DEPARTMENT OF ENERGY

10 CFR Part 430

[EERE–2021–BT–STD–0029]

RIN 1904–AE64

Energy Conservation Program: Energy Conservation Standards for Consumer Furnace Fans

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

ACTION: Final determination.

SUMMARY: The Energy Policy and Conservation Act, as amended (''EPCA''), prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including consumer furnace fans. EPCA also requires the U.S. Department of Energy (''DOE'') to periodically review its existing standards to determine whether more-stringent, amended standards would be technologically feasible and economically justified, and would result in significant energy savings. In this final determination, DOE has determined the energy conservation standards for consumer furnace fans do not need to be amended.

DATES: The effective date of this final determination is November 18, 2024.

ADDRESSES: The docket for this activity, which includes **Federal Register** notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials, is available for review at *www.regulations.gov.* All documents in the docket are listed in the *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 *www.regulations.gov/docket/EERE-2021-BT-STD-0029.* The docket web page contains instructions on how to access all documents, including public comments, in the docket.

FOR FURTHER INFORMATION CONTACT:

Ms. Julia Hegarty, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE–5B, 1000 Independence Avenue SW, Washington, DC 20585–0121. Telephone: (240) 597–6737 Email: *ApplianceStandardsQuestions@ee.doe.gov.*

Mr. Eric Stas, U.S. Department of Energy, Office of the General Counsel, GC–33, 1000 Independence Avenue SW, Washington, DC 20585–0121. Telephone: (202) 586–4798. Email: *Eric.Stas@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 Final Determination

The Energy Policy and Conservation Act, Public Law 94–163, as amended (''EPCA''),[1] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317, as codified) Title III, Part B[2] of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles. (42 U.S.C. 6291–6309) These products include consumer furnace fans, the subject of this final determination. (42 U.S.C. 6295(f)(4)(D))

Pursuant to EPCA, DOE is required to review its existing energy conservation standards for covered consumer products no later than six years after issuance of any final rule establishing or amending a standard. (42 U.S.C. 6295(m)(1)) Pursuant to that statutory provision, DOE must publish either a

[1] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Public Law 116–260 (Dec. 27, 2020), which reflects the last statutory amendments that impact Parts A and A–1 of EPCA.

[2] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part 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). (*Id.*) DOE has conducted this review of the energy conservation standards for consumer furnace fans under EPCA's six-year-lookback authority described herein.

For this final determination, DOE analyzed consumer furnace fans subject to energy conservation standards specified in the Code of Federal Regulations (''CFR'') at 10 CFR 430.32(y). DOE first analyzed the technological feasibility of more energy-efficient consumer furnace fans. For those consumer furnace fans for which DOE determined higher standards to be technologically feasible, DOE evaluated whether higher standards would be cost-effective for consumers by conducting life-cycle cost (''LCC'') and payback period (''PBP'') analyses. In addition, DOE estimated energy savings that would result from potential energy conservation standards by conducting a national impact analysis (''NIA''), in which it estimated the net present value (''NPV'') of the total costs and benefits experienced by consumers.

Based on the results of the analyses, summarized in section V of this document, DOE has determined that the current standards for consumer furnace fans do not need to be amended and is issuing this final determination accordingly.

II. Introduction

The following sections briefly discuss the statutory authority underlying this final determination, as well as some of the historical background relevant to the establishment of energy conservation standards for consumer furnace fans.

A. Authority

Among other things, EPCA authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317, as codified) Title III, Part B [3] of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles. These products include consumer furnace fans, the subject of this document. (42 U.S.C. 6295(f)(4)(D)) Specifically, EPCA authorized DOE to establish energy conservation standards for electricity used for the purpose of circulating air through ductwork. (*Id.*)

The energy conservation program under EPCA consists essentially of four parts: (1) testing; (2) labeling; (3) the establishment of Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

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

Subject to certain criteria and conditions, DOE is required to develop test procedures to measure the energy efficiency, energy use, or estimated annual operating cost of each covered product. (42 U.S.C. 6295(o)(3)(A) and 42 U.S.C. 6295(r)) Manufacturers of covered products must use the prescribed DOE test procedure as the basis for certifying to DOE that their product complies with the applicable energy conservation standards and as the basis for any representations regarding the energy use or energy efficiency of the product. (42 U.S.C. 6293(c) and 42 U.S.C. 6295(s)) Similarly, DOE must use these test procedures to evaluate whether a basic model complies with the applicable energy conservation standard(s). (42 U.S.C. 6295(s)) The DOE test procedures for consumer furnace fans appear at title 10 CFR part 430, subpart B, appendix AA.

As noted previously, not later than six years after the issuance of any final rule establishing or amending a standard, DOE must publish either a notice of proposed determination (''NOPD'') that standards for the product do not need to be amended, or a NOPR including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6295(m)(1) and (3)) EPCA further provides that, not later than three years the issuance of a final determination not to amend standards, DOE must publish either a notification of determination that standards for the product do not need to be amended, or a NOPR including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6295(m)(3)(B)) DOE must make the analysis on which a NOPD or NOPR is based publicly available and provide an opportunity for written comment. (42 U.S.C. 6295(m)(2))

A determination that amended standards are not needed must be based on consideration of whether amended standards will result in significant conservation of energy, are technologically feasible, and are cost-effective. (42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295(n)(2)) Additionally, any new or amended energy conservation standard prescribed by the Secretary for any type (or class) of covered product shall be designed to achieve the maximum improvement in energy efficiency which the Secretary determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) Among the factors DOE considers in evaluating whether a proposed standard level is economically justified includes whether the proposed standard at that level is cost-effective, as defined under 42 U.S.C. 6295(o)(2)(B)(i)(II). 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 products in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses for the covered products that are likely to result from the standard. (42 U.S.C. 6295(n)(2) and 42 U.S.C. 6295(o)(2)(B)(i)(II))

Finally, pursuant to the amendments to EPCA contained in the Energy Independence and Security Act of 2007 (''EISA 2007''), Public Law 110–140, any final rule for new or amended energy conservation standards promulgated after July 1, 2010, is required to address standby mode and off mode energy use. (42 U.S.C. 6295(gg)(3)) Specifically, when DOE adopts a standard for a covered product after that date, it must, if justified by the criteria for adoption of standards under EPCA (42 U.S.C. 6295(o)), incorporate standby mode and off mode energy use into a single standard, or, if that is not feasible, adopt a separate standard for such energy use for that product. (42 U.S.C. 6295(gg)(3)(A)–(B)) However, in a test procedure final rule for furnace fans published in the **Federal Register** on January 3, 2014, DOE has previously determined that there is no need to address standby mode and off mode energy use in the standards for consumer furnace fans, as the standby

[3] As noted previously, for editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

mode and off mode energy use associated with furnace fans is accounted for by the standards and test procedures for the products in which furnace fans are used (*i.e.,* consumer furnaces and consumer central air conditioners and heat pumps). 79 FR 500, 504–505. DOE maintained the same approach in the most recent amended test procedure for consumer furnace fans, which was published in the **Federal Register** on April 12, 2024 (''April 2024 TP Final Rule''; 89 FR 25780, 25782) and continues to do so here for the reasons previously stated.

DOE is publishing this final determination pursuant to the six-year-lookback review requirement in EPCA.

B. Background

1. Current Standards

DOE most recently completed a review of the subject consumer furnace fans standards in a final rule published in the **Federal Register** on July 3, 2014 (''July 2014 Final Rule''), through which DOE prescribed the current energy conservation standards for consumer furnace fans manufactured on and after July 3, 2019. 79 FR 38130. These standards are set forth in DOE's regulations at 10 CFR 430.32(y) and are shown in Table II.1.

TABLE II.1—FEDERAL ENERGY CONSERVATION STANDARDS FOR CONSUMER FURNACE FANS

Furnace fan product class *	Fan energy rating ** (watts/1,000 cubic feet per minute (''cfm''))
Non-Weatherized, Non-Condensing Gas (''NWG–NC'')	FER = 0.044 * Q_{max} + 182.
Non-Weatherized, Condensing Gas (''NWG–C'')	FER = 0.044 * Q_{max} + 195.
Weatherized, Non-Condensing Gas (''WG–NC'')	FER = 0.044 * Q_{max} + 199.
Non-Weatherized, Non-Condensing Oil Furnace Fan (''NWO–NC'')	FER = 0.071 * Q_{max} + 382.
Non-Weatherized Electric Furnace/Modular Blower Fan (''NWEF/NWMB'')	FER = 0.044 * Q_{max} + 165.
Mobile Home Non-Weatherized, Non-Condensing Gas Furnace Fan (''MH–NWG–NC'')	FER = 0.071 * Q_{max} + 222.
Mobile Home Non-Weatherized, Condensing Gas Furnace Fan (''MH–NWG–C'')	FER = 0.071 * Q_{max} + 240.
Mobile Home Electric Furnace/Modular Blower Fan (''MH–EF/MB'')	FER = 0.044 * Q_{max} + 101.
Mobile Home Non-Weatherized Oil Furnace Fan (''MH–NWO'')	Reserved.
Mobile Home Weatherized Gas Furnace Fan (''MH–WG'')	Reserved.

* Furnace fans incorporated into hydronic air handlers, small-duct high-velocity (''SDHV'') modular blowers, SDHV electric furnaces, and central air conditioners/heat pump indoor units are not subject to the standards listed in this table. See section IV.A.1 of this document for further discussion.

** Q_{max} is the airflow, in cfm, at the maximum airflow-control setting measured using the final DOE test procedure at 10 CFR part 430, subpart B, appendix AA.

2. Current Rulemaking History

DOE established energy conservation standards at 10 CFR 430.32(y) for furnace fans through the July 2014 Final Rule. 79 FR 38130. As discussed in section II.A of this document, EPCA authorized DOE to establish energy conservation standards for electricity used for the purpose of circulating air through ductwork. (42 U.S.C. 6295(f)(4)(D)) While the statutory language allows for regulation of the electricity use of any electrically-powered device applied to residential central heating, ventilation, and air conditioning (''HVAC'') systems for the purpose of circulating air through ductwork, in the July 2014 Final Rule, DOE established standards only for certain furnace fans used in furnaces and modular blowers. 79 FR 38130, 38146 (July 3, 2014). Compliance with the prescribed standards established for consumer furnace fans in the July 2014 Final Rule was required as of July 3, 2019. DOE's energy conservation standards for furnace fans use the fan energy rating (''FER'') metric, which is the ratio of the electrical energy consumption to airflow, expressed as watts per 1,000 cubic feet per minute of airflow (''W/1,000 cfm''). 10 CFR 430.32(y). In evaluating whether amended standards for furnace fans are warranted, DOE used the test procedure for determining FER which is established at 10 CFR part 430, subpart B, appendix AA, ''Uniform Test Method for Measuring the Energy Consumption of Furnace Fans'' (''appendix AA''). In parallel to this rulemaking, DOE conducted a test procedure rulemaking that considered whether amendments were warranted for the current test procedure for furnace fans. On May 13, 2022, DOE published in the **Federal Register** a NOPR concerning the test procedure for furnace fans (''May 2022 TP NOPR''). 87 FR 29576. Subsequently, DOE published the April 2024 TP Final Rule. 89 FR 25780.

In support of the present review of the consumer furnace fans energy conservation standards, DOE published a request for information (''RFI'') in the **Federal Register**, which identified various issues on which DOE sought comment to inform its determination of whether the standards need to be amended, on November 23, 2021 (''November 2021 RFI''). 86 FR 66465. The following year, on November 1, 2022, DOE published a notice of availability of the preliminary technical support document (''November 2022 Preliminary Analysis'') and the accompanying preliminary technical support document (''November 2022 Preliminary Analysis TSD'') in the **Federal Register**. 87 FR 65687. In the November 2022 Preliminary Analysis, DOE assessed potential amended standard levels for consumer furnace fans.

On September 20, 2022, a consent decree was issued for *NRDC et al.* v. *DOE* and *New York et al.* v. *DOE* that mandated that a final agency action pertaining to energy conservation standards (*i.e.,* a final rule amending energy conservation standards or a final determination not to amend standards) must be issued by October 31, 2024.

On October 6, 2023, DOE published a NOPD (''October 2023 NOPD'') in the **Federal Register**, which tentatively determined that the current standards for consumer furnace fans do not need to be amended. 88 FR 69826.

DOE received comments in response to the October 2023 NOPD from the interested parties listed in Table II.2.

TABLE II.2—LIST OF COMMENTERS WITH WRITTEN SUBMISSIONS IN RESPONSE TO THE OCTOBER 2023 NOPD

Commenter(s)	Abbreviation	Comment No. in the docket	Commenter type
Air-Conditioning, Heating, & Refrigeration Institute	AHRI	32	Manufacturer Trade Association.
Appliance Standards Awareness Project, American Council for an Energy-Efficient Economy, National Consumer Law Center, Natural Resources Defense Council, New York State Energy Research and Development Authority.	Joint Advocates	31	Efficiency Advocacy Organization.
Lennox International	Lennox	30	Manufacturer.
Michael Ravnitzky	Ravnitzky	29	Individual.

