	Open motors (number of poles)		
	6	4	2
0.25/0.18	67.5	69.5	65.6
0.33/0.25	71.4	73.4	69.5
0.5/0.37	75.3	78.2	73.4
0.75/0.55	81.7	81.1	76.8
1/0.75	82.5	83.5	77.0
1.5/1.1	83.8	86.5	84.0
2/1.5	N/A	86.5	85.5
3/2.2	N/A	86.9	85.5

TABLE II–2—FEDERAL ENERGY CONSERVATION STANDARDS FOR CAPACITOR-START INDUCTION-RUN AND CAPACITOR-START CAPACITOR-RUN SMALL ELECTRIC MOTORS

Motor horsepower/standard kilowatt equivalent	Average full load efficiency		
	Open motors (number of poles)		
	6	4	2
0.25/0.18	62.2	68.5	66.6
0.33/0.25	66.6	72.4	70.5
0.5/0.37	76.2	76.2	72.4
0.75/0.55	80.2	81.8	76.2
1/0.75	81.1	82.6	80.4
1.5/1.1	N/A	83.8	81.5
2/1.5	N/A	84.5	82.9
3/2.2	N/A	N/A	84.1

2. History of Standards Rulemakings for Small Electric Motors

In 2006, DOE determined that energy conservation standards for certain single-phase, capacitor-start, induction-run, small electric motors are technologically feasible and economically justified, and would result in significant energy savings. 71 FR 38799 (July 10, 2006). Later, in 2010, DOE issued a final rule (the ''March 2010 Final Rule'') establishing energy conservation standards for small electric motors manufactured starting on March 9, 2015.[3] 75 FR 10874 (March 9, 2010).

In April 2019, DOE published a request for information (''April 2019 ECS RFI'') to solicit input and data from interested parties to aid in the development of the technical analyses for the determination of whether new and/or amended standards for small electric motors are warranted. 84 FR 14027 (April 9, 2019). The comment period was re-opened in response to a request from an interested party, see NEMA, No. 4 at p. 1, until June 7, 2019. See 84 FR 25203 (May 31, 2019).

DOE received a number of comments from interested parties in response to the April 2019 ECS RFI.[4] The commenters that provided relevant comments are listed in Table II–3.[5]

TABLE II–3—APRIL 2019 ECS RFI WRITTEN COMMENTS

Commenter/organization(s)	Reference in this NOPD	Organization type
ABB Motors and Mechanical Inc	ABB	Manufacturer.
Air-Conditioning, Heating, and Refrigeration Institute (''AHRI'') and Association of Home Appliance Manufacturers (''AHAM'').	AHRI and AHAM	Trade Associations.
Appliance Standards Awareness Project (''ASAP''), Alliance to Save Energy, American Council for an Energy-Efficient Economy, the California Energy Commission, the Natural Resources Defense Council, and Northwest Energy Efficiency Alliance.	ASAP, et al.	Advocacy Groups and State Governmental Agency.
Belanger, Zach	Belanger	Individual.
California Investor-Owned Utilities (''CA IOUs'')—Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison.	CA IOUs	Utilities.
Kasimos, Anastasia	Kasimos	Individual.
Lennox International Inc	Lennox	Manufacturer.
Lenze Americas	Lenze Americas	Manufacturer.

[3] In a technical correction, DOE revised the compliance date for energy conservation standards to March 9, 2015, for each small electric motor manufactured (alone or as a component of another piece of non-covered equipment), or March 9, 2017, in the case of a small electric motor which requires listing or certification by a nationally recognized safety testing laboratory. 75 FR 17036 (April 5, 2010).

[4] The comments received in response to the April 2019 ECS RFI are included in the docket for this action and can be found at *https://www.regulations.gov/docket?D=EERE-2019-BT-STD-0008*.

[5] DOE received a comment unrelated to small electric motors (*i.e.,* Sims, No. 2), which was not addressed.

TABLE II–3—APRIL 2019 ECS RFI WRITTEN COMMENTS—Continued

Commenter/organization(s)	Reference in this NOPD	Organization type
National Electrical Manufacturers Association ("NEMA")	NEMA	Trade Association.
The Institute for Policy Integrity at New York University ("NYU") School of Law.	NYU	Non-Governmental Organization.
Palubin, Erin	Palubin	Individual.
Sierra Club & Earthjustice	Sierra Club & Earthjustice	Advocacy Groups.

DOE also received a number of comments related to certification, compliance and enforcement issues, but these comments fell outside the scope of this rulemaking and are not addressed in this document. The remaining relevant comments and DOE's responses are provided in the appropriate sections of this document.

III. General Discussion

A. Scope of Coverage and Equipment Classes

This document covers equipment meeting the definition of ''small electric motor,'' as codified in 10 CFR 431.442. ''Small electric motor'' means 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.[6] The scope of coverage for these motors is discussed in further detail in section IV.A.1.

When evaluating and establishing energy conservation standards, DOE divides 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.*) The equipment classes for this proposed determination are discussed further in section IV.A.2.

B. Test Procedure

As noted, EPCA directed DOE to establish a test procedure for those small electric motors for which DOE determined that energy conservation standards would (1) be technologically feasible and economically justified and (2) result in significant energy savings. (42 U.S.C. 6317(b)(1)) In a final rule published on July 7, 2009, DOE adopted test procedures for small electric motors. 74 FR 32059.

Subsequently, DOE updated the test procedures for small electric motors on May 4, 2012 (the ''May 2012 test procedure final rule''). 77 FR 26608. The existing test procedures for small electric motors incorporate certain industry standards from the Institute of Electrical and Electronics Engineers (''IEEE'') and Canadian Standards Association (''CSA''), as listed in Table III–1.

TABLE III–1—INDUSTRY STANDARDS CURRENTLY INCORPORATED BY REFERENCE FOR SMALL ELECTRIC MOTORS

Equipment description	Industry test procedure
Single-phase small electric motors	IEEE 114–2010. CSA C747–09.
Polyphase small electric motors less than or equal to 1 horsepower	IEEE 112–2004 Test Method A. CSA C747–09.
Polyphase small electric motors greater than 1 horsepower	IEEE 112–2004 Test Method B. CSA C390–10.

In 2017, DOE solicited the public for information pertaining to the test procedures for small electric motors and electric motors. 82 FR 35468 (July 31, 2017) (the ''July 2017 test procedure RFI''). In the July 2017 test procedure RFI, DOE sought public comments, data, and information on all aspects of, and any issues or problems with, the existing DOE test procedure for small electric motors, including on any needed updates or revisions. DOE also discussed electric motor categories (as defined at 10 CFR 431.12) that may be considered in a future DOE test procedure. 82 FR 35470–35474.

In April 2019, DOE proposed amending its test procedure for small electric motors. 84 FR 17004 (April 23, 2019). In that NOPR, DOE proposed harmonizing its procedure with industry practice by incorporating a new industry standard that manufacturers would be permitted to use in addition to the three industry standards currently incorporated by reference as options for use when testing small electric motor efficiency. 84 FR 17013–17014. In addition, DOE proposed to adopt industry provisions related to the test conditions to ensure the comparability of test results for small electric motors. 84 FR 17014–17018. DOE is currently evaluating the comments received on these proposals.

C. Technological Feasibility

1. General

In evaluating potential amendments to energy conservation standards, DOE conducts a screening analysis based on information gathered on all current technology options and prototype designs that could improve the efficiency of the product or equipment at issue. As the first step in such an analysis, DOE develops a list of technology options for consideration in consultation with manufacturers, design engineers, and other interested parties. DOE then determines which of those means for improving efficiency are technologically feasible. DOE considers technologies incorporated in

[6] The term ''IEC'' refers to the International Electrotechnical Commission.

commercially available equipment or in working prototypes to be technologically feasible. See 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(i).

After DOE has determined that particular options are technologically feasible, it further evaluates each technology option in light of the following additional screening criteria: (1) Practicability to manufacture, install, and service; (2) adverse impacts on equipment utility or availability; and (3) adverse impacts on health or safety. See 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(ii)–(iv).

Additionally, it is DOE policy not to include in its analysis any proprietary technology that is a unique pathway to achieving a certain efficiency level. Section IV.B of this proposed determination discusses the results of the screening analysis for small electric motors, particularly the designs DOE considered, those it screened out, and those that are the basis for the proposed determination. In this NOPD, based on its review of the market and comments received in response to the April 2019 ECS RFI, DOE has tentatively determined that no significant technical advancements in induction motor technology have been made since publication of the March 2010 Final Rule.

2. Maximum Technologically Feasible Levels

When DOE evaluates the potential for new or amended standards, DOE must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for such equipment. Accordingly, in the engineering analysis, DOE determined the maximum technologically feasible (''max tech'') improvements in energy efficiency for small electric motors. 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 options, DOE would only include those that are compatible with each other such that when combined, they 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. The max-tech levels that DOE has determined are described in section IV.C of this proposed determination.

D. Energy Savings

In determining whether to amend the current energy conservation standards for small electric motors, DOE must assess whether amended standards will result in significant conservation of energy. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)(A). See also 42 U.S.C. 6295(n)(2).) For each considered efficiency level, DOE estimated the lifetime energy savings for small electric motors purchased in the expected compliance year for potential standards. See section IV.E for more details for the energy use analysis.

The term ''significant'' is not defined in EPCA. DOE notes that the meaning of this term is currently under consideration. See 84 FR 3910, 3922 (Feb. 13, 2019). DOE is also considering whether to apply a two-pronged threshold approach for determining whether significant energy savings is present in a given standards rulemaking scenario. See id. at 84 FR 3921–3925. In the present case, when applying the criteria of 42 U.S.C. 6295(n)(2) to determine whether to amend the current standards, DOE analyzed the available data and has tentatively determined that amended standards would not be cost-effective as required under EPCA. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. (n)(2)(C)) See also sections IV.F and V.B (discussing in greater detail DOE's analysis of the available data in reaching this tentative determination). Based on available data, DOE's analysis indicates that the LCC of a small electric motor would increase with more stringent standards and the payback period to recoup the relevant costs from investing in more stringent standards would, in most cases, likely exceed the expected lifetimes of the different classes of small electric motors DOE examined in its analysis—pointing to the inability of potential standards to satisfy the cost-effectiveness requirement under EPCA. Consequently, because DOE's analysis indicates that the three mandatory prerequisites that need to be satisfied to permit DOE to move forward with a determination to amend its current standards cannot be met, DOE did not separately determine whether the potential energy savings would be significant for purposes of the statutory test that applies. See 42 U.S.C. 6295(n)(2) (requiring that amended standards must result in significant conservation energy, be technologically feasible, and be cost-effective as provided in 42 U.S.C. 6295(o)(2)(B)(i)(II)).[7]

[7] Under 42 U.S.C. 6295(o)(2)(B)(i)(II), DOE must consider whether ''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.''

E. Cost Effectiveness

EPCA requires DOE to consider the cost effectiveness of amended standards in the context of the savings in operating costs throughout the estimated average life of the covered equipment class compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered equipment that are likely to result from a standard. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)(A))

In considering cost effectiveness, DOE conducted LCC and PBP analyses. The LCC is the sum of the initial price of equipment (including its installation) and the operating expense (including energy, maintenance, and repair expenditures) discounted over the lifetime of the equipment. The LCC analysis requires a variety of inputs, such as equipment prices, equipment energy consumption, energy prices, maintenance and repair costs, equipment lifetime, and discount rates appropriate for consumers. To account for uncertainty and variability in specific inputs, such as equipment lifetime and discount rate, DOE uses a distribution of values, with probabilities attached to each value.

The PBP is the estimated amount of time (in years) it takes consumers to recover the increased purchase cost (including installation) of more-efficient equipment through lower operating costs. DOE calculates the PBP by dividing the change in purchase cost due to a more-stringent standard by the change in annual operating cost for the year that standards are assumed to take effect.

For its LCC and PBP analyses, DOE assumes that consumers would purchase the covered equipment in the first year of compliance with any amended standards. The LCC savings for the considered efficiency levels are calculated relative to the case that reflects projected market trends in the absence of amended standards. DOE's LCC and PBP analysis is discussed in further detail in section IV.F of this proposed determination.

DOE's LCC and PBP analyses indicate that the LCC would increase with more stringent standards and that the payback period to recoup the relevant costs from investing in more stringent standards would, in most cases, likely exceed the expected lifetimes of the different classes of small electric motors DOE examined in its analysis.[8] Therefore,

[8] For polyphase small electric motors, the PBP exceeded the lifetime of the unit at all ELs considered. For CSCR small electric motors, the PBP at EL 1 and EL 2 was comparable to and/or lower than the lifetime of the unit (PBP of 6.7; 7.0;

DOE has tentatively determined that amended standards would not be cost-effective as required under EPCA. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295(n)(2)(C)) See also sections IV.F and V.B (discussing in greater detail DOE's analysis of the available data in reaching this tentative determination).

IV. Methodology and Discussion of Related Comments

This section addresses the analyses DOE performed for this proposed determination regarding small electric motors. Separate subsections address each component of DOE's analyses and responses to related comments.

Lennox commented that DOE should carefully consider and exercise caution to ensure that more stringent standards for small electric motors provide significant energy savings and are economically justified. (Lennox, No. 14 at p. 2) An individual commenter stated that small electric motors energy conservation standards should be considered a priority. (Kasimos, No. 9 at p. 1)

As discussed previously, EPCA requires that, not later than 6 years after the issuance of any final rule establishing or amending a standard, DOE evaluate the energy conservation standards for each type of covered equipment, including those at issue here, and publish either a notification of determination that the standards do not need to be amended, or a NOPR 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)) The following discussion presents DOE's evaluation and tentative determination as required under EPCA.

A. Market and Technology Assessment

DOE has conducted a preliminary market and technology assessment in support of a proposed determination for small electric motors. The goal of the market assessment is to develop a qualitative and quantitative characterization of the small electric motors industry. This assessment characterizes the market structure based on publicly available information as well as data supplied by manufacturers and other interested parties. The goal of the technology assessment is to develop a list of technology options that manufacturers can use to improve the efficiency of small electric motors.