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[4]

III. General Discussion and Rationale

DOE developed this final determination after a review of the market for the subject consumer furnace fans. DOE also considered comments, data, and information from interested parties that represent a variety of interests. This final determination addresses issues raised by these commenters.

A. General Comments

This section summarizes general comments received from interested parties regarding rulemaking timing and process, as well as general recommendations on the standard levels.

In response to the October 2023 NOPD, AHRI commented that it agrees with DOE's proposed determination, stating that it is reasonable and appropriate and that the energy conservation standards for consumer furnace fans do not need to be amended at this time. (AHRI, No. 32 at p. 1) Lennox commented that the October 2023 NOPD indicates that more-stringent consumer furnace fan efficiency levels would cause most consumers to suffer net costs, and it supports DOE's determination to not amend furnace fan standards at this time. (Lennox, No. 30 at pp. 1–3) Ravnitzky supported DOE's proposed determination, stating that the ''cost-benefit analysis does not always demonstrate clear utility.'' Ravnitzky stated that DOE's analysis, which integrates durability and reliability design objectives, ensures that the standards developed are both functional and advantageous. (Ravnitzky, No. 29 at p. 1) Ravnitzky commented that furnace fans are used for air circulation both when the furnace or air conditioner is operating and during its inactive cycle, and that DOE's acknowledgement of furnace fan operation in both cycles is important to establish feasible and relevant standards. (*Id.*)

Conversely, the Joint Advocates commented that DOE should adopt standards that effectively require brushless permanent magnet (''BPM'') motors for all product classes (including oil and mobile home gas furnaces). (Joint Advocates, No. 31 at pp. 1–2) The Joint Advocates commented that, because DOE's analysis shows about 90 percent of mobile home gas furnaces achieve an efficiency level that assumes EL 1 (*i.e.,* a BPM motor), the availability of those products would likely not be affected by an amended standard. (Joint Advocates, No. 31 at pp. 1–2)

As part of the rulemaking process, DOE carefully considers the benefits and burdens of potential amended standards to determine whether the potential amended standards are the maximum standard levels that are technologically feasible and economically justified and would conserve a significant amount of energy, as required by EPCA (*see* 42 U.S.C. 6295(o)(2)(A) and (3)(B)). Given the small role of NWO–NC, MH–NWG–NC, MH–NWG–C, and MH–NWO in the overall furnace market, the declining shipments for the affected product classes, and the number of products that incorporate a BPM motor today, DOE concludes that the energy savings potential from this design option is limited. Further, DOE has concerns about availability of products if standards are amended. If any products lines are required to be updated, that may lead to manufacturers to choose to leave the market, thereby potentially impacting consumers if the market becomes more concentrated. This topic is discussed further in section IV of this document, which outlines DOE's approach to analyzing potential amended standard levels, and section V of this document, which includes a discussion of market considerations, as well as a detailed explanation of DOE's weighing of the benefits and burdens and the rationale for proposing not to amend standards for consumer furnace fans.

Ravnitzky recommended that DOE should mandate that manufacturers disclose the relative energy efficiency of the fans used in air handlers and air conditioners. The commenter stated that implementing an easily comparable metric/rating would allow consumers to make more energy-conscious decisions and encourage manufacturers to innovate their products. Ravnitzky further stated that, by mandating this information, DOE could create a market environment in which energy efficiency is a top consideration for product development and consumer purchasing. (Ravnitzky, No. 29 at p. 1) Further, Ravnitzky commented that DOE should establish a periodic review process to assess the standards' real-world performance and impact, evaluating the longevity, consumer satisfaction, and environmental benefits of the established standards in order to guarantee that standards adapt to technological advancements and market trends. (*Id.* at pp. 1–2) Finally, Ravnitzky commented that DOE should develop partnerships with industry experts and consumer advocacy groups to create refined and impactful energy conservation measures. (*Id.* at p. 2)

In response, DOE notes that the electrical energy consumption of fans used in HVAC products such as air handlers and air conditioners are accounted for by the seasonal energy efficiency ratio 2 (''SEER2'') and heating seasonal performance factor 2 (''HSPF2'') metrics measured by the test procedure for central air conditioners (''CACs'') and heat pumps at 10 CFR part 430, subpart B, appendix M1 (''Appendix M1''). These products are rated using a different metric than that used for furnace fans, as they have different functionalities and cannot not be directly compared. With regard to Ravnitzky's suggestion that DOE establish a collaborative, periodic review process, DOE notes that, as outlined in section II.A of this

[4] The parenthetical reference provides a reference for information located in the docket. (Docket No. EERE–2021–BT–STD–0029, which is maintained at *www.regulations.gov*). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

document, DOE is required to review its existing energy conservation standards for covered consumer products no later than six years after issuance of any final rule establishing or amending a standard (42 U.S.C. 6295(m)(1)) or three years after a determination that standards for the product do not need to be amended. (42 U.S.C. 6295(m)(3)(B)) In these reviews, DOE assesses factors including the economic impact of standards on consumers and national energy savings to capture the real-world impacts of amended standards. As a part of this process, DOE regularly engages with industry stakeholders through manufacturer interviews, public meetings/webinars, and written comments.

B. Product Classes and Scope of Coverage

When evaluating and establishing energy conservation standards, DOE divides covered products into product classes by the type of energy used or by capacity or other performance-related features that justify differing standards. In making a determination whether a performance-related feature justifies a different standard, DOE must consider factors such as the utility of the feature to the consumer and other factors DOE determines are appropriate. (42 U.S.C. 6295(q)) The scope of coverage and product classes for this final determination are discussed in further detail in section IV.A.1 of this document. This final determination covers those consumer products that meet the definition of a ''furnace fan'' as codified at 10 CFR 430.2. That provision states that a ''furnace fan'' is defined as an electrically-powered device used in a consumer product for the purpose of circulating air through ductwork. *Id.*

DOE did not receive any comments on product classes and scope of coverage in response to the October 2023 NOPD. Consequently, DOE is maintaining the same approach for the final determination.

C. Test Procedure

EPCA sets forth generally applicable criteria and procedures for DOE's adoption and amendment of test procedures. (42 U.S.C. 6293) Manufacturers of covered products must use these test procedures to quantify the efficiency of their product and as the basis for certifying to DOE that their product complies with the applicable energy conservation standards and as the basis for any representations regarding the energy use or energy efficiency of the product. (42 U.S.C. 6295(s) and 42 U.S.C. 6293(c)) Similarly, DOE must use these test procedures to evaluate whether a basic model complies with the applicable energy conservation standard(s) pursuant to EPCA. (42 U.S.C. 6295(s); 10 CFR 429.110(e))

The current test procedure for consumer furnace fans is codified at 10 CFR part 430, subpart B, appendix AA, *Uniform Test Method for Measuring the Energy Consumption of Furnace Fans.* Appendix AA includes provisions for determining the FER, the metric on which current standards are based (*see* 10 CFR 430.32(y)). DOE most recently updated appendix AA on April 12, 2024, when DOE published the April 2024 TP Final Rule in the **Federal Register**. 89 FR 25780. The April 2024 TP Final Rule adopted the following changes:

(1) Specify testing instructions for furnace fans incapable of operating at the required external static pressure (''ESP'');

(2) Incorporate by reference the most recent versions of industry standards, ASHRAE 103–2017 and ASHRAE 37–2009 (RA 2019), in 10 CFR 430.3;

(3) Incorporate by reference chapter 1 of the 2021 ASHRAE Handbook;

(4) Define ''dual-fuel furnace fans'' and exclude them from the scope of appendix AA;

(5) Change the term ''default airflow control settings'' to ''specified airflow control settings'';

(6) Make clarifications to nomenclature, correct the value of the conversion factor from watts to British Thermal Units per hour (''Btu/h''), and correct the units of specific volume of dry air;

(7) Revise the ambient temperature conditions allowed during testing to between 65 degrees Fahrenheit (''°F'') and 85 °F for all units (both condensing and non-condensing);

(8) Assign an allowable range of relative humidity during testing to be between 20 percent and 80 percent; and

(9) Require that the power measurements be determined as an average over the last 30 seconds of each steady-state period at intervals of no less than 1 per second, rather than taken as a single point measurement.

Id. at 89 FR 25780, 25783 (April 12, 2024).

DOE did not receive any comments on the furnace fans test procedure in response to the October 2023 NOPD.

D. Technological Feasibility

1. General Considerations

As discussed, a determination that amended energy conservation standards are not needed must be based on consideration of whether amended standards would result in significant conservation of energy, are technologically feasible, and are cost-effective. (42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295(n)(2))

To determine whether potential amended standards would be technologically feasible, DOE first develops a list of all known technologies and design options that could improve the efficiency of products that are the subject of the determination. DOE considers technologies incorporated in commercially-available products or in working prototypes to be ''technologically feasible.'' 10 CFR part 430, subpart C, appendix A, sections 6(b)(3)(i) and 7(b)(1). Section IV.A.2 of this document discusses the technology options identified and considered by DOE for this analysis for consumer furnace fans.

After DOE has determined which, if any, technologies and design options are technologically feasible, it further evaluates each technology and design option in light of the following additional screening criteria: (1) practicability to manufacture, install, and service; (2) adverse impacts on product utility or availability; (3) adverse impacts on health or safety; and (4) unique-pathway proprietary technologies. 10 CFR part 430, subpart C, appendix A, sections 6(b)(3)(ii)–(v) and 7(b)(2)–(5). Those technology options that are ''screened out'' based on these criteria are not considered further. Those technology and design options that are not screened out are considered as the basis for higher efficiency levels that DOE could consider for potential amended standards. Section IV.A.4 of this document discusses the results of the screening analysis conducted for this final determination.

2. Maximum Technologically Feasible Levels

EPCA requires that for any proposed rule that prescribes an amended or new energy conservation standard or prescribes no amendment or no new standard for a type (or class) of covered product, DOE must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for each type (or class) of covered products. (42 U.S.C. 6295(p)(1)) Accordingly, in the engineering analysis, DOE identifies the maximum technologically feasible efficiency level currently available on the market for consumer furnace fans. DOE also defines such ''max-tech'' efficiency level, representing the maximum theoretical efficiency that can be achieved through the application of all available technology options retained from the screening analysis.[5] In many cases, the max-tech efficiency level is not commercially available because it is not currently economically feasible. The max-tech levels that DOE determined for this analysis are described in section IV.B.1.c of this final determination.

E. Energy Savings

1. Determination of Savings

For each efficiency level (''EL'') evaluated, DOE projects anticipated energy savings from application of the EL to the consumer furnace fan products purchased during the 30-year period that begins in the assumed year of compliance with potential amended standards (2030–2059).[6] The savings are measured over the entire lifetime of products purchased during the 30-year analysis period. DOE quantifies the energy savings attributable to each EL as the difference in energy consumption between each standards case and the no-new-standards case. The no-new-standards case represents a projection of energy consumption that reflects how the market for such products would likely evolve in the absence of amended energy conservation standards.

DOE uses its NIA spreadsheet models to estimate national energy savings (''NES'') from potential amended standards for the products analyzed. The NIA spreadsheet model (described in section IV.G of this document) calculates energy savings in terms of site energy, which is the energy directly consumed by the products at the locations where they are used. For electricity, DOE reports NES in terms of primary energy savings, which is the savings in the energy that is used to generate and transmit the site electricity. For natural gas, the primary energy savings are considered to be equal to the site energy savings. DOE also calculates NES in terms of full-fuel-cycle (''FFC'') energy savings. The FFC metric includes the energy consumed in extracting, processing, and transporting primary fuels (*i.e.,* coal, natural gas, petroleum fuels), and, thus, presents a more complete picture of the impacts of energy conservation standards.[7] DOE's approach is based on the calculation of an FFC multiplier for each of the energy types used by covered products. Section IV.G.2 of this document provides more information on FFC energy savings.

2. Significance of Savings

As discussed, a determination that amended standards are not needed must be based on consideration of whether amended standards will result in significant conservation of energy, among other factors. (42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295(n)(2))

The significance of energy savings offered by a new or amended energy conservation standard cannot be determined without knowledge of the specific circumstances surrounding a given rulemaking.[8] For example, for some covered products, most of the energy consumption occurs during periods of peak energy demand. The impacts of these products on the energy infrastructure can be more pronounced than the impacts of products with relatively constant demand. Accordingly, DOE evaluates the significance of energy savings on a case-by-case basis. The significance of energy savings is further discussed in section V.B.1 of this final determination.

F. Cost-Effectiveness

As discussed, a determination that amended standards are not needed must be based on consideration of whether amended standards would be cost-effective, among other factors. (42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295(n)(2))

In evaluating cost-effectiveness, EPCA 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, initial charges, or maintenance expenses for the covered product that are likely to result from the standard. (42 U.S.C. 6295(n)(2)(c) and 42 U.S.C. 6295(o)(2)(B)(i)(II)) Cost-effectiveness is also one of the factors that DOE considers under 42 U.S.C. 6295(o)(2)(B) in determining whether new or amended standards are economically justified. (42 U.S.C. 6295(o)(2)(B)(i)(II))

In determining cost-effectiveness of potential amended standards for covered products, DOE generally conducts LCC and PBP analyses that estimate the costs and benefits to users from potential standards. Section IV.E of this document provides more information on the LCC and PBP analyses conducted for this final determination. To further inform DOE's consideration of the cost-effectiveness of potential amended standards, DOE considered the NPV of total costs and benefits estimated as part of the NIA. The inputs for determining the NPV of the total costs and benefits experienced by consumers are: (1) total annual installed cost, (2) total annual operating costs (energy costs and repair and maintenance costs), and (3) a discount factor to calculate the present value of costs and savings. The results of this analysis are discussed in section V.C.3 of this document.

G. Further Considerations

In determining whether a potential, more-stringent standard is economically justified, DOE must determine whether the benefits of the standard exceed its burdens. (42 U.S.C. 6295(o)(2)(B)(i)) DOE must make this determination after receiving comments on the proposed standard, and by considering, to the greatest extent practicable, the following seven statutory factors:

(1) The economic impact of the standard on manufacturers and consumers of the product subject to the standard;

(2) 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, initial charges for, or maintenance expenses of the covered product that are likely to result from the standard;

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

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

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

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

(7) Other factors the Secretary considers relevant.

(42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

The following sections discuss how DOE has addressed each of these seven factors in this final determination.

1. Economic Impact on Manufacturers and Consumers

In determining the impacts of a potential new or amended standard on manufacturers, DOE conducts a manufacturing impact analysis (''MIA''). DOE first uses an annual cash-flow approach to determine the quantitative impacts. This step includes both a short-

[5] In applying these design options, DOE would only include those that are compatible with each other that when combined, would represent the theoretical maximum possible efficiency.

[6] DOE also presents a sensitivity analysis that considers impacts for products shipped in a nine-year period.

[7] The FFC metric is discussed in DOE's statement of policy and notice of policy amendment. 76 FR 51281 (August 18, 2011), as amended at 77 FR 49701 (August 17, 2012).

[8] The numeric threshold for determining the significance of energy savings established in a final rule published in the **Federal Register** on February 14, 2020 (85 FR 8626, 8670) was subsequently eliminated in a final rule published in the **Federal Register** on December 13, 2021 (86 FR 70892).

term assessment—based on the cost and capital requirements during the period between when a regulation is issued and when entities must comply with the regulation—and a long-term assessment over a 30-year period. The industry-wide impacts analyzed include: (1) industry net present value, which values the industry on the basis of expected future cash flows; (2) cash flows by year; (3) changes in revenue and income; and (4) other measures of impact, as appropriate. Since DOE has determined not to amend the standards for consumer furnace fans, this final determination will have no cash-flow impacts on manufacturers. Accordingly, DOE did not conduct an MIA for this final determination.

For individual consumers, measures of economic impact include the changes in LCC and PBP associated with new or amended standards. These measures are discussed further in the following section. For consumers in the aggregate, DOE also calculates the national NPV of the consumer costs and benefits expected to result from particular standards. DOE also evaluates the impacts of potential standards on identifiable subgroups of consumers that may be affected disproportionately by a standard. Since DOE has determined not to amend the standards for consumer furnace fans, this final determination will have no disproportionate impact on identifiable subgroups of consumers. Accordingly, DOE did not conduct a subgroup analysis for this final determination.

2. Savings in Operating Costs Compared To Increase in Price

EPCA requires DOE to consider 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 that are likely to result from a standard. (42 U.S.C. 6295(m)(1); 42 U.S.C. 6295(n)(2), and 42 U.S.C. 6295(o)(2)(B)(i)(II)) DOE conducts this comparison in its LCC and PBP analyses.

For its LCC and PBP analyses, DOE assumes that consumers will purchase the covered product in the first year of compliance with new or 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 new or amended standards. DOE's LCC and PBP analyses is discussed in further detail in section IV.E of this document.

3. Energy Savings

EPCA requires DOE, in determining the economic justification of an amended standard, to consider the total projected energy savings that are expected to result directly from the standard. (42 U.S.C. 6295(o)(2)(B)(i)(III))

As discussed in section IV.G of this document, DOE uses the NIA spreadsheet models to project national energy savings that are expected to result directly from an amended standard.

4. Lessening of Utility or Performance of Products

In establishing product classes and in evaluating design options and the impact of potential standard levels, DOE evaluates potential standards that would not lessen the utility or performance of the considered product. (42 U.S.C. 6295(o)(2)(B)(i)(IV)) Since DOE has determined not to amend the standards for consumer furnace fans, this final determination will not impact the utility of such products.

5. Impact of Any Lessening of Competition

EPCA directs DOE to consider the impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from a standard. (42 U.S.C. 6295(o)(2)(B)(i)(V)) Since DOE has determined not to amend the standards for consumer furnace fans, DOE did not transmit a copy of its determination to the Attorney General for anti-competitive review.

6. Need for National Energy Conservation

DOE also considers the need for national energy conservation in determining whether a new or amended standard is economically justified. (42 U.S.C. 6295(o)(2)(B)(i)(VI)) The energy savings from the standards are likely to provide improvements to the security and reliability of the Nation's energy system. Reductions in the demand for electricity also may result in reduced costs for maintaining the reliability of the Nation's electricity system. DOE generally conducts a utility impact analysis to estimate how standards may affect the Nation's needed power generation capacity. However, since DOE has determined not to amend the standards for consumer furnace fans, DOE did not conduct this analysis.

DOE maintains that environmental and public health benefits associated with the more efficient use of energy are important to take into account when considering the need for national energy conservation. Amended standards are likely to result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with energy production and use. DOE generally conducts an emissions analysis to estimate how amended standards may affect these emissions. DOE also generally estimates the economic value of emissions reductions resulting from an amended standard. However, since DOE has determined not to amend the standards for consumer furnace fans, DOE did not conduct this analysis.

7. Other Factors

In determining whether an energy conservation standard is economically justified, DOE may consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6295(o)(2)(B)(i)(VII)) To the extent DOE identifies any relevant information regarding economic justification that does not fit into the other categories described previously, DOE could consider such information under ''other factors.''

IV. Methodology and Discussion of Related Comments

The following sections of this document address each key component of the analyses DOE has performed for this final determination with respect to consumer furnace fans. Comments received from interested parties are addressed in each relevant section.

A. Market and Technology Assessment

DOE develops information in the market and technology assessment that provides an overall picture of the market for the products concerned, including the purpose of the products, the industry structure, manufacturers, market characteristics, and technologies used in the products. This activity includes both quantitative and qualitative assessments, based primarily on publicly-available information. The subjects addressed in the market and technology assessment for this final determination include: (1) identification of the scope and product classes, (2) manufacturers and industry structure, (3) existing efficiency programs, (4) shipments information, (5) market and industry trends, and (6) technologies or design options for improving efficiency of consumer furnace fans. The key findings of DOE's market assessment are summarized in the following sections.

1. Product Classes and Scope of Coverage

In the October 2023 NOPD, DOE evaluated products within the same scope as those products for which DOE initially established energy conservation standards in the July 2014 Final Rule. 88 FR 69826, 69832 (Oct. 6, 2023). In this final determination, DOE is maintaining the scope of coverage as presented in the October 2023 NOPD. Products evaluated in this final determination include:

• Furnace fans used in weatherized and non-weatherized gas furnaces, oil furnaces, and electric furnaces; and
• Modular blowers

Consistent with the approach taken in the July 2014 Final Rule, products not addressed in this rulemaking include:

• Furnace fans used in other products, such as split-system CACs and heat pump indoor units, through-the-wall indoor units, small-duct high-velocity indoor units, energy recovery ventilators, heat recovery ventilators, draft inducer fans, exhaust fans, and hydronic air handlers; and
• Fans used in any non-ducted products, such as whole-house ventilation systems without ductwork, CAC condensing unit fans, room fans, and furnace draft inducer fans (because these products do not circulate air through ductwork).

DOE has previously determined that the DOE test procedure for furnace fans is not currently equipped to address fans contained in CACs, heat pumps, or other products. 79 FR 38130, 38149 (July 3, 2014). As mentioned in section III.A of this document, DOE has previously determined that SEER2 and HSPF2 capture a representative measure of CAC and heat pump performance, including fan energy consumption, during heating and cooling operations, and that the test method for determining these metrics is provided in appendix M1. (See, for example, discussion of appendix M1 amendments at 82 FR 1426, 1446–1460 (Jan. 5, 2017)) Therefore, DOE has not established standards covering such products. (42 U.S.C. 6295(o)(3)) Additionally, any products that are non-ducted or that do not move air through ductwork (*e.g.,* draft inducer fans) would not meet the definition of a furnace fan and are, therefore, out of scope of the existing regulations.

When evaluating and establishing or amending energy conservation standards, DOE may establish separate standards for a group of covered products (*i.e.,* establish a separate product class) if DOE determines that separate standards are justified based on the type of energy used, or if DOE determines that the product has a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a different standard. (42 U.S.C. 6295(q)) In making a determination whether a performance-related feature justifies a different standard, DOE considers such factors as the utility of the feature to the consumer and other factors DOE determines are appropriate. (*Id.*)

In its regulations at 10 CFR 430.32(y), DOE currently categorizes furnace fans into 10 product classes, as presented in Table IV.1. In the proposed determination, DOE maintained these 10 classes, with the exception of a change to the mobile home non-weatherized oil furnace fan (''MH–NWO'') class discussed later in this section. 88 FR 69826, 69833 (Oct. 6, 2023).

TABLE IV.1—CURRENT CONSUMER FURNACE FAN PRODUCT CLASSES

Product class
Non-Weatherized, Non-Condensing Gas Furnace Fan (''NWG–NC'').
Non-Weatherized, Condensing Gas Furnace Fan (''NWG–C'').
Weatherized Non-Condensing Gas Furnace Fan (''WG–NC'').
Non-Weatherized, Non-Condensing Oil Furnace Fan (''NWO–NC'').
Non-Weatherized Electric Furnace/Modular Blower Fan (''NWEF/NWMB'').
Mobile Home Non-Weatherized, Non-condensing Gas Furnace Fan (''MH–NWG–NC'').
Mobile Home Non-Weatherized, Condensing Gas Furnace Fan (''MH–NWG–C'').
Mobile Home Electric Furnace/Modular Blower Fan (''MH–EF/MB'').
Mobile Home Non-Weatherized Oil Furnace Fan (''MH–NWO'').*
Mobile Home Weatherized Gas Furnace Fan (''MH–WG'').*

* DOE created the MH–NWO and MH–MG product classes in the July 2014 Final Rule, but these classes do not currently have energy conservation standards.

As directed by EPCA and as previously noted, DOE must specify a different standard level for a type or class of products that has the same function or intended use if DOE determines that products within such group: (A) consume a different kind of energy from that consumed by other covered products within such type (or class), or (B) have a capacity or other performance-related feature that other products within such type (or class) do not have and such feature justifies a higher or lower standard. (42 U.S.C. 6295(q)(1)) As shown in Table IV.1, there are four determinants of product class for consumer furnace fans: (1) whether the associated furnace is non-weatherized or weatherized; (2) whether the associated furnace uses condensing or non-condensing technology; (3) whether or not the associated furnace is designed for use in a mobile home, and (4) the type of fuel used by the associated furnace. DOE's adoption of product classes for condensing and non-condensing furnace fans is discussed in the July 3, 2014 Furnace Fans ECS Final Rule and the December 18, 2023 Furnaces ECS Final Rule published in the **Federal Register** at 79 FR 38130, 38149–38150 and 88 FR 87502, 87537, respectively.

In the July 2014 Final Rule, DOE created product classes for MH–NWO furnace fans and MH–WG furnace fans, but DOE did not analyze or prescribe standards for either product class because of the lack of available data for those product classes. 79 FR 38130, 38150 (July 3, 2014). DOE is not aware of any products that would be considered MH–WG furnace fans at this time. However, DOE has become aware of a limited number of MH–NWO furnace fans that have been introduced to the market. The MH–NWO furnace fans that DOE identified are all used in non-condensing furnaces, so DOE analyzed a subset of the previously established but unanalyzed class—mobile home non-weatherized, oil, non-condensing (''MH–NWO–NC'') furnace fans. As DOE is not aware of any condensing MH–NWO products, DOE did not analyze them for this final determination analysis and instead focused on MH–NWO–NC furnace fans.

In this final determination, DOE maintained the product classes considered in the October 2023 NOPD, including consideration of only non-condensing MH–NWO products. DOE did not consider condensing MH–NWO or MH–WG products because, as noted in the previous paragraph, DOE has not found any such products available on the market. Further, as discussed in the October 2023 NOPD, DOE concluded that it would be premature to analyze energy conservation standards for NWO–C and WG–C furnace fans at this time as DOE is only aware of a very small number of products on the market. 88 FR 69826, 69833. (Oct. 6, 2023) Therefore, DOE did not analyze the NWO–C and WG–C product classes for this final determination. DOE considered the product classes shown in the following list in its analysis:

(1) NWG–NC
(2) NWG–C
(3) MH–NWG–NC
(4) MH–NWG–C
(5) MH–EF/MB
(6) NWO–NC
(7) WG–NC
(8) NWEF/NWMB
(9) MH–NWO–NC

In the case where a covered product has numerous product classes, DOE identifies and selects certain product classes as most representative and concentrates its analytical effort on those classes.