For this proposed determination, DOE evaluated the small electric motors currently subject to standards at 10 CFR 431.446. The following section reviews the scope of coverage and the equipment classes used in the development of the current energy conservation standards for small electric motors and this proposed determination.

1. Scope of Coverage

By statute, 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 MG 1–1987.'' (42 U.S.C. 6311(13)(G)) DOE later clarified by regulation that this definition also includes IEC metric equivalent motors.'' See 10 CFR 431.442. Equipment meeting this definition are within DOE's scope of coverage but not all may be subject to DOE's current standards.

DOE's standards regulate the energy efficiency of those small electric motors that fall within three topologies (*i.e.,* arrangements of component parts): Capacitor-start induction-run (''CSIR''), capacitor-start capacitor-run (''CSCR''), and polyphase motors. See 10 CFR 431.446. EPCA prescribes that standards for small electric motors do not apply to any small electric motor which is a component of a covered product or covered equipment under EPCA. (42 U.S.C. 6317(b)(3)) DOE's current energy conservation standards only apply to small electric motors manufactured alone or as a component of another piece of non-covered equipment. 10 CFR 431.446(a).

Subpart X of 10 CFR part 431 includes energy conservation standards and test procedures for the small electric motors listed in Table IV–1. DOE is not proposing any changes to the scope of small electric motors subject to energy conservation standards (*i.e.,* ''scope of applicability'').

TABLE IV–1—SMALL ELECTRIC MOTORS CURRENTLY SUBJECT TO ENERGY CONSERVATION STANDARDS

[Manufactured alone or as a component of another piece of non-covered equipment]

Motor topology	Pole configuration	Motor output power
Single-phase		
CSIR	2,4,6	0.25–3 hp (0.18–2.2 kW) *
CSCR	2,4,6	0.25–3 hp (0.18–2.2 kW)
Polyphase	2,4,6	0.25–3 hp (0.18–2.2 kW)

Certain motor categories are not currently subject to standards. These include:

- Polyphase, 6-pole, 2 and 3 hp motors;
- CSCR and CSIR, 6-pole, 1.5, 2, and 3 hp motors;
- CSCR and CSIR, 4-pole, 3 hp motors.

* The values in parentheses are the equivalent metric ratings.

In response to the April 2019 ECS RFI, DOE received a number of comments relevant to the scope of applicability of energy conservation standards for small electric motors. Lennox, AHRI and AHAM supported maintaining the existing standards scope for small electric motors. (Lennox, No. 14 at p. 1; AHRI and AHAM, No. 12 at p. 2) AHRI and AHAM also specifically opposed testing and regulating special and definite purpose motors. They argued that regulating special and definite purpose motors could: (1) Increase the cost of the motor

5.9; and 6.4 years compared to an average lifetime of 6.6 years). For all equipment classes and at all ELs considered, the LCC increased with more stringent standards. (See results in section V.B and chapter 8 of the NOPD TSD for more details) and of the finished product without necessarily improving its performance and (2) significantly increase burden on original equipment manufacturers (''OEMs'') if all manufacturers of products using special and definite purpose motors were required to certify compliance with standards for component parts. (AHRI and AHAM, No. 12 at p. 2–3) Lenze Americas added that the scope of applicability for small electric motor standards should not include non-continuous duty motors and motors that are combined with high-efficiency gears. (Lenze Americas, No. 4 at p. 1)

As previously stated in section III.A, this document pertains only to equipment meeting the definition of small electric motor, as codified in 10 CFR 431.442, which includes general purpose motors, but does not include special purpose and definite purpose motors because they do not meet the definition of general purpose motors.[9] In addition, DOE notes that motors with non-continuous duty rating and integral gears are not included in the category of NEMA general purpose single-speed induction motor [10] and are therefore not subject to the energy conservation standards prescribed at 10 CFR 431.446.

Sierra Club & Earthjustice commented that DOE did not explain why it is not considering standards for motors other than currently regulated small electric motors, despite considering test procedures for motors that the market considers ''small'' in the July 2017 test procedure RFI. (Sierra Club & Earthjustice, No. 13 at p. 1) In addition, ASAP, et al. suggested that DOE carefully consider broadening the scope to address a wide range of motors that the market considers ''small''. (ASAP, et al., No. 16 at p. 2) In its filing, the CA IOUs argued that DOE should consider establishing standards for additional categories of motors considered small by customers and the industry, including special- and definite-purpose motors, permanent split capacitor motors, and split phase induction motors. (CA IOUs, No. 10 at pp. 2–3)

In the July 2017 test procedure RFI, DOE indicated that it may consider setting test procedures for electric motors that are considered ''small'' by customers and the electric motors industry, but that are not currently subject to the small electric motor test procedure. 82 FR 35470. DOE specified that the motors under consideration in that test procedure RFI may have similarities to motors that are currently regulated as small electric motors (such as horsepower) and may be used in similar applications, but that despite these similarities, DOE is still determining whether these motors would be regulated as small electric motor or as electric motors under DOE regulations. *Id.* As such, this proposed determination is based on the current scope of the small electric motor definition and not on any hypothetical expanded scope that DOE may consider in the future.

As previously noted, the term ''small electric motor'' has a specific meaning under EPCA. *See* 42 U.S.C. 6311(13)(G) and 10 CFR 431.442. Special purpose and definite purpose motors are not general purpose motors and therefore are not covered under the statutory or regulatory definition of ''small electric motor'' and are not ''small electric motors'' under DOE's statutory or regulatory framework.

Further, single-speed induction motors, as delineated and described in MG1–1987, fall into five categories: Split-phase, shaded-pole, capacitor-start (both CSIR and CSCR), permanent-split capacitor (''PSC''), and polyphase. Of these five motor categories, DOE determined in the March 2010 Final Rule that only CSIR, CSCR, and polyphase motors were able to meet the relevant performance requirements in NEMA MG1 and fell within the general purpose alternating current motor category, as shown by the listings found in manufacturers' catalogs. 75 FR 10882. As stated previously, DOE is not proposing any changes to the scope of small electric motors subject to energy conservation standards. Therefore, for this determination, DOE only considered the currently regulated small electric motors subject to energy conservation standards.[11]

NEMA, AHRI and AHAM, and Lennox commented that DOE should apply a finished-product or system level approach to energy efficiency regulations. (NEMA, No. 11 at p. 18; AHRI and AHAM, No. 12 at pp. 2–3; Lennox, No. 14 at p. 2). NEMA, AHRI, and AHAM commented that there are greater energy savings opportunities when regulating at the finished-product level compared to component level efficiency improvements of small electric motors. (NEMA, No. 11 at p. 3; AHRI and AHAM, No. 12 at p. 3) While acknowledging that such considerations are outside the scope of a small electric motors rulemaking, NEMA commented that DOE should focus on system level efficiency for equipment where advanced technology motors can be applied. (NEMA, No. 11 at p. 18) ABB suggested that regulating systems such as power pumps, compressors, and conveyors would provide greater energy savings than requiring incremental increases in small electric motor efficiency. (ABB, No. 15 at p. 1) Lennox stated that regulating components in covered products and covered equipment undermines innovation in developing more efficient finished-product systems, inhibits OEM flexibility to design better products at lower prices, and adds significant burden. (Lennox, No. 15 at p. 2)

EPCA prescribes that energy conservation standards for small electric motors do not apply to any small electric motor that is a component of a covered product or covered equipment under EPCA. (42 U.S.C. 6317(b)(3)) Small electric motors can also be incorporated in non-covered products and equipment, and in these scenarios, DOE would be unable to regulate—without first satisfying the statutory requirements for setting regulatory coverage over these non-covered products and equipment—the final product/equipment into which these motors would fit.

The CA IOUs commented that DOE should consider motors with integrated controls to capture energy savings from part-load operation. They noted that the IEC 61800–9 Power Driven Systems Standard describes how to classify and test motors with controls and motors that are considered variable-speed systems. (CA IOUs, No. 10 at p. 4) DOE

[9] *See* 42 U.S.C. 6311(13)(C) (defining a definite purpose motor as a motor ''designed in standard ratings with standard operating characteristics or standard mechanical construction for use under service conditions other than usual or for use on a particular type of application and which cannot be used in most general purpose application'') *and* 42 U.S.C. 6311(13)(D) (defining a special purpose motor as ''a 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'').

[10] In response to questions from NEMA and various motor manufacturers, DOE issued a guidance document that identifies some key design elements that manufacturers should consider when determining whether a given individual motor meets the small electric motor definition and is subject to the energy conservation standards promulgated for small electric motors. See *https://www.regulations.gov/document?D=EERE–2017-BT-TP-0047-0082.*

[11] Moreover, even if the facts supported the expansion of the current scope for small electric motors, DOE notes that it would first need to consider the potential test methods to apply when measuring the efficiency of a motor that is not in the scope of the current DOE test procedure. Nothing DOE has reviewed—or that commenters have submitted—have suggested that compatibility exists between motors that fall outside of the already prescribed small electric motor scope set by Congress and the definition of small electric motor. Comments related to the scope of applicability of the DOE test procedure for small electric motors were discussed as part of DOE's test procedure NOPR. 84 FR 17004, 17009 (April 23, 2019).

notes that the statutory definition of small electric motors (42 U.S.C. 6311(13)(G)), which is reflected in the regulatory definition at 10 CFR 431.442, is limited to motors that are single-speed. Consequently, motors with integrated controls or variable-speed configurations are beyond the statutory (and regulatory) definition of small electric motors.

2. Equipment Classes

When evaluating and establishing energy conservation standards, DOE divides 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 the analysis in this proposed determination, DOE considered the 62 equipment classes that it already regulates based on motor category, horsepower rating, and number of poles. This section reviews the motor characteristics used to delineate equipment classes for small electric motors under the current energy conservation standards and this proposed determination.

The first characteristic used to establish equipment classes is phase count. Polyphase and single-phase equipment classes are used to differentiate motors based on the fundamental differences in how the two types of motors operate. 10 CFR 431.446(a). For a rotor to move, the stator (*i.e.,* the stationary part of the motor) must produce a rotating magnetic field. To operate on single-phase alternating current (''AC'') power, the single-phase motor uses an auxiliary winding (or start winding) with current and voltage out of phase with the original (main) winding to produce a net rotating magnetic field. To operate on three-phase power, the polyphase motor uses windings arranged such that when supplied by three-phase alternating current, a rotating magnetic field is produced. In short, three-phase power in a polyphase motor naturally produces rotation, whereas a single-phase motor requires the auxiliary winding to ''engineer'' the conditions for rotation. Due to these differences, polyphase motors are inherently more efficient but require use of a three-phase power source. Based on the differences in efficiency and consumer utility, DOE separated equipment classes based on phase count in the March 2010 Final Rule. 75 FR 10886. This proposed determination maintains this approach.

In addition to differentiating equipment classes by phase count, equipment classes are differentiated by the topology of single-phase motors. 10 CFR 431.446(a). DOE identified two topologies of single-phase motors meeting the statutory definition of small electric motors: CSIR and CSCR. CSIR and CSCR motors both utilize a capacitor (''start-capacitor'') and two windings (''start-winding'' and ''run-winding''). The difference between the two motors occurs when reaching operating speed; while CSIR motors run on the run-winding alone with no capacitor, CSCR motors run using an additional ''run-capacitor'' and both windings. While this additional capacitor can boost CSCR motor efficiency to levels higher than those exhibited by CSIR motor designs, it usually constitutes dimensional changes due to the need to mount the run-capacitor externally on the motor housing. This additional spatial requirement could potentially limit the use of CSCR motors in space-constrained applications, and would cause motor topology to directly impact consumer utility. Given that motor topology can affect motor performance and consumer utility, DOE differentiated single-phase equipment classes by topology in the March 2010 Final Rule. 75 FR 10886. DOE maintains this approach in this proposed determination.

The current energy conservation standards also differentiate classes based on the number of poles in a motor. 10 CFR 431.446(a). The number of poles in an induction motor determines the synchronous speed (*i.e.,* revolutions per minute). There is an inverse relationship between the number of poles and speed: As a motor design increases from two to eight poles, the synchronous speed drops from 3,600 to 900 revolutions per minute. The desired synchronous speed varies by end use application, making the number of poles in a motor a factor directly impacting consumer utility. By examining the efficiency ratings for 1–200 horsepower polyphase electric motors (10 CFR 431.25),[12] motors meeting the NEMA Premium Motor standard, and manufacturer catalogs, DOE observed that full-load efficiency percentages tend to decrease with the number of poles. Therefore, DOE determined that the number of poles has a direct impact on the motor's performance and consumer utility, and consequently, the number of poles is a further means of differentiating among equipment classes. 75 FR 10886. DOE maintains this approach in this proposed determination.

Finally, DOE employs motor horsepower as an equipment class setting factor under the current energy conservation standards. 10 CFR 431.446(a). Average full load efficiency generally correlates with motor horsepower (*e.g.,* a 3-horsepower motor is usually more efficient than a ¼-horsepower motor). DOE found that motor efficiency varies with motor horsepower by evaluating manufacturers' catalog data, the efficiency ratings of the established small electric motor energy conservation standards (10 CFR 431.446), and the efficiency requirements of the NEMA Premium Motor program. Additionally, motor horsepower dictates the maximum load that a motor can drive, which means that a motor's rated horsepower can influence and limit the end use applications where that motor can be used. Horsepower is a critical performance attribute of a small electric motor, and since horsepower has a direct relationship with average full load efficiency and consumer utility, DOE used this element as a criterion for distinguishing among equipment classes in the March 2010 Final Rule. 75 FR 10886. DOE maintains this approach in this proposed determination.

DOE did not identify any other performance-related features affecting consumer utility or efficiency applying to the motors falling within the scope of this proposed determination. Table IV–2 summarizes the structure of the equipment classes identified for this proposed determination and as designated by the current standards at 10 CFR 431.446.

[12] While there is no overlap between the scope of applicability for electric motor standards at 10 CFR 431.25 and small electric motors standards at 10 CFR 431.446, the pole-efficiency relationships observed in the electric motor standards from 1 to 3 horsepower can be considered when determining appropriate pole-efficiency relationships for small electric motors in this horsepower range.

TABLE IV–2—SUMMARY OF SMALL ELECTRIC MOTOR EQUIPMENT CLASSES

Motor topology	Pole configuration	Motor output power *hp*
Single-phase		
CSIR	2,4,6	0.25–3
CSCR	2,4,6	0.25–3
Polyphase	2,4,6	0.25–3

DOE received a number of comments on the April 2019 ECS RFI regarding equipment classes. The CA IOUs, Sierra Club & Earthjustice, and ASAP, et al. supported merging the CSIR and CSCR equipment classes and noted that the market share estimates reported in the April 2019 ECS RFI [13] indicated that CSIR motors no longer appear available in the market. (CA IOUs, No. 10 at p. 3; Sierra Club & Earthjustice, No. 13 at p. 1; ASAP, et al., No. 16 at p. 4) The Sierra Club & Earthjustice commented that the market indicates that the initial concern regarding differences in consumer utility for space-constrained applications with respect to CSIR and CSCR small electric motors was not well-founded. (Sierra Club & Earthjustice, No. 13 at p. 1)

NEMA commented that while the CSIR class is no longer a significant equipment class as a result of the March 2010 Final Rule standards, there is no reason to make changes to the CSIR and CSCR equipment classes. NEMA commented that in order for CSIR motors to meet current efficiency standards, significant design changes were made that resulted in an increase in size and a subsequent reduction in utility compared to CSCR motors. (NEMA, No. 11 at p. 4) NEMA stated that the vast majority of CSIR shipments have shifted to CSCR designs or to special and definite purpose motors except for the lowest horsepower ratings. It asserted that sales of small electric motors have decreased as a result of the standards and that it would expect to see a similar impact from amended standards (NEMA, No. 11 at p. 16) NEMA also commented that there are no new design options for small electric motors that would add consumer utility and, consequently, no need to consider any new equipment classes. (NEMA, No. 11 at p. 5)

As discussed previously, DOE has found that single-phase motor topology (CSIR vs. CSCR) can impact motor performance and consumer utility. Currently, DOE does not have conclusive evidence indicating that CSIR small electric motors are no longer available in the market and the statements offered by NEMA suggest the opposite is the case. In the absence of compelling evidence suggesting otherwise, DOE is maintaining both classes because of the differences in utility that these different classes of small electric motors offer—*i.e.* dimensional differences. Accordingly, DOE is not proposing to modify the equipment classes from those that currently apply under 10 CFR 431.446(a). These equipment classes are summarized in Table IV–2.

The CA IOUs commented that the American Standard for Motors and Generators ANSI/NEMA MG1 (''NEMA MG–1'') does not differentiate between CSIR and CSCR motors, as they are considered by the motor industry to be equivalent motor types. The CA IOUs also commented that DOE should consider defining these terms. (CA IOUs, No. 10 at p. 3) ASAP, et al. commented that it would be helpful to provide regulatory definitions for the three topologies covered by the current regulations. (ASAP, et al., No. 16 at p. 4) NEMA commented that the current definitions for the three topologies of small electric motors are sufficient. (NEMA, No. 11 at p. 3) [14]

NEMA MG–1, the industry consensus standard referenced in the statutory and regulatory definition of ''small electric motor,'' differentiates between the CSIR and CSCR motor topologies. Specifically, the definitions listed in section 1.20.3 of NEMA MG–1 2016 identifies CSIR and CSCR as two of the three distinct types of capacitor motors (''capacitor-start, induction-run'' defined in section 1.20.3.3.1 of NEMA MG–1 2016; ''permanent-split'' [15] defined in section 1.20.3.3.2 of NEMA MG–1 2016; and ''capacitor-start, capacitor-run'' defined in section 1.20.3.3.3 of NEMA MG–1 2016). Given the definitions in the industry consensus standard, the terms ''capacitor-start, induction-run,'' ''permanent-split capacitor,'' or ''capacitor-start, capacitor-run'' are well understood and therefore DOE is not proposing to provide explicit definitions of these motor topologies.

3. Technology Options for Efficiency Improvement

The purpose of the technology assessment is to develop a preliminary list of technology options that could improve the efficiency of small electric motors. For the motors covered in this determination, energy efficiency losses are grouped into four main categories: I^2R losses,[16] core losses, friction and windage losses, and stray load losses. The technology options considered in this section are categorized by these four categories of losses.

The small electric motors evaluated in this proposed determination are all AC induction motors. Induction motors have two core components: a stator and a rotor. The components work together to convert electrical energy into rotational mechanical energy. This is done by creating a rotating magnetic field in the stator, which induces a current flow in the rotor. This current flow creates an opposing magnetic field in the rotor, which creates rotational forces. Because of the orientation of these fields, the rotor field follows the stator field. The rotor is connected to a shaft that also rotates and provides the mechanical energy output.

Table IV–3 summarizes the technology options discussed in this document. Details of each technology option can be found in chapter 3 of the technical support document (''TSD'') prepared as part of DOE's evaluation, which is available in the docket at *https://www.regulations.gov/docket?D=EERE-2019-BT-STD-0008.*

[13] Note: The CA IOU comments referenced the ''2017 RFI'' but points to tables and discussion that are in the 2019 SEM ECS RFI. DOE is assuming that the intent was to refer to the April 2019 ECS RFI.

[14] While NEMA did not specify to which definitions it was referring, DOE understands NEMA's comment to be referring to the definitions in industry standards.

[15] Permanent-split capacitor motors do not meet the performance requirements for general purpose motors in NEMA MG 1 and fall outside the scope of the current standards and test procedures for small electric motors.

[16] I^2R losses refer to conductor losses. In AC circuits, these losses are computed as the square of the current (''I'') multiplied by the conductor resistance (''R'').

TABLE IV–3—SUMMARY OF TECHNOLOGY OPTIONS FOR IMPROVING EFFICIENCY

Type of loss to reduce	Technology option applied
I^2R Losses	Use a copper die-cast rotor cage.
	Reduce skew on conductor cage.
	Increase cross-sectional area of rotor conductor bars.
	Increase end ring size.
	Changing gauges of copper wire in stator.
	Manipulate stator slot size.
	Decrease radial air gap.
	Change run-capacitor rating.
Core Losses	Improve grades of electrical steel.
	Use thinner steel laminations.
	Anneal steel laminations.
	Add stack height (*i.e.,* add electrical steel laminations).
	Use high-efficiency lamination materials.
	Use plastic bonded iron powder.
Friction and Windage Losses	Use better bearings and lubricant.
	Install a more efficient cooling system.

The CA IOUs asserted (without providing any supporting data or information) that DOE should consider the efficiency gains from enhanced motor technologies considered in the March 2010 Final Rule because the availability and affordability of these technologies has increased since publication of the that final rule. (CA IOUs, No. 10 at p. 3) In addition, ASAP, et al. commented that DOE should evaluate and consider all of the technology options that DOE previously analyzed. (ASAP, et al., No. 16 at p. 3) NEMA commented that no technical advancements have been made in small electric motor technology since the last rulemaking. (NEMA, No. 11 at p. 3)

For this evaluation, DOE considered each of the technology options analyzed in the previous rulemaking and examined any changes to the cost or availability of these design options since the publication of the March 2010 Final Rule. In addition, DOE also researched whether there were any new technologies that could improve the efficiency of small electric motors. DOE tentatively determined that no significant technical advancements in induction motor technology have been made since publication of the March 2010 Final Rule. Details of the technology options DOE considered for this evaluation can be found in Chapter 3 of the NOPD TSD.

NEMA commented that many of the motor design options that DOE listed in Table II–5 of the April 2019 ECS RFI are interdependent with one or more design options. In other words, the deployment of one design option sometimes favors the co-dependent application of another design option, but there are cases where deploying certain combinations of design options can negatively impact energy consumption. (NEMA, No. 11 at p. 5) NEMA also commented that many of the design options listed are already optimized in practice, and there may not be further room to pursue efficiency gains with these design options. *Id.* at 6. NEMA asserted that some of the design options listed could negatively impact utility (*e.g.,* through loss of starting torque, increased risk of motor failure, increase in motor size, etc.) or add to manufacturer production costs. (NEMA, No. 11 at pp. 11–12) ABB commented that substituting a copper rotor in a motor may require a complete redesign, and could also require significant investment for development, tooling, and manufacturing. (ABB, No. 15 at pp. 1–2) In addition, ABB commented that components in motors cannot be arbitrarily substituted without consequences to the performance and life of motors. *Id.* at 2.

DOE acknowledges that the technology options listed in Table II–5 cannot be considered individually as they are frequently interdependent (*i.e.,* methods of reducing electrical losses in motors are not completely independent of one another). This means that some technology options that decrease one type of loss may cause an increase in a different type of loss in the motor. Thus, maximizing the efficiency gains in a motor design overall requires balancing out the loss mechanisms. In this evaluation, as in the previous rulemaking, DOE has considered the interactive effects, practical limitations, and costs of applying each technology option before making a determination whether to screen-in the technology options as design options for the engineering analysis. Details of the screened-in design options considered for each motor design can be found in Chapter 4 and 5 of the NOPD TSD.

B. Screening Analysis

DOE uses the following four screening criteria to determine which technology options are suitable[17] for further consideration of new or amended energy conservation standards:

(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 and reliable installation and servicing of a technology in commercial products could not be achieved on the scale necessary to serve the relevant market at the time of the projected compliance date of the standard, then that technology will not be considered further.

(3) *Impacts on product utility or product availability.* If it is determined that a technology would have a significant adverse impact on the utility of the product to significant subgroups of consumers or would result in the unavailability of any covered product type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as products 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 would have significant adverse impacts on health or safety, it will not be considered further.

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

In sum, if DOE determines that a technology, or a combination of

[17] DOE refers to the technology options that pass the screening criteria as ''design options.''

technologies, fails to meet one or more of the above four criteria, it will be excluded from further consideration in the engineering analysis. Additionally, DOE notes that the four screening criteria do not directly address the propriety 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). The reasons for eliminating any technology are discussed below.

Table IV–3 provides a summary of all the technology options DOE considered for improving small electric motor efficiency. For a description of how each of these technology options improves small electric motor efficiency, see NOPD TSD chapter 3. For the proposed determination, DOE screened out three of these technology options: Reducing the air gap below .0125 inches, amorphous metal laminations, and plastic bonded iron powder (''PBIP'').

Reducing the air gap between the rotor and stator can improve motor efficiency. For small electric motors, the air gap is commonly set at 15 thousandths of an inch. Although reducing this air gap can improve efficiency, there is some point at which the air gap is too tight and becomes impracticable to manufacture. In the March 2010 Final Rule DOE screened out air gaps below 12.5 thousandths of an inch because it would exceed the threshold for practicability to manufacture. 75 FR 10887. In response to the April 2019 ECS RFI, NEMA commented that DOE should continue to screen out decreasing the radial air gap below 12.5 thousandths of an inch. (NEMA, No. 11 at p. 7)

A reduction in air gaps is technologically feasible and DOE is unaware of any adverse impacts on health or safety associated with reducing the radial air gap below 12.5 thousandths of an inch. However, this technology option fails the screening criterion of being practicable to manufacture, install, and service. Such a tight air gap may cause problems in manufacturing and service, with the rotor potentially coming into contact with the stator. This technology option also fails the screening criterion of avoiding adverse impacts on consumer utility and reliability, because the motor may experience higher failure rates in service when the manufactured air gaps are less than 12.5 thousandths of an inch.

Using amorphous metals in the rotor laminations is another potential technology option to improve the efficiency of small electric motors. 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 in turn reduces overall losses in small electric motors. However, amorphous steel is a very brittle material which makes it difficult to punch into motor laminations.[18]

Considering the four screening criteria for this technology option, DOE screened out amorphous metal laminations as a means of improving efficiency. Although amorphous metals have the potential to improve efficiency, DOE does not consider this technology option technologically feasible, because it has not been incorporated into a working prototype of a small electric motor. Furthermore, DOE is uncertain whether amorphous metals are practicable to manufacture, install, and service, because a prototype amorphous metal-based small electric motor has not been made and little information is available on the feasibility of adapting this technology for manufacturing small electric motors to reach any conclusions regarding the practicability of using this option. DOE is not aware of any adverse impacts on consumer utility, reliability, health, or safety associated with amorphous metal laminations.

Using PBIP to manufacture small electric motors could cut production costs while increasing production output. Although other researchers may be working on this technology option, DOE notes that a research team at Lund University in Sweden published a paper in 2007 about using PBIP in manufacturing. This technology option is based on an iron powder alloy that is suspended in plastic, and is used in certain motor applications such as fans, pumps, and household appliances.[19] The compound is then shaped into motor components using a centrifugal mold, reducing the number of manufacturing steps. Researchers claim that this technology option could cut losses by as much as 50 percent. The Lund University study, which is the most recent research paper to address the use of PBIP in the production context, indicated that its study team already produced inductors, transformers, and induction heating coils using PBIP, but had not yet produced a small electric motor. In addition, it appears that PBIP technology is aimed at torus, claw-pole, and transversal flux motors, none of which fit the regulatory definition of small electric motors at 10 CFR 431.442. DOE has not found evidence of any significant research or technical advancement in PBIP methodologies that could be applied to small electric motors since publication of the March 2010 Final Rule. In response to the April 2019 ECS RFI, NEMA commented that DOE should continue to screen out this technology option for the same reasons that DOE had previously cited in its TSD to the March 2010 Final Rule. (NEMA, No. 11 at p. 7)

Considering the four screening criteria for this technology option, DOE screened out PBIP as a means of improving efficiency. Although PBIP has the potential to improve efficiency while reducing manufacturing costs, DOE does not consider this technology option technologically feasible because it has not been incorporated into a working prototype of a small electric motor. Also, DOE is uncertain whether the material has the structural integrity to form into the necessary shape of a small electric motor steel frame. Specifically, properties of PBIP can differ depending on the processing. If the metal particles are too closely compacted and begin to touch, the material will gain electrical conductivity, counteracting one of its most important features of preventing electric current from developing, which is critical because this essentially eliminates losses in the core due to eddy currents. If the metal particles are not compacted closely enough, its structural integrity could be compromised because the resulting material will be very porous.