2. Technology Options

DOE develops information in the technology assessment that characterizes the technologies and design options that manufacturers may use to attain higher-efficiency performance.

In the October 2023 NOPD, DOE identified several technology options that would be expected to improve the efficiency of consumer furnace fans, in terms of FER as measured by the DOE test procedure. 88 FR 69826, 69833 (Oct. 6, 2023). To develop a list of technology options, DOE identified possible technology options for improving furnace fan efficiency and examined the most common efficiency-improving technologies used in consumer furnace fans today. These technology options provide insight into the technological improvements typically used to increase the energy efficiency of consumer furnace fans.

For this final determination, DOE has reviewed the consumer furnace fans market and confirmed that the technology options identified in the October 2023 NOPD continue to reflect the market. The identified technology options are shown in Table IV.2.

TABLE IV.2—LIST OF TECHNOLOGY OPTIONS CONSIDERED FOR THIS FINAL DETERMINATION

Technology option	Description
Housing design modifications	Optimizing the shape and orientation of the housing of a furnace fan can improve fan efficiency. This can be accomplished by: (1) optimizing the shape of the inlet cone, (2) optimizing the fan housing shape, (3) optimizing the motor mount and the motor location, (4) minimizing the gaps between the impeller and the inlet cone, and (5) optimizing cut-off location and the manufacturing tolerances.
Multi-stage heating components and controls.	Multi-stage or modulating heating allows furnaces to meet heating load requirements more precisely and can run at a low output when less heat is required. Due to the cubic relationship between fan input power and airflow, operating at the reduced airflow-control setting may reduce overall fan electrical energy consumption for heating despite the extended hours.
Airflow path design	Modifications to the design and configuration of elements in the airflow path, such as the heat exchanger, could reduce internal static pressure. Reduced internal static pressure levels result in lower expected energy consumption levels.
Constant-torque BPM (''CT–BPM'') and constant-airflow BPM (''CA–BPM'') motors.	Furnace fan manufacturers typically use either a permanent split capacitor (''PSC'') motor or a more efficient BPM motor. PSC motors are a type of induction motor where the stator is an electromagnet that consists of electrical wire windings, and BPM motors are three-phase permanent magnet motors.
Inverter controls for PSC motors	Using an inverter, the incoming alternating current (''AC'') is converted to DC current by a rectifier and then back to AC current at a specific frequency. The output AC current is used to drive the motor, the operating speed of which depends on the frequency of the AC current. This allows PSC motors with inverter controls to better match demand.
Higher-efficiency fan blades	Furnace fans typically use an impeller to move air through ductwork. Energy savings may be possible by using backward-inclined impellers. These impellers incorporate backward-facing inclined blades that are generally wider in the airflow direction across the blade as compared with forward-curved impellers.

In response to the October 2023 NOPD, the Joint Advocates stated that more-efficient BPM motors are a technology option that can be used to improve FER but were not considered as an efficiency level in DOE's analysis. (Joint Advocates, No. 31 at p. 3) Lennox commented that the feasible technologies available for furnace fans considered by the NOPD have not changed since the last furnace fan standards rulemaking in 2014, which adopted the current standards that took effect in 2019. (Lennox, No. 30 at pp. 1–3)

In response, DOE notes that BPM motor manufacturers do not currently disclose the efficiency of their motors. Further, as discussed in the October 2023 NOPD, DOE is not aware of any data showing the relationship between improved BPM motor efficiency and FER ratings. In the October 2023 NOPD, DOE requested data regarding this relationship and stated that it may include efficiency levels corresponding to the use of more-efficient BPM motors in a future analysis, but DOE did not include this additional efficiency level in the October 2023 analysis, due to the lack of data. 88 FR 69826, 69840 (Oct. 6, 2023). For this final determination, although DOE did continue to analyze use of BPM motors, DOE similarly did not include an analysis of *more-efficient* BPM motors as a technology option, due to lack of data about BPM motors that are more efficient than those analyzed by DOE. DOE's analysis of BPM motors as a technology for improving FER ratings is discussed further in section IV.B.1 of this document.

3. Impact From Other Rulemakings

In response to the October 2023 NOPD, Lennox commented that the significant cumulative regulatory burden on furnace manufacturers furthers the case that adopting a ''no-new-standard'' for furnace fans is warranted. The commenter added that there are a variety of Federal and State regulations being implemented that impact furnace manufacturers, including the EPA Technology Transition Final Rule to lower global warming potential (''GWP'') refrigerants, EPA Refrigerant Management NOPR, DOE energy conservation standards (''ECS'') Furnace Standards rulemaking, National and Regional Cold Climate Heat Pump Specifications, DOE ECS for Three-Phase Central Air Conditioners and Heat Pumps below 65,000 Btu/h, DOE Test Procedure for Variable Refrigerant Flow (''VRF'') Systems, DOE Walk-in Cooler and Freezer Test Procedure, and DOE Walk-in Cooler and Freezer ECS NOPR. (Lennox, No. 30 at p. 3) Lennox emphasized that Federal and State refrigerant regulations are consuming nearly all of manufacturers' testing, laboratory, and product development resources. (*Id.*) AHRI commented that the furnace industry will be significantly impacted by the amended energy conservation standards for non-weatherized gas-fired furnaces, and DOE should consider this burden when assessing the manufacturer impact on this rule.[9] (AHRI, No. 32 at pp. 1–2) The commenter further stated that the U.S. Consumer Product Safety Commission (''CPSC'') published a NOPR in the **Federal Register** on October 25, 2023, in which it proposed to require that all consumer gas-fired furnaces and boilers must continuously monitor the production of carbon monoxide (''CO'') during the combustion process and modulate or shut down the furnace at certain carbon monoxide levels (*see* 88 FR 73272). AHRI commented that CPSC's proposal would have a significant impact on the furnace industry, and DOE should consider CPSC's proposal when assessing manufacturer impacts of this current rulemaking. (*Id.* at p. 2)

In response, DOE notes that the Department is not amending the energy conservation standards for consumer furnace fans, and, therefore, it does not expect this rulemaking to contribute to the cumulative regulatory burden of manufacturers.

4. Screening Analysis

As discussed, DOE conducts a screening analysis to evaluate whether to further consider each identified technology and design option. DOE uses the following five screening criteria to determine which technology options are suitable for further consideration in an energy conservation standards rulemaking:

(1) Technological feasibility. Technologies that are not incorporated in commercially-available products or in commercially-viable, existing prototypes will not be considered further.

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

(3) Impacts on product utility. If a technology is determined to have a significant adverse impact on the utility of the product to subgroups of consumers or results 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) Safety of technologies. If it is determined that a technology would have significant adverse impacts on health or safety, it will not be considered further.

(5) Unique-pathway proprietary technologies. If a technology has proprietary protection and represents a unique pathway to achieving a given efficiency level, it will not be considered further, due to the potential for monopolistic concerns.

See 10 CFR part 430, subpart C, appendix A, sections 6(a)(3)(iii) and 7(b).

If DOE determines that a technology fails to meet one or more of these listed criteria, it is excluded from further consideration in the engineering analysis. The following sections include comments from interested parties pertinent to the screening analysis and DOE's evaluation of each technology option against the screening analysis criteria.

a. Screened-Out Technologies

In the October 2023 NOPD, DOE tentatively screened out housing design modifications and changes to airflow path designs from its analysis. 88 FR 69826, 69835–69836 (Oct. 6, 2023). As discussed in section IV.A.2 of this document, airflow path and fan housing improvements can improve furnace fan efficiencies. However, as initially discussed in chapter 4 of the November 2022 Preliminary Analysis TSD, DOE does not have data to quantify the impact of housing design modifications or airflow path design on FER. Additionally, DOE has found that the housing design modifications and airflow path design can impact the performance of the furnace efficiency as measured in AFUE. Although housing design modifications and changes to the airflow path design have the potential to reduce FER, DOE currently lacks the data necessary to conclude that these options will not reduce utility to consumers (*e.g.,* by reducing the AFUE), and, therefore, the Department has continued to screen out these technologies for this analysis. DOE did not receive any comments on the screening of these technologies in response to the October 2023 NOPD.

Based on DOE's research, DOE screened out the technology options on the basis of each of the screening criteria shown in Table IV.3 from further consideration as options to improve the FER (as measured by the DOE test procedure) of consumer furnace fans. The reasons for exclusion associated with each technology are marked in the table with an ''X.''

TABLE IV.3—TECHNOLOGY OPTIONS SCREENED OUT

Technology option	Screening criteria (X = basis for screening out)				
	Technological feasibility	Practicability to install, manufacture, and service	Impacts on product utility or product availability	Adverse impacts on health or safety	Unique-pathway proprietary technologies
Housing Design Modifications			X		
Airflow Path Design			X		

[9] At the time of AHRI's comment, DOE had issued a pre-publication copy of the final rule amending the standards for consumer non-weatherized gas furnaces and mobile home gas furnaces. That final rule was ultimately published in the **Federal Register** on December 18, 2023. 88 FR 87502.

b. Remaining Technologies

After a thorough review of each technology, DOE concludes that all of the remaining identified technologies not ''screened out'' meet all of the screening criteria. In summary, DOE retained (*i.e.,* did not screen out) the technology options listed below:

- Multi-stage heating components and controls;
- High-efficiency fan motors;
- Inverter controls for PSC motors, and
- Higher-efficiency fan blades.

DOE determined that these technology options are technologically feasible because they are being used or have previously been used in commercially-available products or working prototypes. DOE also finds that all of the remaining technology options meet the other screening criteria (*i.e.,* practicable to manufacture/install/service; do not result in adverse impacts on product utility, product availability, health, or safety; and do not utilize unique-pathway proprietary technologies). DOE considers these remaining technology options as the basis for higher efficiency levels that DOE could consider for potential amended standards.

In response to the October 2023 NOPD, Lennox commented that backward-inclined impellers do not guarantee efficiency improvements for furnace fans. The commenter stated that there is a limited number of backward-inclined impellers on the market and expressed concern about the feasibility of implementing this technology option across all input capacities and cabinet sizes, which could lead to the unavailability of certain furnace product sizes. Consequently, Lennox recommended that this technology should not form the basis for more-stringent furnace fan standards. (Lennox, No. 30 at p. 2)

As discussed in the October 2023 NOPD, even if there are only a limited number of commercially-available product designs that incorporate backward-inclined impellers, they are sufficient to demonstrate technological feasibility, as required by EPCA and clarified in DOE's regulations at 10 CFR part 430, subpart C, appendix A, section 7(b)(1). 88 FR 69826, 69836 (Oct. 6, 2023). Further, DOE is aware of backward-inclined impellers that have been safely and reliably implemented in consumer furnace fan models currently available on the market and that reduce the FER of those units. Thus, DOE finds that backward-inclined impellers pass the screening analysis and consequently are suitable for further consideration. However, DOE acknowledges that there may be additional challenges associated with backward-inclined impellers, and these issues are discussed further in section IV.H of this document.

B. Engineering and Cost Analysis

The purpose of the engineering analysis is to establish the relationship between the efficiency and manufacturer production cost (''MPC'') of the subject product (*i.e.,* consumer furnace fans). There are two elements to consider in the engineering analysis: (1) the selection of efficiency levels to analyze (*i.e.,* the ''efficiency analysis''), and (2) the determination of product cost at each efficiency level (*i.e.,* the ''cost analysis''). In determining the performance of higher-efficiency products, DOE considers those technologies and design option combinations not eliminated by the screening analysis. For each product class, DOE estimates the baseline cost, as well as the incremental cost for the product at efficiency levels above the baseline. The output of the engineering analysis is a set of cost-efficiency ''curves'' that are used in downstream analyses (*i.e.,* the LCC and PBP analyses and the NIA).

DOE recently conducted an engineering analysis to determine the cost-efficiency relationship for furnace fans for the October 2023 NOPD. 88 FR 69826, 69837–69849 (Oct. 6, 2023). For this final determination, DOE reviewed market data collected as part of the market and technology assessment (see section IV.A of this document) and has determined that consumer furnace fan efficiencies have not changed substantially since the October 2023 NOPD analysis. Thus, as discussed in section IV.B.1 of this document, DOE maintained the efficiency levels from the October 2023 NOPD in the final determination analysis. Additionally, DOE examined its most recent inputs to its manufacturing cost analysis (*e.g.,* raw material prices, component prices, labor rates) and found that, while underlying manufacturing costs inputs have increased, the resulting manufacturing cost increases would be nearly proportional at each efficiency level. In other words, the incremental increase in cost to achieve each efficiency level would be approximately the same as was presented in the October 2023 NOPD analysis. Because incremental cost increases at efficiency levels above the baseline would not change significantly, DOE concludes that an updated cost analysis would not impact the results of this final determination. Therefore, as discussed in sections IV.B.2 and IV.B.3 of this document, DOE used the same cost analysis methodology as the October 2023 NOPD, and the resulting cost-efficiency relationships used for this final determination are the same as the October 2023 NOPD. Further information on this analytical methodology is presented in the following subsections.