Furthermore, DOE is uncertain whether PBIP is practicable to manufacture, install, and service, because a prototype PBIP small electric motor has not yet been made and little information is available on the feasibility of adapting this option for manufacturing small electric motors. However, DOE is not aware at this time of any adverse impacts on product utility, product availability, health, or safety that may arise from the use of PBIP in small electric motors.

DOE has determined that the remaining technology options listed in Table IV–2 are technologically feasible. The evaluated technologies all have been used (or are being used) in

[18] 1 S.R. Ning, J. Gao, and Y.G. Wang. Review on Applications of Low Loss Amorphous Metals in Motors. 2010. ShanDong University. Weihai, China.

[19] 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.

commercially available products or working prototypes. These technologies all incorporate materials and components that are commercially available in today's supply markets for the small electric motors that are the subject of this document. Therefore, DOE has screened in these technology options as design options in the engineering analysis.

C. Engineering Analysis

The engineering analysis estimates the increase in manufacturer selling price (''MSP'') associated with improvements to the average full load efficiency of small electric motors. This section presents DOE's assumptions and methodology for the engineering analysis. The output from the engineering analysis is a price-efficiency relationship for each equipment class that describes how MSP changes as efficiency increases. The engineering analysis is used as an input to the LCC and PBP analyses.

DOE typically structures the engineering analysis using one of three approaches: (1) Design option, (2) efficiency level, or (3) reverse engineering (or cost assessment). The design option approach involves adding the estimated cost and associated efficiency of various efficiency-improving design changes to the baseline product to model different levels of efficiency. The efficiency level approach uses estimates of costs and efficiencies of products available on the market at distinct efficiency levels to develop the cost-efficiency relationship. The reverse engineering approach involves testing products for efficiency and determining cost from a detailed bill of materials (''BOM'') derived from reverse engineering representative products. The efficiency ranges from that of the least-efficient small electric motor sold today (*i.e.,* the baseline) to the maximum technologically feasible efficiency level.

For analysis purposes, this proposed determination reflects DOE's adoption of a design option approach based on motor modeling conducted in support of the March 2010 Final Rule. In this design option approach, DOE considers efficiency levels corresponding to motor designs that meet or exceed the efficiency requirements of the current energy conservation standards at 10 CFR 431.446. DOE has tentatively determined that there are no additional technology options that pass the screening criteria that would enable the consideration of any additional efficiency levels representing higher efficiency levels than the maximum technologically feasible level analyzed in the March 2010 Final Rule.

1. Summary of Significant Data Sources

DOE utilized two principal data sources for the engineering analysis: (1) A database of small electric motor manufacturer suggested retail price (''MSRP'') and performance data based on the current market, and (2) motor modeling data, test data, and performance specifications from the March 2010 Final Rule. DOE determined that relying on the data from the March 2010 Final Rule was reasonable because a review of the catalog data and responses to the April 2019 ECS RFI suggested that there were no significant technological advancements in the motor industry that could lead to more efficient or lower cost motor designs relative to the motors modeled for the March 2010 Final Rule. Accordingly, in this determination, DOE has elected to evaluate the motor designs that were modeled for the March 2010 Final Rule analysis. To confirm this approach, DOE is again requesting comments regarding this issue.

DOE collected MSRP and performance data from product literature and catalogs distributed by four major motor manufacturers: ABB (which includes the manufacturer formerly known as Baldor Electric Company), Nidec Motor Corporation (which includes the US Motors brand), Regal-Beloit Corporation (which includes the Marathon and Leeson brands), and WEG Electric Motors Corporation.[20] Based on market information from the Low-Voltage Motors World Market Report,[21] DOE estimates that the four major motor manufacturers noted above comprise the majority of the U.S. small electric motor market and are consistent with the motor brands considered in the March 2010 Final Rule. (Throughout this document this data will be referred to as the ''manufacturer catalog data.'')

[20] ABB (Baldor-Reliance): Online Manufacturer Catalog, accessed January 3, 2019. Available at *https://www.baldor.com/catalog#category=2;* Nidec: Online Manufacturer Catalog, accessed December 26, 2018. Available at *ecatalog.motorboss.com/Catalog/Motors/ALL;* Regal (Marathon and Leeson): Online Manufacturer Catalog, accessed December 27, 2018. Available at *https://www.regalbeloit.com/Products/Faceted-Search?category=Motors&brand=Leeson,Marathon%20Motors;* WEG: Online Manufacturer Catalog, accessed December 24, 2018. Available at *http://catalog.wegelectric.com/*

[21] Based on the Low-Voltage Motors, World Market Report (IHS Markit Report September 2017, Edition 2017–2018) Table 5.15: Market Share Estimates for Low-voltage Motors: Americas; Suppliers 'share of the Market in 2015 and 2016.

2. Representative Equipment Classes

Due to the large number of equipment classes, DOE did not directly analyze all 62 equipment classes of small electric motors considered under this proposed determination. Instead, DOE selected representative classes based on two factors: (1) The quantity of motor models available within an equipment class and (2) the ability to scale to other equipment classes.

DOE notes that the minimum energy conservation standards adopted in the March 2010 Final Rule correspond to the efficiency level that represented the maximum technologically feasible efficiency for CSIR motors. As discussed previously, DOE was unable to identify any additional design options that passed the screening criteria that would indicate that a motor design meeting a higher efficiency level is technologically feasible and commercially viable (see NOPD TSD chapter 3). In addition, DOE was unable to identify any CSIR motors in the manufacturer catalog data that exhibited efficiency levels exceeding the current energy conservation standards for CSIR motors. From this information, DOE tentatively concluded that more stringent energy conservation standards for CSIR motors do not appear to be technologically feasible. Consequently, DOE did not include a representative CSIR equipment class as part of the engineering analysis.

The minimum energy conservation standards adopted in the March 2010 Final Rule corresponded to efficiency levels below the maximum technologically feasible levels for the CSCR and polyphase topologies, and therefore DOE elected to analyze one representative equipment class for each of these motor topologies. Equipment classes in the both the polyphase and CSCR topologies were directly analyzed due to the fundamental differences in their starting and running electrical characteristics. These differences in operation have a direct impact on performance and indicate that polyphase motors are typically more efficient than single-phase motors. In addition, the efficiency relationships across horsepower and pole configuration are different between single-phase and polyphase motors.

DOE did not vary the pole configuration of the representative classes it analyzed because analyzing the same pole configuration provided the strongest relationship upon which to base its scaling. See section IV.C.5 for details on DOE's scaling methodology. Keeping as many design characteristics constant as possible enabled DOE to more accurately identify how design changes affect efficiency across horsepower ratings. For each motor topology, DOE directly analyzed the most common pole-configuration. For both motor topologies analyzed, 4-pole motors constitute the largest fraction of motor models on the market.

When DOE selected its representative equipment classes, DOE chose the horsepower ratings that constitute a high volume of motor models and approximate the middle of the range of covered horsepower ratings so that DOE could develop a reasonable scaling methodology. DOE notes that the representative equipment classes for polyphase and CSCR motors that were selected for the engineering analysis align with the representative classes that were directly analyzed in the March 2010 Final Rule. 75 FR 10874, 10888. These representative classes are outlined in Table IV–4.

TABLE IV–4—REPRESENTATIVE EQUIPMENT CLASSES

Motor topology	Pole configuration	Motor output power *hp*
Polyphase	4	1.00
Single-phase CSCR	4	0.75

DOE seeks comment on the selection of representative equipment classes for CSCR and polyphase motors and the tentative determination that more stringent energy conservation standards for CSIR motors are not technologically feasible.

See section VII.B for a complete list of issues on which DOE seeks comments.

3. Engineering Analysis Methodology

DOE relied on a design option approach to generate incremental MSPs and establish efficiency levels, in which the relative costs of achieving increases in efficiency are determined based on the cost of various efficiency-improving design changes to the baseline motor. For each representative equipment class, DOE identified a specific motor as a fundamental design against which it would apply changes to improve the motor's efficiency. Each increase in efficiency over the baseline level that DOE analyzed was assigned an efficiency level (''EL'') number.

Consistent with its usual analytical approach, DOE considered the current minimum energy conservation standards to establish the baseline efficiency levels for each representative equipment class. In response to the April 2019 ECS RFI, the CA IOUs supported using the current standards as the baseline efficiency level. (CA IOUs, No. 10 at p. 4) In addition, NEMA commented that the current energy conservation standards reasonably approximate the baseline for covered equipment. (NEMA, No. 11 at p. 7)

As discussed previously, DOE selected representative equipment classes that align with the classes analyzed in the March 2010 Final Rule. DOE identified specific motor designs from the March 2010 Final Rule engineering analysis that exhibit full-load efficiency ratings that are representative of the minimum energy conservation standards for small electric motors. DOE chose these motor designs as the baseline designs against which design options to improve motor efficiency would be implemented as part of DOE's analysis.

For the March 2010 Final Rule engineering analysis, DOE purchased and tested motors with the lowest catalog efficiency rating available in the market for each representative equipment class. DOE's technical expert tore down each motor to obtain dimensions, a BOM, and other pertinent design information. DOE worked with a subcontractor to reproduce these motor designs using modeling software and then applied design options to a modeled motor that would increase that motor's efficiency to develop a series of motor designs spanning a range of efficiency levels. For the current evaluation, DOE continued to base its analysis on the modeled motor designs. In light of its catalog review and the responses received to the April 2019 ECS RFI indicating that there were no significant technological advancements in the motor industry that could lead to more efficient or lower cost motor designs relative to the motors modeled for the March 2010 Final Rule.[22] Further information on the development of modeled motor designs from the March 2010 Final Rule is available in section 5.3 of the NOPD TSD.

NEMA commented that DOE did not adequately consider comments regarding OEM design impacts from the larger motor dimensions that would result from re-designing motors to be compliant with the energy conservation standards adopted in the March 2010 Final Rule. (NEMA, No. 11 at p. 7) NEMA added that DOE should seek input from OEMs on the impact of increased motor size that would be needed to increase motor efficiency. (NEMA, No. 11 at p. 17) AHRI and AHAM commented that more efficient motors within a particular topology are likely to be larger and heavier, which could decrease consumer utility. AHRI and AHAM stated that replacement motors must be able to fit inside the finished product for which they are destined, and this factor must be considered when evaluating more stringent standards. (AHRI and AHAM, No. 12 at p. 3)

In developing the modeled motor designs and associated costs, DOE considered both space-constrained and non-space-constrained scenarios. DOE prepared designs of increased efficiency covering both scenarios for each representative equipment class. The design levels prepared for the space-constrained scenario included baseline and intermediate levels, a level for a design using a copper rotor, and a max-tech level with a design using a copper rotor and exotic core steel. The high-efficiency space-constrained designs incorporate copper rotors and exotic core steel in order to meet comparable levels of efficiency to the high-efficiency non-space-constrained designs while meeting the parameters for minimally increased stack length. The design levels created for the non-space-constrained scenario corresponded to the same efficiency levels created for the space-constrained scenario. Further information on the development of modeled motor designs is available in section 5.3 of the March 2010 Final Rule TSD. In addition to developing different MSPs for space-constrained and non-space-constrained scenarios, DOE developed a modified OEM markup in support of the March 2010 Final Rule to account for the costs faced by OEMs needing to redesign their products to incorporate small electric motors of different sizes.[23] In this current evaluation, DOE continues to analyze increased efficiency in both space-

[22] DOE also notes that ASAP, et al. recommended that DOE conduct an analysis similar to the modeling analysis completed for the March 2010 Final Rule. (ASAP, et al., No. 16 at p. 4)

[23] For more details see chapter 7 of the 2010 small electric motors final rule TSD, at *https://www.regulations.gov/document?D=EERE-2007-BT-STD-0007-0036.*

constrained and non-space-constrained scenarios for each of the representative equipment classes, in line with the March 2010 Final Rule.

NEMA also commented that more stringent energy conservation standards would result in the design of motors with lower slip[24] and in turn, higher full-load speeds. NEMA stated that, as such, more stringent energy conservation standards would force manufacturers of end-use products to redesign their products to account for the higher motor speeds. (NEMA, No. 11 at p. 13) This factor, it asserted, would have the impact of increasing the speed and therefore the output power delivered to the motor's application and offset some of the improvement in motor efficiency. NEMA also commented that small businesses, including motor manufacturers and OEMs, would be required to spend more for motors that provide little additional energy savings from more stringent energy conservation standards for the small electric motors at issue. (NEMA, No. 11 at p. 18) The designs analyzed in the engineering analysis did not show a significant (less than 2 percent) and consistent (some more efficient designs had slightly lower speeds) increase in speed with increasing efficiency across all ELs (See NOPD TSD Chapter 5). However, as discussed previously, DOE has tentatively determined that more stringent energy conservation standards would not be cost effective and therefore is not proposing to amend the current energy conservation standards for this equipment.

As discussed in section IV.A.3, DOE considered each of the design options analyzed in the previous rulemaking and also researched whether there were any new technologies that could improve the efficiency of small electric motors. Accordingly, DOE determined that there were no significant technological advancements since the March 2010 Final Rule. In addition, comments received suggested the same. (NEMA, No. 11 at p. 3) Given that DOE was unable to identify any additional design options for improving efficiency that passed the screening criteria and were not already considered in the March 2010 Final Rule engineering analysis, DOE analyzed the same motor designs that were developed for the March 2010 Final Rule except for CSIR motors (which, as indicated earlier, did not appear to have any technologically-feasible options available to improve their efficiency). For each representative equipment class, DOE established an efficiency level for each motor design that exhibited improved efficiency over the baseline design. As discussed previously, DOE considered the current minimum energy conservation standards as the baseline efficiency levels for each representative equipment class. These efficiency levels are summarized in Table IV–5.