1. Efficiency Analysis

DOE typically uses one of two approaches to develop energy efficiency levels for the engineering analysis: (1) relying on observed efficiency levels in the market (*i.e.,* the efficiency-level approach), or (2) determining the incremental efficiency improvements associated with incorporating specific design options to a baseline model (*i.e.,* the design-option approach). Using the efficiency-level approach, the efficiency levels established for the analysis are determined based on the market distribution of existing products (in other words, based on the range of efficiencies and efficiency-level ''clusters'' that already exist on the market). Using the design-option approach, the efficiency levels established for the analysis are determined through detailed engineering calculations and/or computer simulations of the efficiency improvements from implementing specific design options that have been identified in the technology assessment. DOE may also rely on a combination of these two approaches. For example, the efficiency-level approach (based on actual products on the market) may be extended using the design-option approach to interpolate to define ''gap fill'' levels (to bridge large gaps between other identified efficiency levels) and/or to extrapolate to the ''max-tech'' level (particularly in cases where the ''max-tech'' level exceeds the maximum efficiency level currently available on the market).

Although FER data exist in DOE's Compliance Certification Database (''CCD'') for furnace fans currently subject to efficiency standards, DOE has determined through testing that for many furnace fan models, the rated FER values may not be representative of the model's actual performance. During confidential manufacturer interviews, several manufacturers confirmed that they rate the FER of their furnace fan products conservatively. Therefore, an efficiency-level approach was not possible because the FER ratings of products currently available are largely not representative of their actual performance. Thus, DOE chose a design-option approach to identify efficiency levels for the analysis in this final determination.

a. Baseline Efficiency

For each product class, DOE generally selects a baseline model as a reference point for each class, and measures anticipated changes to the product resulting from potential energy conservation standards against the baseline model. The baseline model in each product class represents the characteristics of products typical of that class (*e.g.,* capacity, physical size). Generally, a baseline model is one that just meets current energy conservation standards, or, if no standards are in place, the baseline is typically the most-common or least-efficient unit on the market. For consumer furnace fans, the energy conservation standard sets a maximum energy usage requirement, and, therefore, a baseline furnace fan's rated FER is just below or at the maximum FER threshold.

DOE used baseline units for comparison in several analyses, including the engineering analysis, LCC analysis, PBP analysis, and NIA. To determine energy savings that will result from an amended energy conservation standard, DOE compared energy use at each of the higher efficiency levels to the energy consumption of the baseline unit. Similarly, to determine the changes in price to the consumer that will result from an amended energy conservation standard, DOE compared the prices of baseline units to the prices of units at each higher efficiency level.

The identification of baseline units requires establishing the baseline efficiency level. In cases where there is an existing standard, DOE defines ''baseline units'' as units with efficiencies equal to the current Federal energy conservation standards. For the MH–NWO–NC furnace fan product class, which does not currently have energy conservation standards, DOE developed the baseline equation by modifying the current energy conservation standards for the NWO–NC product class to account for the lower ESP experienced by mobile home units compared to other units. Specifically, DOE multiplied the y-intercept (382) by 0.75, which was the conversion factor determined in the analysis for the July 2014 Final Rule that was previously used to calculate the MH–NWG–NC baseline based on the NWG–NC baseline.[10]

In the October 2023 NOPD, DOE used the current energy conservation standards for consumer furnace fans and the developed equation for MH–NWO–NC furnace fans, presented in Table IV.4, as the baseline FER efficiency level for each consumer furnace fan product class, along with the typical characteristics of a baseline unit.

TABLE IV.4—BASELINE EFFICIENCY LEVELS AND ASSOCIATED DESIGN OPTIONS FOR EACH PRODUCT CLASS

Product class	Maximum FER	Design option
Non-weatherized, non-condensing gas furnace fan	$0.044 * Q_{Max} + 182$	BPM motor w/forward-inclined impeller.
Non-weatherized, condensing gas furnace fan	$0.044 * Q_{Max} + 195$	BPM motor w/forward-inclined impeller.
Weatherized, non-condensing gas furnace fan	$0.044 * Q_{Max} + 199$	BPM motor w/forward-inclined impeller.
Non-weatherized, non-condensing oil furnace fan	$0.071 * Q_{Max} + 382$	Improved PSC motor w/forward-inclined impeller.
Non-weatherized electric furnace fan/modular blower fan	$0.044 * Q_{Max} + 165$	BPM motor w/forward-inclined impeller.
Manufactured home, non-weatherized, non-condensing gas furnace fan.	$0.071 * Q_{Max} + 222$	Improved PSC motor w/forward-inclined impeller.
Manufactured home, non-weatherized, condensing gas furnace fan	$0.071 * Q_{Max} + 240$	Improved PSC motor w/forward-inclined impeller.
Manufactured home, non-weatherized electric furnace fan/modular blower fan.	$0.044 * Q_{Max} + 101$	BPM motor w/forward-inclined impeller.
Manufactured home, non-weatherized, non-condensing oil furnace fan.	$0.071 * Q_{Max} + 287$	Improved PSC motor w/forward-inclined impeller.

Products in the NWG–NC, NWG–C, WG–NC, NWEF/NWMB, and MH–EF/MB product classes are currently subject to the standards set in the July 2014 Final Rule, in which the efficiency levels adopted were understood at that time to reflect models with CT–BPM motors and multi-stage operation. Products in the NWO–NC and MH–NWG–NC product classes are currently subject to standards set in the July 2014 Final Rule, in which the efficiency levels adopted were understood to correspond to the performance associated with models including improved PSC motors and single-stage operation. Baseline products in the MH–NWO–NC product class were also found to correspond to performance associated with models including improved PSC motors and single-stage operation, based on DOE's market findings for mobile home oil-fired units certified in DOE's CCD for consumer furnaces.

Many furnaces include multi-stage or modulating heating controls. However, based on current furnace fan market data, as well as feedback received during manufacturer interviews, it is unclear if these features impact furnace fan efficiency as measured by FER (*see* section IV.A.2 of this document). Therefore, DOE did not include the costs of multi-stage or modulating heating controls in the baseline design (*i.e.,* DOE's MPC estimates reflect single-stage units). However, DOE did develop separate cost values for multi-stage or modulating heating controls that can be applied to the above costs to represent the addition of multi-stage or modulating heating controls (*see* section IV.B.2.b of this document). These additional cost values are used in DOE's LCC and PBP analyses in order to represent typical furnace fan cost distributions.

In addition, the baseline motor technology is either BPM or PSC, depending on the product class. Manufacturers may choose a CA–BPM motor instead of a CT–BPM, despite its relatively higher cost, to add comfort-related benefits to their product. This additional comfort may be marketed as a premium feature. Therefore, DOE included the cost of a CT–BPM motor in the MPCs for furnace fans with BPM motors. DOE also developed cost values to represent the cost increase for CA–BPM motors relative to CT–BPM motors (*see* section IV.B.2.b of this document). These values were applied in the LCC

[10] Chapter 5 of the TSD accompanying the July 2014 Final Rule includes additional details about how this conversion factor was calculated. *See* docket no. EERE–2010–BT–STD–0011.

analysis to represent the distribution of BPM blower motor technologies expected on the market because, although DOE is not differentiating between CA–BPM motors and CT–BPM motors in terms of furnace fan efficiency, manufacturers and consumers may consider CA–BPM motors to be a premium feature that may offer comfort-related consumer benefits.

In developing the cost-efficiency relationship, teardowns of baseline units were used as a reference point for determining the cost-efficiency relationship of units with lower (more efficient) FERs. DOE compared the design features incorporated into products at the baseline efficiency to the features of units with higher energy efficiencies in order to determine the changes in manufacturing, installation, and operating costs that occur as FER decreases.

DOE did not receive comments in response to the baseline efficiency levels used in the October 2023 NOPD. Therefore, for this final determination, DOE used the baseline efficiency levels as presented in the October 2023 NOPD.

b. Intermediate Efficiency Levels

As noted, EPCA requires that any new or amended energy conservation standard be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A))

In the October 2023 NOPD, DOE analyzed intermediate efficiency levels for NWO–NC, MH–NWG–NC, MH–NWG–C, and MH–NWO–NC classes of consumer furnace fans. 88 FR 69826, 69840 (Oct. 6, 2023). As discussed in section IV.B.1.c of this document, DOE did not identify any efficiency levels between baseline and max-tech for the NWG–NC, NWG–C, WG–NC, NWEF/NWMB, and MH–EF/MB classes. The intermediate efficiency levels identified are representative of efficiency levels where major technological changes occur (*i.e.,* replacing PSC motors with BPM motors). As discussed in section IV.B.1.a of this document, DOE has found that CT–BPM motors and CA–BPM motors have comparable impacts on FER ratings, and DOE has, therefore, only analyzed a single efficiency level reflecting the implementation of BPM motors. In the 2014 Final Rule (79 FR 38130, 38159), DOE used the assumption of a 12-percent reduction in FER for improved PSC motors and a 46-percent reduction in FER for models with a CT–BPM and multi-staging from the baseline to calculate a 39-percent reduction in FER from improved PSC (the current baseline) to CT–BPM with multi-staging. The 39-percent reduction in FER is implemented into the current analysis to represent the reduction in FER from improved PSC to a model with a CT–BPM (regardless of staging) because DOE decided not to include staging as a technology option that improves FER.

In commenting on the October 2023 NOPD, the Joint Advocates recommended that DOE gather additional information about BPM motor efficiency and analyze an efficiency level with improved (*i.e.,* higher-efficiency) BPM motors. The Joint Advocates commented that, based on conversations with motor manufacturers, more-efficient BPM motors exist in the furnace fan market and would improve furnace fan efficiency. (Joint Advocates, No. 31 at p. 3)

In response, as discussed in section IV.A.2 of this document, DOE does not currently have the data necessary to determine the relationship between improved BPM motor efficiency and furnace fan efficiency. Therefore, although DOE continued to analyze BPM motors as a technology that improves FER, the Department did not analyze an efficiency level based on improved BPM motor efficiency (relative to the BPM motor efficiency identified in the October 2023 NOPD) for this final determination.

c. Maximum Technology (''Max-Tech'') Efficiency Levels

As part of its analysis, DOE identifies the ''maximum available'' efficiency level, representing the highest-efficiency unit currently available on the market. DOE also defines a ''max-tech'' efficiency level, representing the maximum theoretical efficiency that can be achieved through the application of all available technology options retained from the screening analysis. In many cases, the max-tech efficiency level is not commercially available because it is not currently economically feasible.

In the October 2023 NOPD, DOE identified the max-tech design for all consumer furnace fan product types as incorporating a BPM motor and a backward-inclined impeller. 88 FR 69826, 69840 (Oct. 6, 2023). BPM motors are described in sections IV.B.1.a and IV.B.1.b of this document. For furnace fan models that use PSC motors, BPM motors can offer an improvement in efficiency and reduce FER. Backward-inclined impellers, in comparison to forward-inclined impellers (which are used in the majority of furnace fans on the market), have been found to have a higher efficiency under certain operating conditions. DOE has used the same assumptions about the percent reduction in FER associated with implementing backward-inclined impellers as in the July 2014 Final Rule (*i.e.,* a 10-percent reduction in FER compared to models that include forward-inclined impellers). 79 FR 38130, 38159 (July 3, 2014).

In response to the October 2023 NOPD, the Joint Advocates encouraged DOE to investigate the most efficient furnace fans currently available on the market that exceed DOE's max-tech level. The commenters argued that there are many furnace fan models across a range of airflows in the major product classes that are more efficient than EL 1. The Joint Advocates added that there are many NWG–C furnace fans in the CCD that exceed the max-tech level by more than 10 percent and do not appear to use backward-inclined impeller technology. The Joint Advocates further stated it is unlikely that the CCD overstates the efficiencies of these fans, as they are often rated conservatively. (Joint Advocates, No. 31 at p. 2)

In response, DOE assessed the furnace fan entries in the CCD that are rated at a lower FER than would be required by the max-tech efficiency level and found that these fans used a variety of motor technologies, staging technologies, and controls. DOE was unable to identify a design option that captured the technologies used in these units to develop an additional efficiency level. DOE notes that technologies such as housing design modifications and airflow design paths could allow the identified furnace fans to achieve FER ratings below those prescribed by the max-tech efficiency levels. However, as discussed in section IV.A.4 of this document, these technology options were screened out due to adverse impacts on product utility. Therefore, for this final determination, DOE concludes that the max-tech efficiency levels, as presented in the October 2023 NOPD, accurately reflect the maximum possible efficiency levels using the technology options remaining after the screening analysis.

d. Summary of Efficiency Levels Analyzed

The FER efficiency levels and associated technologies expected to be used to increase energy efficiency above the baseline levels for each class of consumer furnace fans are presented in Table IV.5 through Table IV.13, respectively.