TABLE IV–5—SUMMARY OF EFFICIENCY LEVELS

Representative equipment class	EL	Efficiency (%)
Single-phase CSCR, 4-pole, 0.75-hp	0	81.8
	1	82.8
	2	84.0
	3	84.6
	4	86.7
	5	87.9
Polyphase, 4-pole, 1-hp	0	83.5
	1	85.2
	2	86.3
	3	87.8

In response to the April 2019 ECS RFI, ASAP, et al. commented that DOE should thoroughly investigate more stringent efficiency levels than those currently available in the market (ASAP, et al., No. 16 at p. 3) ASAP, et al. noted that DOE had found 15 percent of CSCR motor models attained efficiencies exceeding the levels adopted in the March 2010 Final Rule and stated that the prior availability of these higher levels demonstrates technological feasibility. In addition, ASAP, et al. suggested that DOE review manufacturer literature and other data sources to determine if products exceeding minimum standards are available in the market for any regulated equipment class. (ASAP, et al., No. 16 at pp. 3–4) As noted previously, DOE is evaluating efficiency levels up to the maximum technologically feasible levels for each motor topology, including efficiency levels that represent motors that are not yet commercially available (*e.g.,* a small electric motor design that is technologically feasible but not available on the market because of cost considerations). As part of this evaluation, DOE reviewed manufacturer literature to determine the availability of small electric motors across all equipment classes considered in this document by efficiency level. This literature includes efficiency values derived from manufacturer testing using the mandatory DOE test procedure. DOE's review of this information indicated that for CSCR motors, the most recent manufacturer catalog data only included a single model with an efficiency above the baseline level (*i.e.* the current standard required of these motors). (See also section IV.F.8).

ASAP, et al. recommended that DOE conduct an analysis similar to the modeling analysis completed for the March 2010 Final Rule and added that while levels of maximum technological feasibility may not be commercially available today, energy conservation standards policy could provide the basis for making cost-effective improvements to motors that could not be otherwise achieved by market forces. (ASAP, et al., No. 16 at p. 4) Lenze Americas commented that DOE should consider setting standard levels at an International Efficiency (''IE'')2[25] equivalent for motors below 1 hp and an

[24] Motor slip is the difference between the speed of the rotor (operating speed) and the speed of the rotating magnetic field of the stator (synchronous speed). When net rotor resistance of a motor design is reduced, efficiency of the motor increases but slip decreases, resulting in higher operating speeds.

[25] The IE designations are efficiency levels defined by IEC standard 60034–30–1 for 50 and 60 Hz single or three-phase line motors (regardless of the technology). Motors meeting the IE1 efficiency level are designated ''standard efficiency,'' IE2 qualifying motors are designated ''high-efficiency,'' IE3 qualifying motors are designated ''premium efficiency,'' and IE4 qualifying motors are designated ''super premium efficiency.''

IE3 equivalent for motors greater than or equal to 1 hp. (Lenze Americas, No. 3 at p. 1)

DOE is adopting the motor modeling approach used in support of the March 2010 Final Rule to analyze and establish efficiency levels and incremental motor MSPs. DOE did not identify any additional design options in the market for improving efficiency that were not already considered in the March 2010 Final Rule. In addition, while DOE is not specifically evaluating the IE levels in this analysis, the range of motor efficiency levels analyzed in this evaluation is inclusive of efficiencies specified in the IE2 and IE3 efficiency levels.

The CA IOUs commented that DOE should conduct independent testing to verify the efficiency performance of the motor designs considered in each representative equipment class. (CA IOUs, No. 10 at p. 3) ASAP, et al. suggested that DOE investigate whether motors rated at the standard level are more efficient than stated because DOE regulations permit manufacturers to rate their products conservatively. (ASAP, et al., No. 16 at pp. 3–4) DOE notes that the performance of the motor designs considered in this analysis were verified by conducting motor efficiency testing during the previous rulemaking. Details of this validation testing can be found in appendix 5A of the March 2010 Final Rule TSD.

DOE seeks comment on the methodologies employed in the engineering analysis, specifically regarding the adoption of the motor designs and associated efficiency levels considered in the March 2010 Final Rule analysis as the basis for this proposed determination.

See section VII.B for a complete list of issues on which DOE seeks comments.

4. Cost

For representative equipment classes, each efficiency level is based on a motor design with a distinct set of performance characteristics, production costs, and non-production costs. Full production cost is a combination of direct labor, direct materials, and overhead. Non-production costs include the cost of selling (market research, advertising, sales representatives, logistics), general and administrative costs, research and development, interest payments and profit factor.

A standard BOM was constructed for each motor design that includes direct material costs and labor time estimates along with costs. The BOM is then multiplied by a markup for overhead to obtain an MPC that is further marked up to reflect non-production costs to create an MSP. DOE notes that the costs established for direct material costs and labor time were initially determined in terms of $2009 for the March 2010 Final Rule. For this evaluation, DOE updated these material and labor costs to be representative of the market in 2018. DOE adjusted historical material prices to $2018 using the historical Bureau of Labor Statistics Producer Price Indices (''PPI'')[26] for each commodity's industry. In addition, DOE updated labor costs and markups based on the most recent and complete version (*i.e.* 2012) of the Economic Census of Industry by the U.S. Census Bureau.[27]

In response to the April 2019 ECS RFI, NEMA commented that tariffs on steel and aluminum have caused cost increases for current motor designs which could exacerbate the cost impacts of more stringent standards. (NEMA, No. 11 at p. 13) DOE notes that changes in the cost of steel and aluminum components since 2010 have been accounted for in this proposed determination and are considered when evaluating more stringent energy conservation standards.

DOE seeks input on whether and how the costs estimated for motor designs considered in the March 2010 Final Rule have changed since the time of that analysis. DOE also requests information on the investments (including related costs) necessary to incorporate specific design 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, and manufacturing/production impacts.

See section VII.B for a complete list of issues on which DOE seeks comments.

5. Scaling Relationships

In analyzing the equipment classes, DOE developed a systematic approach to scaling efficiency across horsepower ratings and pole configurations, while retaining reasonable levels of accuracy, in a manner similar to the March 2010 Final Rule. DOE's current energy conservation standards for small electric motors found at 10 CFR 431.446 list minimum required efficiencies over a range of horsepower and pole configurations, providing a basis for scaling efficiency across horsepower and pole configurations for polyphase and single-phase motors. The efficiency relationships in the established standards are based on a combination of NEMA recommended efficiency standards, NEMA premium designations, catalog data, and test data for individual manufacturer motor product lines. DOE has elected to apply the same scaling methodologies used to support the March 2010 Final Rule to the engineering analysis for this proposed determination. 75 FR 10894–10895. This approach has been presented previously to stakeholders and has been updated based on stakeholder input. In DOE's view, this approach has the added advantage of reducing the analytical complexity associated with conducting a detailed engineering analysis of the cost-efficiency relationship on all 62 equipment classes. *Id.*

For this NOPD, while the engineering analysis focuses on two representative units, the energy use and life-cycle cost analyses (see sections IV.E and IV.F) consider two additional representative units to separately analyze consumers of integral (*i.e.,* with horsepower greater than or equal to 1 hp) single-phase CSCR small electric motors and fractional (*i.e.,* with horsepower less than 1 hp) polyphase small electric motors. To scale to the equipment classes that were not directly analyzed, DOE followed several steps. First, DOE evaluated the efficiency relationships presented in the recommended standards provided by NEMA for the March 2010 Final Rule. DOE then compiled efficiency data for as many manufacturers and equipment classes as possible and filtered the data to ensure an accurate representation of the small electric motors that are covered by the statute. Next, DOE modeled all the efficiency data in terms of motor losses and used a best-fit curve to project values to fill in any potential gaps in data. Finally, DOE scaled the results of the engineering analysis based on the relationships found from the combined NEMA data and catalog data.

DOE seeks input on implementing a similar scaling methodology as that used for the March 2010 Final Rule in this NOPD.

See section VII.B for a complete list of issues on which DOE seeks comments.

D. Markups Analysis

The markups analysis develops appropriate markups (*e.g.,* retailer markups, distributor markups, contractor markups) in the distribution chain to convert the MSP estimates derived in the engineering analysis to consumer prices, which are then used in the LCC and PBP analysis. At each step in the distribution channel, companies mark up the price of the equipment to cover business costs and profit margin. For small electric motors, the main

[26] *www.bls.gov/ppi/.*

[27] U.S. Census Bureau, 2012 Economic Census of Industry Series Reports for Industry, U.S. Department of Commerce, 2012

parties in the distribution chain are manufacturers, distributors, contractors or installers, OEMs of equipment incorporating small electric motors, and consumers.

DOE relied on estimates provided by NEMA during the March 2010 Final Rule to establish the proportion of shipments through each distribution channel.[28] In response to the April 2019 ECS RFI, DOE did not receive any data to support alternative distribution channels for small electric motors. DOE used data from the U.S. Census Bureau[29] and the Sales Tax Clearinghouse[30] to develop distribution channel markups and sales tax estimates.

DOE also developed baseline and incremental markups for each actor in the distribution chain. Baseline markups are applied to the price of equipment with baseline efficiency, while incremental markups are applied to the difference in price between baseline and higher-efficiency models (the incremental cost increase). The incremental markup is typically less than the baseline markup and is designed to maintain similar per-unit operating profit before and after new or amended standards.[31] DOE relied on economic data from the U.S. Census Bureau to estimate average baseline and incremental markups.

Further, in the space-constrained scenario, DOE developed a modified OEM markup to account for the costs faced by those OEMs of equipment incorporating small electric motors needing to redesign their products in order to incorporate small electric motors of different, including larger, sizes. Nationally, businesses spend about 2.7 percent of U.S. gross domestic product on research and development (''R&D'').[32] DOE estimates that R&D by equipment OEMs, including the design of new products, approximately represents at most 2.7 percent of company revenue. Similar to what was done in the March 2010 Final Rule, DOE accounted for the additional costs to redesign products and incorporate differently-shaped motors by adding 2 percent to the OEM markups.[33]

Table IV–6 summarizes the overall baseline and incremental markups for each distribution channel considered for small electric motors.

TABLE IV–6—SMALL ELECTRIC MOTORS DISTRIBUTION CHANNEL MARKUPS

Distribution channel (from manufacturer)	Direct to OEMs (65%)		Via wholesalers to OEMs (30%)		Via wholesalers to end-users (5%)	
Main Party	Baseline	Incremental	Baseline	Incremental	Baseline	Incremental
Motor Wholesaler	....	....	1.35	1.19	1.35	1.19
Original Equipment Manufacturer (OEM)*	1.47/1.50	1.23/1.25	1.47/1.50	1.23/1.25	....	....
Equipment Wholesaler	1.41	1.19	1.41	1.19	....	....
Retailer	....	....	....	....	1.53	1.27
Contractor	1.1	1.1	1.1	1.1	1.1	1.1
Sales Tax	1.0721		1.0721		1.0721	
Overall	2.45/2.50	1.72/1.76	3.31/3.37	2.06/2.10	2.44	1.78

* Non-space-constrained scenario/space-constrained scenario.

DOE seeks comment on the methodology and data used for estimating end-user prices for small electric motors.

See section VII.B for a complete list of issues on which DOE seeks comments. Chapter 6 of the TSD provides details on the DOE's markup analysis for small electric motors.

E. Energy Use Analysis

The purpose of the energy use analysis is to determine the annual energy consumption of small electric motors at different efficiency levels and to assess the energy savings potential of increased efficiency. The analysis estimates the range of energy use of small electric motors in the field (*i.e.,* as they are actually used by consumers). The energy use analysis provides the basis for other analyses DOE performed, particularly assessments of the energy savings and the savings in consumer operating costs that could result from adoption of amended or new standards.

The analysis focuses on the two representative units identified in the engineering analysis (see section IV.C) for which engineering analysis results were obtained at levels at and above the baseline. Two additional representative units were included to separately analyze consumers of integral (*i.e.,* with horsepower greater than or equal to 1 hp) single-phase CSCR small electric motors and fractional (*i.e.,* with horsepower less than 1 hp) polyphase small electric motors (see Table IV–7).[34] For each representative unit, DOE determined the annual energy consumption value by multiplying the motor input power by the annual operating hours for a representative sample of motor consumers.

[28] For more details see chapter 7 of the 2010 small electric motors final rule TSD, at *https://www.regulations.gov/document?D=EERE-2007-BT-STD-0007-0036.*

[29] U.S. Census Bureau, 2014 Annual Survey of Manufacturers; 2012 Economic Census Annual Wholesale Trade Survey.

[30] Sales Tax Clearinghouse, Inc. *State sales tax rates along with combined average city and county rates,* 2017. Available at: *http://thestc.com/STrates.stm.*

[31] Because the projected price of standards-compliant products is typically higher than the price of baseline products, using the same markup for the incremental cost and the baseline cost would result in higher per-unit operating profit. While such an outcome is possible, DOE maintains that in markets that are reasonably competitive it is unlikely that imposing more stringent standards would lead to a sustainable increase in profitability in the long run.

[32] National Science Board. January 2018. *Science and Engineering Indicators 2018.* Figure 4–3, Ratio of U.S. R&D to gross domestic product, by roles of federal, business, and other nonfederal funding for R&D: 1953–2015. Arlington, VA: National Science Foundation (NSB–2018–1) Available at *https://www.nsf.gov/statistics/2018/nsb20181/assets/1038/research-and-development-u-s-trends-and-international-comparisons.pdf.*

[33] For more details see chapter 7 of the 2010 small electric motors final rule TSD, at *https//www.regulations.gov/document?D=EERE-2007-BT-STD-0007-0036.*

[34] Similar to the approach used in the engineering analysis when selecting representative units, DOE reviewed model counts from the manufacturer online catalog data to identify these additional units. DOE reviewed counts of CSCR, 4-poles small electric motors and polyphase, 4-poles, small electric motors models. For CSCR motors, the 1 horsepower value had the most counts and DOE selected a unit at 1 horsepower. For polyphase motors, the 0.33, 0.5, and 0.75 horsepower values had the most counts (and similar counts) and DOE selected a unit at 0.5 horsepower (*i.e.* the mid-range of these horsepower values).