TABLE IV.5—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL FOR NWG–NC FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.044 * Q_{Max} + 182$	BPM motor w/forward-curved impeller	N/A
1—Max-tech	$0.04 * Q_{Max} + 164$	BPM motor w/backward-inclined impeller	10

TABLE IV.6—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL FOR NWG–C FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.044 * Q_{Max} + 195$	BPM motor w/forward-curved impeller	N/A
1—Max-tech	$0.04 * Q_{Max} + 176$	BPM motor w/backward-inclined impeller	10

TABLE IV.7—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL FOR WG–NC FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.044 * Q_{Max} + 199$	BPM motor w/forward-curved impeller	N/A
1—Max-tech	$0.04 * Q_{Max} + 179$	BPM motor w/backward-inclined impeller	10

TABLE IV.8—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL FOR NWEF/NWMB FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.044 * Q_{Max} + 165$	BPM motor w/forward-curved impeller	N/A
1—Max-tech	$0.04 * Q_{Max} + 149$	BPM motor w/backward-inclined impeller	10

TABLE IV.9—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL FOR MH–EF/MB FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.044 * Q_{Max} + 101$	BPM motor w/forward-curved impeller	N/A
1—Max-tech	$0.04 * Q_{Max} + 91$	BPM motor w/backward-inclined impeller	10

TABLE IV.10—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL FOR MH–NWG–NC FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.071 * Q_{Max} + 222$	Improved PSC motor	N/A
1	$0.044 * Q_{Max} + 137$	BPM motor w/forward-curved impeller	39
2—Max-tech	$0.04 * Q_{Max} + 123$	BPM motor w/backward-inclined impeller	45

TABLE IV.11—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL FOR MH–NWG–C FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.071 * Q_{Max} + 240$	Improved PSC motor	N/A
1	$0.044 * Q_{Max} + 148$	BPM motor w/forward-curved impeller	39
2—Max-tech	$0.04 * Q_{Max} + 133$	BPM motor w/backward-inclined impeller	45

TABLE IV.12—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL FOR NWO–NC FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.071 * Q_{Max} + 382$	Improved PSC motor	N/A
1	$0.044 * Q_{Max} + 236$	BPM motor w/forward-curved impeller	39
2—Max-tech	$0.04 * Q_{Max} + 212$	BPM motor w/backward-inclined impeller	45

TABLE IV.13—EFFICIENCY LEVELS AND TECHNOLOGIES USED AT EACH EFFICIENCY LEVEL MH–NWO–NC FANS

EL	FER equation	Description of technologies typically incorporated	Percentage reduction in FER from baseline
0—Baseline	$0.071 * Q_{Max} + 287$	Improved PSC motor	N/A
1	$0.044 * Q_{Max} + 176$	BPM motor w/forward-curved impeller	39
2—Max-tech	$0.04 * Q_{Max} + 158$	BPM motor w/backward-inclined impeller	45

2. Cost Analysis

The cost analysis portion of the engineering analysis is conducted using one or a combination of cost approaches. The selection of cost approach depends on a suite of factors, including the availability and reliability of public information, characteristics of the regulated product, and the availability and timeliness of purchasing the product on the market. The cost approaches generally used by DOE are summarized as follows:

☐ *Physical teardowns:* Under this approach, DOE physically dismantles commercially-available products, component-by-component, to develop a detailed bill of materials for the products.

☐ *Catalog teardowns:* In lieu of physically deconstructing products, DOE identifies each component using parts diagrams (available from manufacturer websites or appliance repair websites, for example) to develop the bill of materials for the product.

☐ *Price surveys:* If neither a physical nor catalog teardown is feasible (*e.g.,* for tightly integrated products such as fluorescent lamps, which are infeasible to disassemble and for which parts diagrams are unavailable), cost-prohibitive, or otherwise impractical (*e.g.,* large commercial boilers), DOE conducts price surveys using publicly-available pricing data published on major online retailer websites and/or by soliciting prices from distributors and other commercial channels.

In the October 2023 NOPD, DOE conducted the cost analysis using a combination of physical and catalog teardowns to assess how manufacturing costs change with increased product efficiency. 88 FR 69826, 69844 (Oct. 6, 2023). DOE estimated the MPC associated with each efficiency level to characterize the cost-efficiency relationship of improving consumer furnace fan performance. The MPC estimates are not for the entire HVAC product. Because consumer furnace fans are a component of the HVAC product into which they are integrated, the MPC estimates include costs only for the components of the HVAC product that impact FER. *Id.*

Products were selected for physical teardown analysis that have characteristics of typical products on the market near a representative input capacity of 80,000 Btu/h for the NWG–NC, NWG–C, WG–NC, NWEF/NWMB, MH–NWG–NC, MH–NWG–C, MH–EF/MB, and MH–WG product classes and 105,000 Btu/h for the NWO–NC and MH–NWO–NC product classes (determined based on market data and discussions with manufacturers). Selections spanned a range of FER efficiency levels and designs and included most manufacturers. The resulting bill of materials provides the basis for the MPC estimates for products at various efficiency levels spanning the full range of efficiencies from the baseline to max-tech.

To account for manufacturers' non-production costs and profit margin, DOE applies a non-production cost multiplier (the manufacturer markup) to the MPC. The resulting manufacturer selling price (''MSP'') is the price at which the manufacturer distributes a unit into commerce. DOE developed an average manufacturer markup by examining the annual Securities and Exchange Commission (''SEC'') 10–K reports filed by publicly-traded manufacturers primarily engaged in HVAC manufacturing and whose combined product range includes consumer furnace fans. DOE refined its understanding of manufacturer markups by using information obtained during manufacturer interviews. The manufacturer markups were used to convert the MPCs into MSPs. Further information on this analytical methodology is presented in the following subsections.

a. Teardown Analysis

For the October 2023 NOPD, to assemble bills of materials (''BOMs'') and to calculate manufacturing costs for the different components in consumer furnace fans, multiple units were disassembled into their base components, and DOE estimated the materials, processes, and labor required to manufacture each individual component, a process referred to as a ''physical teardown.'' Using the data gathered from the physical teardowns, each component was characterized according to its weight, dimensions, material, quantity, and the manufacturing processes used to fabricate and assemble it.

For supplementary catalog teardowns, product data were gathered, such as dimensions, weight, and design features from publicly-available information such as manufacturer catalogs. Such ''virtual teardowns'' allowed DOE to estimate the major physical differences between a product that was physically disassembled and a similar product that was not. For this final determination, data from a total of 61 physical and virtual teardowns of consumer furnace fans were used to calculate industry MPCs in the engineering analysis.

The models selected for teardown in each product class represented manufacturers with large market shares in the product classes for which their teardown units are categorized. Whenever possible, DOE examined multiple models from a given manufacturer that capture different design options and used them as direct points of comparison. DOE examined products with PSC, CT–BPM, and CA–BPM indoor blower motors, as well as products using single-stage, two-stage, and modulating combustion systems. As further discussed in section IV.B.2.b of this document, cost values were developed for some of these technologies to estimate the manufacturing cost of changing designs from one technology to another (*i.e.,* using a CA–BPM instead of a CT–BPM, or two-stage combustion instead of single-stage combustion).

As described in Chapter 5 of the November 2022 Preliminary Analysis TSD, DOE found that MPC did not differ significantly across product classes at a given efficiency level and given production volume because manufacturers use similar components. Therefore, in this analysis, DOE used teardowns of non-weatherized gas and mobile home gas furnaces to represent all high-volume product classes, including NWG–NC, NWG–C, WG–NC, NWEF/NWMB, and MH–EF/MB, while teardowns of non-weatherized oil units were used for the analysis of the NWO–NC and MH–NWO–NC product classes.

b. Cost Estimation Method

For the October 2023 NOPD, the costs of individual models were estimated using the content of the BOMs (*i.e.,* relating to materials, fabrication, labor, and all other aspects that make up a production facility) to generate MPCs. The resulting MPCs include costs such as overhead and depreciation, in addition to materials and labor costs. DOE collected information on labor rates, tooling costs, raw material prices, and other factors to use as inputs into the cost estimates. For purchased parts, DOE estimates the purchase price based on volume-variable price quotations and detailed discussions with manufacturers and component suppliers. Furnace fans are a component of HVAC products that include other products not associated with the cost and/or efficiency of the furnace fan. Therefore, DOE focused its engineering analysis on the components that compose the furnace fan assembly, including:

- Fan motor and integrated controls (as applicable);
- HVAC product control boards;
- Impellers;
- Single-staging or multi-staging components and controls;
- Fan housing, and
- Components used to direct or guide airflow.

For purchased parts, DOE estimated the purchase prices paid to the original equipment manufacturers (''OEMs'') of these parts based on discussions with manufacturers during confidential interviews. Whenever possible, DOE obtained price quotes directly from the component suppliers used by furnace fan manufacturers whose products were examined in the engineering analysis. DOE determined that the components in Table IV.14 are generally purchased from outside suppliers.

TABLE IV.14—PURCHASED FURNACE FAN COMPONENTS

Assembly	Purchased sub-assemblies or components
Fan assembly	Fan motor. Motor capacitor (when applicable). Impeller.
Controls	Primary control board (''PCB''). Multi-staging components (when applicable).

For parts fabricated in-house, the costs of underlying ''raw'' materials are determined based on manufacturer interviews, quotes from suppliers, and secondary research. Past results are updated periodically and/or inflated to present-day prices using indices from resources such as MEPS International,[11] PolymerUpdate,[12] the U.S. Geological Survey (''USGS''),[13] and the U.S. Bureau of Labor Statistics (''BLS'').[14] The prices of the underlying raw metals (*e.g.,* tube, sheet metal) are estimated on the basis of five-year averages spanning from 2018 through 2022 to smooth out spikes in demand. For non-metal raw material prices (*e.g.,* plastic resins, insulation materials), DOE used prices based on current market data, rather than a five-year average, because non-metal raw materials typically do not experience the same level of price volatility as metal raw materials.

Certain factory parameters—such as fabrication rates, labor rates, and wages—also affect the cost of each unit produced. DOE factory parameter assumptions were based on internal expertise and manufacturer feedback. Table IV.15 lists the factory parameter assumptions used for both high-volume and low-volume manufacturers. For the engineering analysis, these factory parameters, including production volume, are the same at every efficiency level. The production volume used at each efficiency level corresponds with the average production volume per manufacturer, if 100 percent of all units manufactured were at that efficiency level. These assumptions are generalized to represent typical production and are not intended to model a specific factory. For the NWG–NC, NWG–C, WG–NC, NWEF/NWMB, MH–NWG–NC, MH–NWG–C, and MH–EF/MB product classes, high production volume parameters were assumed due to these classes having generally high production volumes or using enough of the same major components as other high production volume classes. For NWO–NC and MH–NWO product classes, low production parameters were assumed.

TABLE IV.15—FACTORY PARAMETER ASSUMPTIONS

Parameter	High-volume furnace fan estimate	Low-volume furnace fan estimate
Actual Annual Production Volume (units/year)	1,500,000	5,000.

[11] For more information on MEPS International, please visit *www.mepsinternational.com/gb/en* (last accessed March 25, 2024).

[12] For more information on PolymerUpdate, please visit *www.polymerupdate.com* (last accessed March 25, 2024).

[13] For more information on USGS metal price statistics, please visit *www.usgs.gov/centers/national-minerals-information-center/commodity-statistics-and-information* (last accessed March 25, 2024).

[14] For more information on the BLS producer price indices, please visit *www.bls.gov/ppi/* (last accessed March 25, 2024).

TABLE IV.15—FACTORY PARAMETER ASSUMPTIONS—Continued

Parameter	High-volume furnace fan estimate	Low-volume furnace fan estimate
Purchased Parts Volume	500,000 units/year	5,000 units/year.
Workdays Per Year (days)	250	250.
Assembly Shifts Per Day (shifts)	2	1.
Fabrication Shifts Per Day (shifts)	2	2.
Fabrication Labor Wages ($/h)	16	16.
Assembly Labor Wages ($/h)	16	16.
Length of Shift (hr)	8	8.
Average Equipment Installation Cost (% of purchase price)	10%	10%.
Fringe Benefits Ratio	50%	50%.
Indirect to Direct Labor Ratio	33%	33%.
Average Scrap Recovery Value	30%	30%.
Worker Downtime	10%	10%.
Building Life (in years)	25	25.
Burdened Assembly Labor Wage ($/h)	24	24.
Burdened Fabrication Labor Wage ($/h)	24	24.
Supervisor Span (workers/supervisor)	25	25.
Supervisor Wage Premium (over fabrication and assembly wage)	30%	30%.

Constant-Airflow BPM Blower Motor Cost Value

As discussed in section IV.B.1.a of this document, for the NWG–NC, NWG–C, WG–NC, NWEF/NWMB, and MH–WF/MB product classes, the current baseline motor technology is a BPM motor, and specifically a CT–BPM motor. DOE's research suggests that the predominant BPM indoor blower motors sold on the market today are either a constant-torque or a constant-airflow design. Both types of motors rely on electronic variable-speed motor systems that are typically mounted in an external chassis to the back of the motor. CA–BPM motors utilize feedback control to adjust torque based on ESP in order to maintain a desired airflow. This differentiates them from CT–BPM motors that will maintain torque and likely decrease airflow output in environments with high ESPs. Additionally, CA–BPM motors use feedback control to vary their output to maintain pre-programmed airflows. DOE has found that there are no significant differences in measured FER performance between furnace fans using CA–BPM and CT–BPM motors; however, CA–BPM motors are sometimes chosen for other benefits, such as increased consumer comfort. CA–BPM fan motors typically cost more than CT–BPM motors while not improving FER. Therefore, as discussed in section IV.B.1.a of this document, DOE considered the baseline design to include CT–BPM motors for the NWG–NC, NWG–C, WG–NC, NWEF/NWMB, and MH–EF/MB classes. However, to better represent costs to consumers, DOE has developed cost values for CA–BPMs that are applied in the LCC analysis to a portion of furnace fan installations. Table IV.16 shows the cost difference between CT–BPM and CA–BPM motors for high-volume and low-volume product classes.