TABLE IV–7—REPRESENTATIVE UNITS ANALYZED IN THE ENERGY USE AND LIFE-CYCLE COST ANALYSES

Representative unit	Equipment class group	Pole configuration	Rated horsepower
1	Single-phase, CSCR	4-pole	0.75
2	Polyphase	4-pole	1
3	Single-phase, CSCR	4-pole	1
4	Polyphase	4-pole	0.5

DOE seeks comments on how whether additions or changes should be made to the energy use analysis as well as any data supporting alternate inputs to characterize the variability in annual energy consumption for small electric motors.

See section VII.B for a complete list of issues on which DOE seeks comments. Chapter 7 of the TSD provides details on the DOE's energy use analysis for small electric motors.

1. Consumer Sample

For each representative unit, DOE created consumer samples for three individual sectors: Residential, commercial, and industrial. DOE used the samples to determine small electric motor annual energy consumption as well as for conducting the LCC and PBP analyses. Each consumer in the sample was assigned a sector and an application. DOE used data from the March 2010 Final Rule to establish distributions of small electric motors by sector. Five main motor applications were selected as representative applications (compressors, fans, pumps, material handling, and others). In order to characterize the distributions of small electric motors across applications in the industrial sector, DOE used data from hundreds of field assessments aggregated in two databases: (1) A database of motor nameplate and field data compiled by the Washington State University (''WSU'') Extension Energy Program, Applied Proactive Technologies, and New York State Energy Research and Development Authority, and; (2) a database of motor nameplate and field data compiled by the Industrial Assessment Center at Oregon University (''field assessment data'').[35] For the commercial and residential sectors, DOE used data from a previous DOE publication to estimate distribution of small electric motors by application.[36] DOE also assumed that 20 percent of consumers had space-constraints and 80 percent were non-space-constrained based on data from the March 2010 Final Rule. In response to the April 2019 ECS RFI, DOE did not receive any data to support alternative distributions of small electric motors by sectors and applications or by space-constrained/non-space-constrained applications.

DOE seeks comment on the approach used for estimating distribution of consumers of small electric motors across applications and sectors, as well as any data supporting the use of alternate distributions.

See section VII.B for a complete list of issues on which DOE seeks comments. See chapter 7 of the TSD for more details on the resulting distribution of consumers by sector and applications.

2. Motor Input Power

DOE calculated the motor input power as the sum of the motor rated horsepower multiplied by the motor operating load (*i.e.,* the motor output power) and of the losses at the operating load (*i.e.,* part-load losses). DOE determined the part-load losses using outputs from the engineering analysis (full-load efficiency at each efficiency level) and published part-load efficiency information from manufacturer catalogs to model motor part-load losses as a function of the motor's operating load. NEMA commented that there was a range of operating motor loads for small electric motors and that there was no typical operating load by application. NEMA did not provide data to characterize operating load. (NEMA, No. 11 at p. 15) DOE estimated the operating load using operating load data specific to motors in the 0.25–3 hp range, which was based on additional field assessments data collected since the publication of the March 2010 Final Rule.[37]

DOE seeks comment on the methodology used for estimating the distribution of motor load for each application and sector, as well as any data supporting alternate distributions.

See section VII.B for a complete list of issues on which DOE seeks comments. See chapter 7 of the TSD for the resulting distribution of load for each application.

3. Annual Operating Hours

NEMA commented that there was a range of operating hours for small electric motors and noted that for this equipment, operating hours are generally lower compared to electric motors and stated that most small electric motors do not run continuously. NEMA did not provide data to characterize operating hours. (NEMA, No. 11 at p. 15) For the industrial sector, DOE used data specific to motors in the 0.25–3 hp range from the field assessment data to establish distributions of annual operating hours by application. For the commercial and residential sectors, DOE used operating hours data from the March 2010 Final Rule.[38]

DOE seeks comment on the methodology used to estimate annual operating hours, as well as any data supporting alternate distribution of operating hours by application and sector.

See section VII.B for a complete list of issues on which DOE seeks comments. See chapter 7 of the TSD for more details on the distributions of annual operating hours by application and sector.

Table IV–8 shows the estimated average annual energy use at each efficiency level analyzed.

[35] Strategic Energy Group (January 2008), Northwest Industrial Motor Database Summary. Regional Technical Forum. Available at *http://rtf.nwcouncil.org/subcommittees/osumotor/Default.htm.*

[36] W. Goetzler, T. Sutherland, C. Reis. ''Energy Savings Potential and Opportunities for High-Efficiency Electric Motors in Residential and Commercial Equipment'' U.S. Department of Energy, December 4, 2013. Available at *https://energy.gov/sites/prod/files/2014/02/f8/Motor%20Energy%20Savings%20Potential%20Report%202013-12-4.pdf.*

[37] This horsepower range was selected as it corresponds to the motor horsepower of small electric motors that are currently subject to standards (see section IV.A.1).

[38] For more details see chapter 6 of the 2010 small electric motors final rule TSD, at *https://www.regulations.gov/document?D=EERE-2007-BT-STD-0007-0036.*

TABLE IV–8—AVERAGE ANNUAL ENERGY USE BY EFFICIENCY LEVEL

Rep. unit	Description	Kilowatt-hours per year					
		EL 0	EL 1	EL 2	EL 3	EL 4	EL5
1	Single-phase, CSCR, 4-pole, 0.75 hp	1,651.6	1,626.2	1,596.7	1,582.0	1,534.4	1,507.5
2	Polyphase, 4-pole, 1 hp	2,091.2	2,046.1	2,019.3	1,982.4		
3	Single-phase, CSCR, 4-pole, 1 hp	2,176.6	2,144.1	2,107.9	2,089.3	2,029.0	1,994.2
4	Polyphase, 4-pole, 0.5 hp	1,164.9	1,129.8	1,108.3	1,079.4		

F. Life-Cycle Cost and Payback Period Analysis

DOE conducted LCC and PBP analyses to evaluate the economic impacts on individual consumers of potential energy conservation standards for small electric motors. The effect of new or amended energy conservation standards on individual consumers usually involves a reduction in operating cost and an increase in purchase price. DOE used the following two metrics to measure consumer impacts:

- The LCC is the total consumer expense of equipment over the life of that equipment, consisting of total installed cost (MSP, distribution chain markups, sales tax, and installation costs) plus operating costs (expenses for energy use, maintenance, and repair). To compute the operating costs, DOE discounts future operating costs to the time of purchase and sums them over the lifetime of the equipment.
- The simple PBP is the estimated amount of time (in years) it takes consumers to recover the increased purchase cost (including installation) of more-efficient equipment through lower operating costs. DOE calculates the simple PBP by dividing the change in purchase cost at higher efficiency levels by the change in annual operating cost for the year that amended or new standards are assumed to take effect.

For any given efficiency level, DOE measures the change in LCC relative to the LCC in the no-new-standards case, which reflects the estimated efficiency distribution of small electric motors in the absence of new or amended energy conservation standards. In contrast, the simple PBP for a given efficiency level is measured relative to the baseline equipment. The analysis focuses on the four representative units identified in Table IV–7.

For each considered efficiency level in each equipment class, DOE calculated the LCC and PBP for a nationally representative set of consumers. As stated previously, DOE developed a sample based on distributions of consumers across sectors and applications, as well as across efficiency levels. For each sample consumer, DOE determined the unit energy consumption and appropriate energy price. By developing a representative sample of consumers, the analysis captured the variability in energy consumption and energy prices associated with the use of small electric motors.

Inputs to the calculation of total installed cost include the cost of the equipment—which includes MSPs, retailer 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, and discount rates. DOE created distributions of values for equipment lifetime, discount rates, and sales taxes, with probabilities attached to each value, to account for their uncertainty and variability.

The computer model DOE uses to calculate the LCC and PBP relies on a Monte Carlo simulation to incorporate uncertainty and variability into the analysis. The Monte Carlo simulations randomly sample input values from the probability distributions and consumer samples. The model calculated the LCC and PBP for equipment at each efficiency level for 10,000 consumers per representative unit per simulation run. The analytical results include a distribution of 10,000 data points showing the range of LCC savings for a given efficiency level relative to the no-new-standards case efficiency distribution. In performing an iteration of the Monte Carlo simulation for a given consumer, equipment efficiency is chosen based on its probability. If the chosen equipment efficiency is greater than or equal to the efficiency of the standard level under consideration, the LCC and PBP calculation reveals that a consumer is not impacted by the standard level. By accounting for consumers who already purchase more-efficient equipment, DOE avoids overstating the potential benefits from increasing equipment efficiency.

DOE calculated the LCC and PBP for all consumers as if each were to purchase a new motor in the expected year of compliance with amended standards. For purposes of its analysis, DOE estimated that any amended standards would apply to small electric motors manufactured 5 years after the date on which the amended standard is published. DOE estimated publication of a final rule in the first half of 2023. Therefore, for purposes of its analysis, DOE used 2028 as the first full year of compliance.

Table IV–9 summarizes the approach and data DOE used to derive inputs to the LCC and PBP calculations. The subsections that follow provide further discussion.

TABLE IV–9—SUMMARY OF INPUTS AND METHODS FOR THE LCC AND PBP ANALYSIS *

Inputs	Source/method
Equipment Cost	Derived by multiplying MSPs by distribution channel markups and sales tax, as appropriate.
Installation Costs	Assumed no change with efficiency level other than shipping costs.
Annual Energy Use	Motor input power multiplied by annual operating hours per year. Variability: Based on plant surveys and previous DOE study.

TABLE IV–9—SUMMARY OF INPUTS AND METHODS FOR THE LCC AND PBP ANALYSIS *—Continued

Inputs	Source/method
Energy Prices	Electricity: Used average and marginal prices (Coughlin and Beraki).
Energy Price Trends	Based on *AEO 2019* price projections.
Repair and Maintenance Costs	Assumed no change with efficiency level.
Equipment Lifetime	Estimated using information from 2010 standards final rule and from DOE's Advanced Manufacturing Office.
Discount Rates	Residential: Approach involves identifying all possible debt or asset classes that might be used to purchase the considered appliances, or might be affected indirectly. Primary data source was the Federal Reserve Board's Survey of Consumer Finances. Commercial: Calculated as the weighted average cost of capital for entities purchasing small electric motors. Primary data source was Damodaran Online.
Compliance Date	2028

* References for the data sources mentioned in this table are provided in the sections following the table.

1. Equipment Cost

To calculate consumer equipment costs, DOE multiplied the MSPs developed in the engineering analysis by the distribution channel markups described in section IV.D (along with sales taxes). DOE used different markups for baseline motors and higher-efficiency motors, because DOE applies an incremental markup to the increase in MSP associated with higher-efficiency equipment. Further, in this proposed determination, DOE assumed the prices of small electric motors would remain constant over time (no decrease in price).

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous materials and parts needed to install the equipment. In response to the April 2019 ECS RFI, DOE did not receive any information on small electric motors consumer installation costs. Based on information from the March 2010 Final Rule and installation cost data from RS Means Electrical Cost Data 2019,[39] DOE estimated that installation costs do not increase with equipment efficiency except in terms of shipping costs depending on the weight of the more efficient motor.[40] To arrive at total installed costs, DOE included shipping costs as part of the installation costs. These were based on weight data from the engineering analysis, which accounted for updated manufacturer catalog data collected by DOE.

DOE seeks comment on the methodology used to estimate installation costs as well as any data supporting alternate installation cost estimates.

See section VII.B for a complete list of issues on which DOE seeks comments. See chapter 8 of the TSD for more information on the installation costs for small electric motors.

3. Annual Energy Consumption

For each sampled consumer, DOE determined the energy consumption for small electric motors in each standards case analyzed using the approach described in section IV.E of this proposed determination.

4. Energy Prices

For electricity prices, DOE used national annual marginal and average prices from Coughlin and Beraki (2019).[41] To estimate energy prices in future years, DOE multiplied the energy prices by a projection of annual change in average price consistent with the projections in the *AEO 2019,* which has an end year of 2050. To estimate price trends after 2050, DOE used the average annual rate of change in prices from 2030 to 2050.

5. Maintenance and Repair Costs

Repair costs are associated with repairing or replacing small electric motor components that have failed; maintenance costs are associated with maintaining the operation of the equipment. Small electric motors are usually not repaired. Most small motors are mass produced and are not constructed or designed to be repaired because the manufacturing process uses spot welding welds and rivets to fasten or secure the frame and assembled components, not nuts and bolts—meaning that the small electric motor cannot be readily disassembled and reassembled. During the rulemaking for the March 2010 Final Rule, DOE found no evidence that repair or maintenance costs, if any, would increase with higher motor energy efficiency.[42] DOE reviewed more recent motor repair cost data for small electric motors and found no evidence that maintenance and repair costs increase with efficiency for small electric motors in scope.[43] NEMA commented that for small electric motor designs that simply added more active material to the rotors and/or stators, repair practices are unlikely to change. NEMA noted that CSCR motors have higher repair costs compared to CSIR motors due to the inclusion of a second capacitor. NEMA did not provide any

[39] RS Means. *Electrical Cost Data, 42h Annual Edition,* 2019. Rockland, MA. p. 315.

[40] For more details see chapter 8 of the 2010 small electric motors final rule TSD, at *https://www.regulations.gov/document?D=EERE-2007-BT-STD-0007-0036.*

[41] *See* Coughlin, K. and B. Beraki. Residential Electricity Prices: A Review of Data Sources and Estimation Methods. 2018. Lawrence Berkeley National Lab. (LBNL), Berkeley, CA (United States). Report No. LBNL–2001169. (Last accessed May 21, 2019.) *https://ees.lbl.gov/publications/residential-electricity-prices-review. See also* Coughlin, K. and B. Beraki. Non-residential Electricity Prices: A Review of Data Sources and Estimation Methods. 2019. Lawrence Berkeley National Lab. (LBNL), Berkeley, CA (United States). Report No. LBNL–2001203. (Last accessed May 21, 2019.) *https://ees.lbl.gov/publications/non-residential-electricity-prices.*

[42] For more details see chapter 8 of the 2010 small electric motors final rule TSD, at *https://www.regulations.gov/document?D=EERE-2007-BT-STD-0007-0036.*

[43] Vaughen's (2013), Vaughen's Motor & Pump Repair Price Guide, 2013 Edition. Available at *www.vaughens.com.*

additional information to characterize repair costs. (NEMA, No. 11 at p. 15)

Based on information DOE reviewed, small electric motors are generally not repaired and NEMA's comments suggest that repair practices are unlikely to change within each equipment class group (*i.e.,* polyphase, CSCR, and CSIR). Accordingly, DOE assumed that more efficient small electric motors would not have greater repair or maintenance costs and therefore did not account for these costs in the LCC calculation.