TABLE IV.16—INCREMENTAL COST DIFFERENCE FOR BPM MOTORS

Product class	Incremental cost increase for CT–BPM to CA–BPM (2022$)
NWG–C, NWG–NC, WG–NC, NWEF/NWMB, MH–NWG–NC, MH–NWG–C, and MH–EF/MB	$28.07
NWO–NC, MH–NWO–NC	83.67

Multi-Stage Furnace

As discussed in section IV.A.2 of this document, DOE has identified a number of furnace fans in two-stage and modulating furnaces that are rated at the same relative FER as single-stage furnaces. DOE has determined that consumers choose to purchase multi-stage products for the additional thermal comfort offered by furnaces with multiple stages of heating output. During teardowns, DOE examined multi-stage furnace designs to analyze the production cost differential for manufacturers to switch from single-stage to two-stage or modulating combustion. DOE determined a market-share weighted-average marginal cost increase of $21.07 for the NWG–C, NWG–NC, WG–NC, NWEF/NWMB, MH–NWG–NC, MH–NWG–C, and MH–EF/MB classes to change a furnace from a single-stage to a two-stage design. DOE determined that oil units with multi-staging were rare and, thus, not representative of the market, so DOE did not analyze the cost increase of multi-stage burners for the NWO–NC and MH–NWO–NC product classes. Where applicable, the additional cost to change to a two-stage furnace includes the added cost of a two-stage gas valve, a two-speed inducer assembly, an additional pressure switch, and additional controls and wiring. As with the blower motor costs discussed previously, the additional cost of a multi-stage burner is accounted for in the LCC analysis based on the market penetration of such designs for furnaces.

Scaling to Alternative Input Capacities

For the October 2023 NOPD, DOE also developed equations to scale the MPC results at the representative capacity to the full range of input capacities available on the market for each motor type. DOE performed regression analyses on the discrete MPCs for each teardown and their respective input capacities—which spanned a range of capacities and airflows and encompassed a range of motor sizes—to generate an equation for each motor technology that reflects the relationship between these parameters. These parameters were derived separately for high-volume (NWG–C, NWG–NC, MH–NWG–NC, MH–NWG–C, and WG–NC) and low-volume (NWO–NC and MH–NWO–NC) product classes. These equations, which are presented in Table IV.17, are used in the LCC analysis (*see* section IV.E of this document) to analyze the impacts on furnace fans over the full range of input capacities. To estimate the MPC at a given input, first the appropriate adder is calculated using the equation and then the result added to or subtracted from (as applicable) the MPC at the representative input capacity.

TABLE IV.17—EQUATIONS FOR SCALING MPCS TO ADDITIONAL INPUT CAPACITIES

Input Capacity MPC Scaling Equation: MPC Change = Slope * (Input Capacity (kBtu/h) − Representative Capacity (kBtu/h))		
	NWGF–C, NWGF–NC, MH–NWGF–NC, MH–NWGF–C, WGF–NC	NWOF–NC and MH–NWOF–NC
Motor technology	Slope	Slope
PSC	0.0650	0.7031
Constant-torque BPM	0.1395	0.6272
Constant-airflow BPM	0.1603	1.0069

Backward-Inclined Impellers

For the max-tech efficiency levels, in the October 2023 NOPD, DOE estimated the cost to manufacture a backward-inclined impeller by using manufacturer feedback along with photographs and specifications found in research reports to determine cost model inputs to estimate the MPCs of the backward-inclined impeller. 88 FR 69826, 69847 (Oct. 6, 2023). These costs were scaled to different capacities by evaluating the impact of the backward-inclined impeller on the overall furnace system, depending on the average cabinet width at that capacity. DOE estimated the manufacturing cost of implementing a backward-inclined impeller and compared it to the average cost of using the forward-inclined impellers that are ubiquitous in furnace fans currently on the market to determine the incremental increase in MPC associated with implementing backward-inclined impellers as compared to forward-inclined impellers. The cost increases for backward-inclined impellers at each capacity were applied at the max-tech level to estimate the MPCs and are outlined in Table IV.18.

TABLE IV.18—BACKWARD-INCLINED IMPELLER MPC INCREASES

Input capacity (kBtu/h)	High volume (2022$)	Low volume (2022$)
40	28.60	34.15
60	34.93	41.71
80	37.21	44.43
100	55.18	65.89
120	59.09	70.56

3. Cost-Efficiency Results

The results of the October 2023 NOPD engineering analysis are the MPCs for each furnace fan product class analyzed at each FER efficiency level (and associated design option), resulting in a cost-efficiency relationship. The cost-efficiency results are shown in tabular form in Table IV.19 through Table IV.21 in the form of efficiency versus MPC. (Q_{Max} is the airflow, in cfm, at the maximum airflow-control setting measured using the DOE test procedure.) As described in section IV.B.2.b of this document, the MPC presented is not for the entire HVAC product, because furnace fans are a component of the HVAC product in which they are integrated.

As discussed in section IV.B.2.b of this document, separate cost values were developed for constant-airflow BPM motors and multi-staging because these premium design elements could add comfort or provide other benefits but were not incorporated as design options into efficiency levels for furnace fans used in this analysis.

DOE used the cost-efficiency curves from the engineering analysis as an input to the LCC analysis to determine the added price of the more-efficient furnace fan components in HVAC equipment sold to the customer (*see* section IV.E of this document).

TABLE IV.19—COST-EFFICIENCY RESULTS BY PRODUCT CLASS—NWG–NC, NWG–C, WGF–NC, NWEF/NWMB, AND MH–EF/MB

	Efficiency level	
	Design option	
	Baseline	EL 1
	BPM motor	BPM motor + backward-inclined impeller
MPC	$108.06	$136.13.
Product class	Maximum allowable FER equation	

TABLE IV.19—COST-EFFICIENCY RESULTS BY PRODUCT CLASS—NWG–NC, NWG–C, WGF–NC, NWEF/NWMB, AND MH–EF/MB—Continued

	Efficiency level	
	Design option	
	Baseline	EL 1
	BPM motor	BPM motor + backward-inclined impeller
NWG–NC	0.044 * Q_{Max} + 182	0.04 * Q_{Max} + 164.
NWG–C	0.044 * Q_{Max} + 195	0.04 * Q_{Max} + 176.
WG–NC	0.044 * Q_{Max} + 199	0.04 * Q_{Max} + 179.
NWEF/NWMB	0.044 * Q_{Max} + 165	0.04 * Q_{Max} + 149.
MH–EF/MB	0.044 * Q_{Max} + 101	0.04 * Q_{Max} + 91.

TABLE IV.20—COST-EFFICIENCY RESULTS BY PRODUCT CLASS—MH–NWG–NC AND MH–NWG–C

	Efficiency level		
	Design option		
	Baseline	EL 1	EL 2
	Improved PSC	BPM motor	BPM motor + backward-inclined impeller
MPC	$82.39	$108.06	$136.13.
Product class	Maximum allowable FER equation		
MH–NWG–NC	0.071 * Q_{Max} + 222	0.044 * Q_{Max} + 137	0.04 * Q_{Max} + 123.
MH–NWG–C	0.071 * Q_{Max} + 240	0.044 * Q_{Max} + 148	0.04 * Q_{Max} + 133.

TABLE IV.21—COST-EFFICIENCY RESULTS BY PRODUCT CLASS—NWO–NC AND MH–NWO–NC

	Efficiency level		
	Design option		
	Baseline	EL 1	EL 2
	Improved PSC	BPM motor	BPM motor + backward-inclined impeller
MPC	$195.61	$216.95	$300.62.
Product Class	Maximum allowable FER equation		
NWO–NC	0.071 * Q_{Max} + 382	0.044 * Q_{Max} + 236	0.04 * Q_{Max} + 212.
MH–NWO–NC	0.071 * Q_{Max} + 287	0.044 * Q_{Max} + 176	0.04 * Q_{Max} + 158.

In commenting on the October 2023 NOPD, Lennox stated that equipment costs have increased since the most recent furnace fans standards went into effect in 2019. (Lennox, No. 30 at pp. 1–3) The commenter argued that consumers are struggling to afford new furnace equipment due to inflation and supply-chain issues. Lennox stated that this makes increasing furnace fan costs through standards particularly ill-advised, and Lennox supported the NOPD's conclusion that amended standards are not appropriate. (*Id.*)

In response, DOE notes that changes in equipment costs have been taken into account in the engineering analysis for this final determination. As discussed in section IV.B.2.b of this document, DOE gathered price quotations for purchased parts from major suppliers at different production volumes during manufacturer interviews that were conducted after the standards went into effect in 2019. For parts produced in-house, metal raw material prices are estimated on the basis of five-year averages, spanning from 2018 through 2022, which includes changes since the 2019 standards went into effect. These material costs are captured in the cost-efficiency results and, in turn, are reflected in the LCC and PBP analyses, which are outlined in section IV.E of this document.

In this final determination DOE maintained the same cost analysis as that used for the October 2023 NOPD. As a result, the cost-efficiency relationships used for this final determination are the same as those presented in the October 2023 NOPD.

C. Markups Analysis

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

As part of the analysis, DOE identifies key market participants and distribution channels. As in the October 2023 NOPD, DOE used the same distribution channels for furnace fans as it used for furnaces in the recent energy conservation standards rulemaking for those products. DOE believes that this is an appropriate approach because the vast majority of the furnace fans covered in this rulemaking are a component of a furnace. DOE has concluded that there is insufficient evidence of a replacement market for furnace fans to establish a separate distribution channel on that basis.

DOE developed baseline and incremental markups for each actor in the distribution chain. Baseline markups are applied to the price of products 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.[15]

To estimate average baseline and incremental markups, DOE relied on several sources, including: (1) the HARDI 2013 Profit Report (*i.e.,* for wholesalers), and (2) U.S. Census Bureau 2017 Economic Census data on the residential and commercial building construction industry (*i.e.,* for general contractors, mechanical contractors, and mobile home manufacturers). In addition, DOE used the 2005 Air Conditioning Contractors of America's (''ACCA's'') financial analysis on the heating, ventilation, air-conditioning, and refrigeration contracting industry to disaggregate the mechanical contractor markups into replacement and new construction markets. DOE also used various sources for the derivation of the mobile home dealer markups (*see* chapter 6 of the November 2022 Preliminary Analysis TSD).

DOE derived State and local taxes from data provided by the Sales Tax Clearinghouse.[16] These data represent weighted averages that include county and city rates. DOE applied the State sales taxes to match the State-level markups for wholesalers and mechanical and general contractors.

DOE did not receive comments regarding markups in response to the October 2023 NOPD. Chapter 6 of the November 2022 Preliminary Analysis TSD provides details on DOE's development of markups for consumer furnace fans.

D. Energy Use Analysis

The purpose of the energy use analysis is to determine the annual energy consumption of consumer furnace fans at different efficiencies in representative U.S. homes and commercial buildings, and to assess the energy savings potential of increased consumer furnace fan efficiency. The energy use analysis estimates the range of energy use of the subject products in the field (*i.e.,* as the products are actually used by consumers). The energy use analysis provides the basis for other analyses DOE performed, particularly assessments of the potential energy savings and the savings in consumer operating costs that could result from adoption of amended or new standards.

For the October 2023 NOPD, DOE primarily used data from the U.S. Energy Information Administration's (''EIA's'') 2015 Residential Energy Consumption Survey (''RECS 2015'') to establish a reasonable range of energy consumption for consumer furnace fans. RECS 2015 is a national sample survey of housing units that collects statistical information on the consumption of and expenditures for energy in housing units, along with data on energy-related characteristics of the housing units and occupants. RECS 2015 has a sample size of 5,686 housing units and was constructed by EIA to be a national representation of the household population in the United States. DOE also considered the use of consumer furnace fans in commercial applications, based on characteristics from EIA's most recent 2012 Commercial Building Energy Consumption Survey (''CBECS 2012'') for a subset of building types that use consumer furnace fans covered by a potential standard. DOE utilized additional data sources to refine the development of a representative population of buildings for each furnace fan product class, as detailed in chapter 7 of the November 2022 Preliminary Analysis TSD.