DOE seeks comment on the assumptions for estimating repair and maintenance costs as well as any data supporting alternate repair and maintenance cost estimates.

See section VII.B for a complete list of issues on which DOE seeks comments. See chapter 8 of the TSD for more information on the repair and maintenance costs for small electric motors.

6. Motor Lifetime

To characterize lifetimes in a manner that would reflect the fact that this factor is dependent on its application, DOE used two Weibull distributions.[44] One characterizes the motor lifetime in total operating hours (*i.e.,* mechanical lifetime), while the other characterizes the lifetime in years of use in the application (*e.g.,* a pump). DOE used mechanical lifetime data from the 2010 small electric motors final rule analysis and from DOE's Advanced Manufacturing Office[45] and estimated an average mechanical lifetime of 30,000 hours for CSCR motors and of 40,000 hours for polyphase motors. The Weibull parameters from the March 2010 Final Rule were used to derive these lifetime distributions.[46] In the course of the life-cycle analysis, DOE's current analysis further combines these two distributions with OEM application lifetimes to estimate the distribution of small electric motor lifetimes. DOE determined the mechanical lifetime of each motor in years by dividing its mechanical lifetime in hours by its annual hours of operation. DOE then compared this mechanical lifetime (in years) with the sampled application lifetime (also in years), and assumed that the motor would be retired at the younger of these two ages. In the March 2010 Final Rule, this approach resulted in projected average lifetimes of 7 years for single-phase CSCR motors and 9 years for polyphase motors. In the April 2019 ECS RFI, DOE presented the average lifetimes from the March 2010 Final Rule (*i.e.* 7 years for single-phase CSCR motors and 9 years for polyphase motors). NEMA commented that 8 years was a reasonable starting point to estimate lifetime for small electric motors. NEMA did not provide lifetime estimates by equipment class and noted that the actual lifetime is heavily dependent on the application. (NEMA, No. 11 at p. 15). Because of updates made to the annual operating hours (see section IV.E.3), the updated analysis for this NOPD yielded average lifetimes of 6.6 years for single-phase CSCR motors and 8.5 years for polyphase motors.

DOE seeks comment on the methodology it used for estimating small electric motor lifetimes, as well as any data supporting alternate values for these lifetimes.

See section VII.B for a complete list of issues on which DOE seeks comments. See chapter 8 of the TSD for more information on the lifetime of small electric motors.

7. Discount Rates

In calculating LCC, DOE applies discount rates appropriate to commercial, industrial, and residential consumers to estimate the present value of future operating costs. DOE estimated a distribution of discount rates for small electric motors based on the cost of capital of publicly traded firms in the sectors that purchase small electric motors.

As part of its analysis, DOE also applies weighted average discount rates calculated from consumer debt and asset data, rather than marginal or implicit discount rates.[47] DOE notes that the LCC does not analyze the equipment purchase decision, so the implicit discount rate is not relevant in this model. The LCC estimates net present value over the lifetime of the equipment, so the appropriate discount rate will reflect the general opportunity cost of household funds, taking this time scale into account. Given the long time horizon modeled in the LCC, the application of a marginal interest rate associated with an initial source of funds is inaccurate. Regardless of the method of purchase, consumers are expected to continue to rebalance their debt and asset holdings over the LCC analysis period, based on the restrictions consumers face in their debt payment requirements and the relative size of the interest rates available on debts and assets. DOE estimates the aggregate impact of this rebalancing using the historical distribution of debts and assets.

To establish residential discount rates for the LCC analysis, DOE identified all relevant household debt or asset classes in order to approximate a consumer's opportunity cost of funds related to appliance energy cost savings. It estimated the average percentage shares of the various types of debt and equity by household income group using data from the Federal Reserve Board's Survey of Consumer Finances[48] (''SCF'') for 1995, 1998, 2001, 2004, 2007, 2010, 2013, and 2016. Using the SCF and other sources, DOE developed a distribution of rates for each type of debt and asset by income group to represent the rates that may apply in the year in which amended standards would take effect.

For commercial and industrial consumers, DOE used the cost of capital to estimate the present value of cash flows to be derived from a typical company project or investment. Most companies use both debt and equity capital to fund investments, so the cost of capital is the weighted-average cost to the firm of equity and debt financing. This corporate finance approach is referred to as the weighted-average cost of capital. DOE used currently available economic data in developing discount rates. See chapter 8 of the TSD for details on the development of end-user discount rates.

8. 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 considered 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 its analysis for the March 2010 Final Rule,

[44] The Weibull distribution is one of the most commonly used distributions in reliability. It is commonly used to model time to fail, time to repair and material strength.

[45] U.S. Department of Energy. Advanced Manufacturing Office. *Motors Systems Tip Sheet #3. Energy Tips: Motor Systems. Extending the Operating Life of Your Motor.* 2012. *https://www.energy.gov/sites/prod/files/2014/04/f15/extend_motor_operlife_motor_systemts3.pdf.*

[46] For more details see chapter 8 of the 2010 small electric motors final rule TSD, at *https://www.regulations.gov/document?D=EERE-2007-BT-STD-0007-0036.*

[47] The implicit discount rate is inferred from a consumer purchase decision between two otherwise identical goods with different first cost and operating cost. It is the interest rate that equates the increment of first cost to the difference in net present value of lifetime operating cost, incorporating the influence of several factors: Transaction costs; risk premiums and response to uncertainty; time preferences; interest rates at which a consumer is able to borrow or lend.

[48] Board of Governors of the Federal Reserve System. *Survey of Consumer Finances.* 1995, 1998, 2001, 2004, 2007, 2010, 2013, and 2016. Available at: *http://www.federalreserve.gov/econresdata/scf/scfindex.htm.*

DOE developed no-new standards case efficiency distributions based on the distributions of currently available models for which small electric motor efficiency is included in catalog listings. In preparation for the NOPD, DOE collected updated catalog data and analyzed the distribution of small electric motors in the manufacturer catalog data for CSCR and polyphase small electric motors.[49] In response to the April 2019 RFI, DOE did not receive any input on projected efficiency trends. DOE projected that these efficiency distributions would remain constant throughout 2028. See chapter 8 of the TSD for the estimated efficiency distributions.

9. Payback Period Analysis

The PBP is the amount of time it takes the consumer to recover the additional installed cost of more-efficient equipment, compared to baseline equipment, through energy cost savings. PBPs are expressed in years. PBPs that exceed the life of the equipment mean that the increased total installed cost is not recovered in reduced operating expenses.

The inputs to the simple PBP calculation for each efficiency level are the change in total installed cost of the equipment and the change in the first-year annual operating expenditures relative to the baseline. The simple PBP calculation uses the same inputs as the LCC analysis, except that discount rates are not needed.

G. Other Comments Received

In response to the April 2019 ECS RFI, DOE also received comments on aspects of the standards for small electric motors that do not relate to the methodologies or discussions presented in other sections of this document. This section addresses these stakeholder comments.

The Institute for Policy Integrity commented on monetizing the benefits of emissions reductions in analyzing the national impact and selecting the maximum economically justified efficiency level. (Institute for Policy Integrity, No. 5 at p. 1) DOE also received a comment from an individual questioning how DOE would ensure that GHG (*i.e.* greenhouse gas) emissions would not increase as a result of amended standards. (Zach Belanger, No. 7 at p. 1)

[49] DOE relied on 140 models of CSCR small electric motors and 229 models of polyphase small electric motors identified in the manufacturer catalog data. More details on the distributions of currently available models for which motor catalog list efficiency is available in Chapter 8 of the TSD.

As discussed previously, under the periodic review of energy conservation standards required by EPCA, DOE is directed to consider whether amended standards would result in significant conservation of energy; are technologically feasible; and would be cost effective. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1) and 42 U.S.C. 6295 (n)(2)) In evaluating the cost-effectiveness of amended standards, EPCA requires DOE to consider the savings in operating costs throughout the estimated average life of the covered equipment in the type (or class) compared to any increase in price, initial charges, or maintenance expenses of the covered equipment that are likely to result from the imposition of the standard. (See 42 U.S.C. 6295(n)(2)(C) and 42 U.S.C. 6295(o)(2)(B)(II)) DOE has tentatively determined that the potential standards would not be cost-effective as defined in EPCA. See section V.B., infra. DOE has not conducted an emissions analysis as would generally be performed were DOE to propose amended energy conservation standards.

The CA IOUs suggested that DOE adopt a common metric between small electric motors and electric motors. The CA IOUs commented that different metrics create confusion and represent an additional burden for the motor industry. The CA IOUs recommended consideration of a single metric for both small electric motors and electric motors or development of a new metric in consultation with industry. (CA IOUs, No. 10 at p. 4)

The energy conservation standards for small electric motors at 10 CFR 431.446 are expressed in terms of average full-load efficiency, while the standards for electric motors at 10 CFR 431.25 are expressed in terms of nominal full-load efficiency. The nominal efficiency values for electric motors are based on a sequence of discretized standard values in NEMA Standard MG 1–2016 Table 12–10, and are familiar to motor users. Under this approach, the full-load efficiency is identified on the electric motor nameplate by a nominal efficiency level selected from Table 12–10 that shall not be greater than the average efficiency of a large population of motors of the same design. However, NEMA has not adopted a comparable set of standardized values for small electric motors. Because no standardized nominal values are published for small electric motors, DOE is unable to consider at this time their appropriateness as a small electric motor performance metric. Absent standardized nominal values for small electric motors, DOE is unable to ascertain whether existing energy conservation standards would require the same level of stringency if based on nominal values. Therefore, DOE is not proposing to amend the metric for small electric motor energy conservation standards in this document.

Finally, DOE received a comment from an individual requesting information on the RFI data collection process, specifically in reference to the privacy of manufacturers and consumers. (Palubin, No. 2 at p. 1) As provided in the April 2019 ECS RFI, DOE accepted written comments from the public on any subject within the scope of the small electric motors energy conservation standards. The confidentiality of comments submitted is addressed in section VII of this document, including requests to have comments treated as confidential under 10 CFR 1004.11.

V. Analytical Results and Conclusions

The following section addresses the results from DOE's analyses with respect to the considered energy conservation standards for small electric motors examined by DOE.

A. Energy Savings

For each standards case considered, DOE estimated the per unit lifetime energy savings for small electric motors purchased in the expected compliance year of any potential standards. DOE did not separately evaluate the significance of the potential energy conservation under the considered amended standard because it has tentatively determined that the potential standards would not be cost-effective as defined in EPCA. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)(A); 42 U.S.C. 6295(n)(2))

B. Cost Effectiveness

In general, higher-efficiency equipment affects consumers in two ways: (1) Purchase price increases and (2) annual operating cost decreases. Inputs used for calculating the LCC and PBP include total installed costs (*i.e.,* equipment price plus installation costs), and operating costs (*i.e.,* annual energy and water use, energy and water prices, energy and water price trends, repair costs, and maintenance costs). The LCC calculation also uses equipment lifetime and a discount rate.

Table V–1 through Table V–7 show the LCC and PBP results for the ELs considered for each equipment class. Results for each representative unit are presented by two tables: In the first of each pair of tables, the simple payback is measured relative to the baseline equipment. In the second table, the impacts are measured relative to the efficiency distribution in the no-new-standards case in the expected compliance year for the potential standards considered. Because some consumers purchase equipment with higher efficiency in the no-new-standards case, the average savings are greater than the difference between the average LCC of the baseline equipment and the average LCC at each EL. The savings refer only to consumers who are affected by a standard at a given EL. Those who already purchase a small electric motor with efficiency at or above a given EL are not affected. Consumers for whom the LCC-increases at a given EL experience a net cost.

TABLE V–1—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR REPRESENTATIVE UNIT 1: SINGLE-PHASE, CSCR, 4-POLE, 0.75 HP

Efficiency Level	Average costs 2018$				Simple payback years	Average lifetime years
	Total installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	465.8	156.2	600.6	1,066.3		6.6
1	481.8	153.8	591.4	1,073.2	6.7	6.6
2	502.1	151.1	580.7	1,082.8	7.0	6.6
3	544.4	149.7	575.4	1,119.8	12.0	6.6
4	571.9	145.2	558.1	1,130.0	9.6	6.6
5	1,403.1	142.7	548.3	1,951.4	69.2	6.6

Note: The results for each EL represent the average value if all purchasers in the sample use equipment with that efficiency level. The PBP is measured relative to the baseline equipment.

TABLE V–2—LCC SAVINGS RELATIVE TO THE NO-NEW STANDARDS CASE EFFICIENCY DISTRIBUTION FOR REPRESENTATIVE UNIT 1: SINGLE-PHASE, CSCR, 4-POLE, 0.75 HP

Efficiency level	Life-cycle cost savings	
	Percent of customers that experience	Average savings*
	Net cost (percent)	2018$
1	78.3	−6.8
2	81.8	−16.3
3	90.7	−53.3
4	89.8	−63.0
5	100.0	−884.3

* The savings represent the average LCC for affected consumers.

TABLE V–3—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR REPRESENTATIVE UNIT 2: POLYPHASE, 4-POLE, 1 HP

Efficiency level	Average costs 2018$				Simple payback years	Average lifetime years
	Total installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	450.4	192.8	923.1	1,373.5		8.5
1	519.7	188.7	903.2	1,423.0	16.7	8.5
2	579.3	186.2	891.4	1,470.7	19.5	8.5
3	1,386.3	182.8	875.2	2,261.4	93.6	8.5

Note: The results for each EL represent the average value if all purchasers in the sample use equipment with that efficiency level. The PBP is measured relative to the baseline equipment.

TABLE V–4—LCC SAVINGS RELATIVE TO THE NO-NEW STANDARDS CASE EFFICIENCY DISTRIBUTION FOR REPRESENTATIVE UNIT 2: POLYPHASE, 4-POLE, 1 HP

Efficiency level	Life-cycle cost savings	
	Percent of customers that experience	Average Savings*
	Net cost (percent)	2018$
1	85.8	−49.4
2	98.7	−95.3
3	99.2	−885.4

* The savings represent the average LCC for affected consumers.

TABLE V–5—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR REPRESENTATIVE UNIT 3: SINGLE-PHASE, CSCR, 4-POLE, 1 HP

Efficiency level	Average costs 2018$				Simple payback years	Average lifetime years
	Total installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	529.6	206.3	784.1	1,313.8		6.6
1	547.9	203.3	772.5	1,320.3	5.9	6.6
2	570.9	199.9	759.5	1,330.4	6.4	6.6
3	619.1	198.1	752.8	1,371.9	10.9	6.6
4	650.3	192.4	731.1	1,381.5	8.7	6.6
5	1,594.9	189.1	718.6	2,313.5	61.9	6.6

Note: The results for each EL represent the average value if all purchasers in the sample use equipment with that efficiency level. The PBP is measured relative to the baseline equipment.

TABLE V–6—LCC SAVINGS RELATIVE TO THE NO-NEW STANDARDS CASE EFFICIENCY DISTRIBUTION FOR REPRESENTATIVE UNIT 3: SINGLE-PHASE, CSCR, 4-POLE, 1 HP

Efficiency level	Life-cycle cost savings	
	Percent of customers that experience	Average savings*
	Net cost (percent)	2018$
1	74.5	−6.5
2	78.8	−16.6
3	87.7	−58.0
4	86.8	−66.9
5	100.0	−998.9

* The savings represent the average LCC for affected consumers.

TABLE V–7—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR REPRESENTATIVE UNIT 4: POLYPHASE, 4-POLE, 0.5 HP

Efficiency level	Average costs 2018$				Simple payback years	Average lifetime years
	Total installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	374.2	107.3	510.8	885.0		8.4
1	431.7	104.1	495.5	927.2	17.9	8.4
2	481.3	102.1	486.0	967.3	20.6	8.4
3	1,150.6	99.4	473.4	1,624.0	99.0	8.4

Note: The results for each EL represent the average value if all purchasers in the sample use equipment with that efficiency level. The PBP is measured relative to the baseline equipment.

TABLE V–8—LCC SAVINGS RELATIVE TO THE NO-NEW STANDARDS CASE EFFICIENCY DISTRIBUTION FOR REPRESENTATIVE UNIT 4: POLYPHASE, 4-POLE, 0.5 HP

Efficiency level	Life-cycle cost savings	
	Percent of customers that experience	Average savings*
	Net cost (percent)	2018$
1	88.2	−42.1
2	99.8	−80.5
3	100.0	−737.2

* The savings represent the average LCC for affected consumers.

C. Proposed Determination

For this proposed determination, DOE considered the amount of energy savings conservation, technological feasibility, and cost effectiveness of potential amended standards for small electric motors at each considered EL. (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295 (n)(2)) As presented in the prior section, DOE projects that the average customer purchasing a representative small electric motor would experience an increase in LCC at each evaluated standards case as compared to the no new standards case. The simple PBP for the average of a representative small electric motor customer at each EL is projected to be generally longer than the mean lifetime of the equipment. Based on the above considerations, DOE has tentatively determined that more stringent amended energy conservation standards for small electric motors cannot satisfy the relevant statutory requirements because such standards would not be cost effective as required and described under EPCA. (See 42 U.S.C. 6295(n)(2) and (o)(2)(B)(II))

DOE seeks comment on its analysis indicating that increasing the stringency of the energy conservation standards for small electric motors are not cost effective.

VI. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866

This proposed determination has been determined to be not significant for purposes of Executive Order (''E.O.'') 12866, ''Regulatory Planning and Review.'' 58 FR 51735 (Oct. 4, 1993). As a result, the Office of Management and Budget (''OMB'') did not review this proposed determination.

B. Review Under Executive Orders 13771 and 13777

On January 30, 2017, the President issued E.O. 13771, ''Reducing Regulation and Controlling Regulatory Costs.'' E.O. 13771 stated the policy of the executive branch is to be prudent and financially responsible in the expenditure of funds, from both public and private sources. E.O. 13771 stated it is essential to manage the costs associated with the governmental imposition of private expenditures required to comply with Federal regulations.

Additionally, on February 24, 2017, the President issued E.O. 13777, ''Enforcing the Regulatory Reform Agenda.'' See 82 FR 12285 (March 1, 2017). E.O. 13777 required the head of each agency to designate an agency official as its Regulatory Reform Officer (''RRO''). Each RRO oversees the implementation of regulatory reform initiatives and policies to ensure that agencies effectively carry out regulatory reforms, consistent with applicable law. Further, E.O. 13777 requires the establishment of a regulatory task force at each agency. The regulatory task force is required to make recommendations to the agency head regarding the repeal, replacement, or modification of existing regulations, consistent with applicable law. At a minimum, each regulatory reform task force must attempt to identify regulations that:

(1) Eliminate jobs, or inhibit job creation;

(2) Are outdated, unnecessary, or ineffective;

(3) Impose costs that exceed benefits;

(4) Create a serious inconsistency or otherwise interfere with regulatory reform initiatives and policies;

(5) Are inconsistent with the requirements of the Information Quality Act, or the guidance issued pursuant to that Act, particularly those regulations that rely in whole or in part on data, information, or methods that are not publicly available or that are insufficiently transparent to meet the standard for reproducibility; or

(6) Derive from or implement Executive Orders or other Presidential directives that have been subsequently rescinded or substantially modified.

DOE initially concludes that this proposed determination is consistent with the directives set forth in these executive orders. As discussed in this document, DOE is proposing not to amend the current energy conservation standards for small electric motors and this proposal is estimated to have no cost impact. Therefore, if finalized as proposed, this determination is expected to be an E.O. 13771 other action.

C. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis (''IRFA'') and a final regulatory flexibility analysis (''FRFA'') for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (Aug. 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website (*http://energy.gov/gc/office-general-counsel*).

DOE reviewed this proposed determination pursuant to the Regulatory Flexibility Act and the procedures and policies discussed above. DOE has tentatively concluded that, based on the data and available information it has been able to review, amended energy conservation standards for small electric motors would not be cost-effective. Therefore, DOE is not proposing to amend the current energy conservation standards for small electric motors. On the basis of the foregoing, DOE certifies that this proposed determination, if adopted, will not have a significant economic impact on a substantial number of small entities. Accordingly, DOE has not prepared an IRFA for this proposed determination. DOE will transmit this certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

D. Review Under the Paperwork Reduction Act

Manufacturers of small electric motors must certify to DOE that their products comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their equipment according to the DOE test procedures, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including small electric motors. 76 FR 12422 (March 7, 2011); 80 FR 5099 (Jan. 30, 2015). The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (''PRA''). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 30 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

The proposed determination, which tentatively finds that amended energy conservation standards for small electric motors would not be cost effective, impose no new information or record keeping requirements. Accordingly, the Office of Management and Budget (OMB) clearance is not required under the Paperwork Reduction Act. (44 U.S.C. 3501 *et seq.*)

E. Review Under the National Environmental Policy Act of 1969

DOE is analyzing this proposed action in accordance with the National Environmental Policy Act (''NEPA'') and DOE's NEPA implementing regulations (10 CFR part 1021). DOE's regulations include a categorical exclusion for actions which are interpretations or rulings with respect to existing regulations. 10 CFR part 1021, subpart D, appendix A4. DOE anticipates that this action qualifies for categorical exclusion A4 because it is an interpretation or ruling in regards to an existing regulation and otherwise meets the requirements for application of a categorical exclusion. See 10 CFR 1021.410. DOE will complete its NEPA review before issuing the final action.

F. Review Under Executive Order 13132

Executive Order 13132, ''Federalism,'' 64 FR 43255 (Aug. 10, 1999), imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. As this proposed determination does not amend the standards for small electric motors, there is no impact on the policymaking discretion of the States. Therefore, no action is required by Executive Order 13132.

G. Review Under Executive Order 12988

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, ''Civil Justice Reform,'' imposes on Federal agencies the general duty to adhere to the following requirements: (1) Eliminate drafting errors and ambiguity, (2) write regulations to minimize litigation, (3) provide a clear legal standard for affected conduct rather than a general standard, and (4) promote simplification and burden reduction. 61 FR 4729 (Feb. 7, 1996). Regarding the review required by section 3(a), section 3(b) of Executive Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation (1) clearly specifies the preemptive effect, if any, (2) clearly specifies any effect on existing Federal law or regulation, (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction, (4) specifies the retroactive effect, if any, (5) adequately defines key terms, and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this proposed determination meets the relevant standards of Executive Order 12988.

H. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (''UMRA'') requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Public Law 104–4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect them. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820. DOE's policy statement is also available at *http://energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf.* This proposed determination does not contain a Federal intergovernmental mandate, nor is it expected to require expenditures of $100 million or more in any one year by the private sector. As a result, the analytical requirements of UMRA do not apply.

I. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This proposed determination would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

J. Review Under Executive Order 12630

Pursuant to Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 53 FR 8859 (March 18, 1988), DOE has determined that this proposed determination would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

K. Review Under the Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516, note) provides for Federal agencies to review most disseminations of information to the public under information quality guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed this proposed determination under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

L. Review Under Executive Order 13211

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,'' 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to the Office of Information and Regulatory Affairs (''OIRA'') at OMB, a Statement of Energy Effects for any significant energy action. A ''significant energy action'' is defined as any action by an agency that promulgates or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy, or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

Because this proposed determination would not amend the current standards for small electric motors, it is not a significant energy action, nor has it been designated as such by the Administrator at OIRA. Accordingly, DOE has not prepared a Statement of Energy Effects.

M. Review Under the Information Quality Bulletin for Peer Review

On December 16, 2004, OMB, in consultation with the Office of Science and Technology Policy (''OSTP''), issued its Final Information Quality Bulletin for Peer Review (''the Bulletin''). 70 FR 2664 (Jan. 14, 2005). The Bulletin establishes that certain scientific information shall be peer reviewed by qualified specialists before it is disseminated by the Federal Government, including influential scientific information related to agency regulatory actions. The purpose of the bulletin is to enhance the quality and credibility of the Government's scientific information. Under the Bulletin, the energy conservation standards rulemaking analyses are ''influential scientific information,'' which the Bulletin defines as ''scientific information the agency reasonably can determine will have, or does have, a clear and substantial impact on important public policies or private sector decisions.'' 70 FR 2667.

In response to OMB's Bulletin, DOE conducted formal in-progress peer reviews of the energy conservation standards development process and analyses and has prepared a Peer Review Report pertaining to the energy conservation standards rulemaking analyses. Generation of this report involved a rigorous, formal, and documented evaluation using objective criteria and qualified and independent reviewers to make a judgment as to the technical/scientific/business merit, the actual or anticipated results, and the productivity and management effectiveness of programs and/or projects. The ''Energy Conservation Standards Rulemaking Peer Review Report'' dated February 2007 has been disseminated and is available at: *http://www.energy.gov/eere/buildings/peer-review.*

VII. Public Participation

A. Submission of Comments

DOE will accept comments, data, and information regarding this proposed determination no later than the date provided in the **DATES** section at the beginning of this proposed determination. Interested parties may submit comments, data, and other information using any of the methods described in the **ADDRESSES** section at the beginning of this document.

Submitting comments via *http://www.regulations.gov.* The *http://www.regulations.gov* web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies 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 itself 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. Otherwise, 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 *http://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 in 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, in which case 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, that are written in English, and that are 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. Pursuant 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).

B. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

1. DOE seeks comment on the selection of representative equipment classes for CSCR and polyphase motors and the tentative determination that more stringent energy conservation standards for CSIR motors are not technologically feasible.
2. DOE seeks comment on the methodologies employed in the engineering analysis, specifically regarding the adoption of the motor designs and associated efficiency levels considered in the March 2010 Final Rule analysis as the basis for this proposed determination.
3. DOE seeks input on whether and how the costs estimated for motor designs considered in the March 2010 Final Rule have changed since the time of that analysis. DOE also requests information on the investments (including related costs) necessary to incorporate specific design 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, and manufacturing/production impacts.
4. DOE seeks input on implementing a similar scaling methodology as that used for the March 2010 Final Rule in this NOPD.
5. DOE seeks comment on the methodology and data used for estimating end-user prices for small electric motors.
6. DOE seeks comments on how whether additions or changes should be made to the energy use analysis as well as any data supporting alternate inputs to characterize the variability in annual energy consumption for small electric motors.
7. DOE seeks comment on the approach used for estimating distribution of consumers of small electric motors across applications and sectors, as well as any data supporting the use of alternate distributions.
8. DOE seeks comment on the methodology used for estimating the distribution of motor load for each application and sector, as well as any data supporting alternate distributions.
9. DOE seeks comment on the methodology used to estimate annual operating hours, as well as any data supporting alternate distribution of operating hours by application and sector.
10. DOE seeks comment on the methodology used to estimate installation costs as well as any data supporting alternate installation cost estimates.
11. DOE seeks comment on the assumptions for estimating repair and maintenance costs as well as any data supporting alternate repair and maintenance cost estimates.
12. DOE seeks comment on the methodology it used for estimating small electric motor lifetimes, as well as any data supporting alternate values for these lifetimes.
13. DOE seeks comment on its analysis indicating that increasing the stringency of the energy conservation standards for small electric motors are not cost effective.
14. Additionally, DOE welcomes comments on other issues relevant to the conduct of this rulemaking that may not specifically be identified in this document.

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this proposed determination.

Signed in Washington, DC, on April 6, 2020.

Daniel R Simmons,

Assistant Secretary for Energy, Efficiency and Renewable Energy.

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