EIA recently published the microdata for the 2020 edition of RECS.[17] To assess the impact of using RECS 2020, DOE compared the LCC consumer sample in the July 2022 Furnace NOPR, which used RECS 2015, to the consumer sample used in the December 2023 Furnace Final Rule consumer sample, which used RECS 2020. DOE assumed that changes in annual energy heating use between the two RECS editions serves as a reasonable proxy for the relative change in consumer furnace fans energy use. As can be seen by comparing Table 7.4.1 of the TSD for the July 2022 Furnace NOPR and Table 7.4.1 of the TSD for the December 2023 Furnace final rule, the estimated average annual energy consumption by region and efficiency level is similar between the two versions of RECS for households with furnaces, with RECS 2020 showing slightly lower energy consumption. Given the correlation in usage between furnaces and furnace fans and given that the estimated furnace energy use declines when updating to RECS 2020, updating the consumer sample to RECS 2020 would not alter the conclusions of this final determination. Therefore, DOE continued to use RECS 2015 as the basis for its consumer sample, as was done in the October 2023 NOPD.

DOE notes that commercial installations of consumer furnace fans account for approximately five percent or less of total installations, as shown in Table 6.2.1 of the November 2022 Preliminary Analysis TSD. Given the relatively small number of installations in the commercial sector relative to the residential sector, changes between CBECS 2012 and 2018 would not significantly impact overall analytical conclusions. Therefore, for this final determination, DOE continued to use CBECS 2012 as the basis of its consumer sample, as was done in October 2023 NOPD.

In calculating the energy consumption of furnace fans, DOE adjusted the energy use from RECS 2015 and CBECS 2012 to normalize for year-to-year variation in weather. This was accomplished by adjusting the RECS 2015 household and CBECS 2012 building energy consumption values based on 10-year average heating degree day (''HDD'') and average cooling degree day (''CDD'') data for each geographical region. DOE also accounted for the change in building shell characteristics by applying the building shell efficiency index and projected trend in the HDD and CDD in EIA's *Annual Energy Outlook 2023* (''*AEO 2023*'').

As in the October 2023 NOPD, DOE's analysis takes into account ACCA

[15] 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 standards would lead to a sustainable increase in profitability in the long run.

[16] Sales Tax Clearinghouse, Inc., State Sales Tax Rates Along With Combined Average City and County Rates (Jan. 4, 2023) (Available at: *www.thestc.com/STrates.stm*) (last accessed June 28, 2024).

[17] Energy Information Administration (EIA), 2020 Residential Energy Consumption Survey (RECS) (Available at: *www.eia.gov/consumption/residential/data/2020/index.php/*) (last accessed June 11, 2024).

Manuals J, S, and D methods to size every household and building in the sample. DOE first uses Manual J to estimate the house or building design heating load in order to determine the blower requirements for the assigned heating and cooling equipment. DOE's analysis considers that typically the furnace fan is sized based on the maximum cooling capacity required. The heating and cooling furnace fan speed setting is then varied to match the recommended/required airflow performance and takes into account differences in the ductwork system curve in the field.

DOE did not receive comments regarding energy use in response to the October 2023 NOPD. Chapter 7 of the November 2022 Preliminary Analysis TSD provides details on DOE's energy use analysis for consumer furnace fans.

E. Life-Cycle Cost and Payback Period Analysis

DOE conducts LCC and PBP analyses to evaluate the economic impacts on individual consumers of potential amended energy conservation standards for consumer furnace fans. The effect of new or amended energy conservation standards on individual consumers usually involves a reduction in operating cost and an increase in purchase cost. DOE typically uses the following two metrics to measure consumer impacts:

☐ Life-Cycle Cost (''LCC'') is the total consumer expense of operating the product over the lifetime of that product, consisting of total installed cost (which includes manufacturer selling price, distribution chain markups, sales tax, and installation costs) plus operating costs (*e.g.,* 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 product.

☐ Payback Period (''PBP'') is the estimated amount of time (in years) it takes consumers to recover the increased purchase cost (including installation) of a more-efficient product through lower operating costs. DOE calculates the 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 the product in the absence of new or amended energy conservation standards. In contrast, the PBP for a given efficiency level is measured relative to the baseline product.

For each considered efficiency level in each product class, DOE calculated the LCC and PBP for a nationally representative set of housing units and, where appropriate, commercial buildings. As stated previously, DOE developed household and commercial building samples from RECS 2015 and CBECS 2012, respectively. For each sample household or commercial building, DOE determined the energy consumption for the consumer furnace fans and the appropriate energy price. By developing a representative sample of households and commercial buildings, the analysis captured the variability in energy consumption and energy prices associated with the use of consumer furnace fans.

Inputs to the LCC calculation include the installed cost to the consumer, operating expenses, the lifetime of the product, and a discount rate. Inputs to the calculation of total installed cost include the cost of the product—which includes MPCs, manufacturer markups, retailer and distributor markups, and sales taxes (where applicable)—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy prices and price projections, repair and maintenance costs, product lifetimes, and discount rates. Inputs to the PBP calculation include the installed cost to the consumer and first-year operating expenses. DOE created distributions of values for installation cost, repair and maintenance, product 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 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 product user samples. For this proceeding, the Monte Carlo approach is implemented in Microsoft Excel together with the Crystal Ball™ add-on.[18] The model calculated the LCC for products at each efficiency level for 10,000 consumers 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, product efficiency is chosen based on its probability. If the chosen product efficiency is greater than or equal to the efficiency of the standard level under consideration, the LCC calculation reveals that a consumer is not impacted by the standard level. By accounting for consumers who are already projected to purchase more-efficient products than the baseline in a given case, DOE avoids overstating the potential benefits from increasing product efficiency.

DOE calculated the LCC and PBP for consumers of consumer furnace fans as if each were to purchase a new product in the expected first year of required compliance with new or amended standards. For purposes of this final determination, DOE used 2030 as the first year of compliance with any amended standards.

Table IV.22 summarizes the approach and data DOE used to derive inputs to the LCC and PBP analysis. The subsections that follow provide further discussion. Details of the spreadsheet model, and how all inputs to the LCC and PBP analyses are applied, are contained in chapter 8 of the November 2022 Preliminary Analysis TSD and its appendices.

TABLE IV.22—SUMMARY OF INPUTS AND METHODS FOR THE LCC AND PBP ANALYSES *

Inputs	Source/method
Product Cost	Derived from the manufacturer production cost (''MPC'') for furnace fans at different heating input capacities for each efficiency level (from the engineering analysis). The MPCs are then multiplied by the various market participant markups (*e.g.,* manufacturer, wholesaler, and plumbing contractor) for each distribution channel and sales taxes derived for each State and the District of Columbia.

[18] Crystal Ball™ is a commercially-available software tool to facilitate the creation of these types of models by generating probability distributions and summarizing results within Excel (Available at: *www.oracle.com/technetwork/middleware/crystalball/overview/index.html*) (last accessed June 11, 2024).

TABLE IV.22—SUMMARY OF INPUTS AND METHODS FOR THE LCC AND PBP ANALYSES *—Continued

Inputs	Source/method
Installation Costs	Varies by efficiency level and individual house/building characteristic. Material and labor costs are derived for each State and the District of Columbia mainly using RSMeans Residential Cost Data 2023. Overhead and profits are included in the RSMeans data. Probability distributions are derived for various installation cost input parameters.
Annual Energy Use	Derived mainly by using the heating energy use data for each housing unit and building from the Energy Information Administration's ("EIA's") 2015 Residential Energy Consumption Survey ("RECS 2015") and EIA's 2012 Commercial Buildings Energy Consumption Survey ("CBECS 2012"), together with consumer furnace fans test procedure calculation methodologies used to determine the annual energy consumption associated with the considered standard levels. Probability distributions are derived for various input parameters.
Energy Prices	Calculated monthly marginal average electricity, natural gas or liquefied petroleum gas ("LPG"), and fuel oil prices in each of the 50 U.S. States and District of Columbia, using EIA historical data and billing data for each RECS 2015 housing unit and CBECS 2012 building.
Energy Price Trends	Residential and commercial prices were escalated by using EIA's *Annual Energy Outlook 2023* (*AEO 2023*) forecasts to estimate future energy prices. Escalation was performed at the Census Division level.
Repair and Maintenance Costs	Estimated the costs associated with preventive maintenance (*e.g.,* checking furnace fan) and repair (*e.g.,* replacing motor) based on data from a variety of published sources, including RSMeans 2023 Facilities Maintenance and Repair Data. It is assumed that maintenance and repair costs vary by efficiency level, and probability distributions are derived for various input parameters.
Product Lifetime	Used Weibull probability distribution of lifetimes developed for consumer furnace fans based on various survey and shipments data.
Discount Rates	Probability distributions by income bins are derived for residential discount rates based on the Federal Reserve Board's Survey of Consumer Finances from 1995 to 2019 and various interest rate sources. Probability distributions for commercial discount rates for various building activities (*e.g.,* office) are derived using multiple interest rate sources. *See* section IV.E.7 of this document.
Compliance Date	2030 (five years after expected publication of the final rule).

* References for the data sources mentioned in this table are provided in the sections following the table or in chapter 8 of the November 2022 Preliminary Analysis TSD. Energy price trends, product lifetimes, and discount rates are not used for the PBP calculation.

1. Product Cost

To calculate consumer product costs, DOE multiplied the MPCs developed in the engineering analysis by the markups described previously (along with sales taxes). DOE used different markups for baseline products and higher-efficiency products, because DOE applies an incremental markup to the increase in MSP associated with higher-efficiency products.

For the October 2023 NOPD, DOE assumed no price trend for consumer furnace fans due to uncertainty in future commodity prices. DOE did not receive comment on this assumption and maintains the same approach for this final determination.

See chapter 8 of the November 2022 Preliminary Analysis TSD for details.

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous materials and parts needed to install the product. Because consumer furnace fans are installed in furnaces in the factory, there is generally no additional installation cost in the home. However, consumer furnace fans that employ a constant-airflow BPM design may require additional installation costs. DOE assumed that all constant-airflow BPM furnace fan installations will require extra labor at startup to check and adjust airflow.

As in the October 2023 NOPD, DOE estimated the installation costs at each considered efficiency level using a variety of sources, including RSMeans data, manufacturer literature, and information from an expert consultant report. DOE's analysis of installation costs accounted for regional differences in labor costs. For a detailed discussion of the development of installation costs, *see* appendix 8C of the November 2022 Preliminary Analysis TSD.

3. Annual Energy Consumption

For each sampled household or commercial building, DOE determined the energy consumption for a consumer furnace fan at different efficiency levels using the approach described previously in section IV.D of this document.

4. Energy Prices

Energy bills to consumers typically include fixed costs (*i.e.,* costs that do not depend on consumption) and costs that depend on the level of consumption. To estimate the impact of standards on consumer operating costs, DOE calculated average energy prices, which represent the typical cost for a consumer to use energy, including fixed costs, and marginal energy prices, which represent the energy price consumers would pay for reduced consumption. In other words, a marginal energy price reflects the cost or benefit of adding or subtracting one additional unit of energy consumption. Because marginal price more accurately captures the incremental savings associated with a change in energy use from higher efficiency, it provides a better representation of incremental change in consumer costs than average electricity prices. DOE applied average natural gas and electricity prices for the energy use of the product purchased in the no-new-standards case, and marginal prices for the incremental change in energy use associated with the other efficiency levels considered.

For the October 2023 NOPD, DOE derived average monthly marginal residential and commercial electricity, natural gas, LPG, and fuel oil prices for each State using data from EIA.[19 20 21] DOE calculated marginal monthly regional energy prices by: (1) first estimating an average annual price for each region; (2) multiplying by monthly energy price factors; and (3) multiplying by seasonal marginal price factors for electricity, natural gas, and LPG. The

[19] EIA, Form EIA–861M (formerly EIA–826) detailed data (2022) (Available at: *www.eia.gov/electricity/data/eia861m/*) (last accessed June 28, 2024).

[20] EIA, Natural Gas Navigator (2022) (Available at: *www.eia.gov/naturalgas/data.php*) (last accessed June 11, 2024).

[21] EIA, 2021 State Energy Data System (SEDS) (2021) (Available at: *www.eia.gov/state/seds/*) (last accessed June 11, 2024).

analysis used 2022 data for residential and commercial natural gas and electricity prices and 2021 data for LPG and fuel oil prices. Further details may be found in chapter 8 of the Preliminary Analysis TSD.

For the October 2023 NOPD, DOE compared marginal price factors developed by DOE from the EIA data to develop seasonal marginal price factors for 23 gas tariffs provided by the Gas Technology Institute for the 2016 residential boilers energy conservation standards rulemaking.[22] DOE found that the winter price factors used by DOE are generally comparable to those computed from the tariff data, indicating that DOE's marginal price estimates are reasonable at average usage levels. The summer price factors are also generally comparable. Of the 23 tariffs analyzed, eight have multiple tiers, and of these eight, six have ascending rates and two have descending rates. The tariff-based marginal factors use an average of the two tiers as the commodity price. A full tariff-based analysis would require information about the household's total baseline gas usage (to establish which tier the consumer is in), and a weight factor for each tariff that determines how many customers are served by that utility on that tariff. These data are generally not available in the public domain. DOE's use of EIA State-level data effectively averages overall consumer sales in each State, and so incorporates information from all utilities. DOE's approach is, therefore, more representative of a large group of consumers with diverse baseline gas usage levels than an approach that uses only tariffs.

DOE notes that within a State, there could be significant variation in the marginal price factors, including differences between rural and urban rates. To take this into account, DOE developed marginal price factors for each individual household using RECS 2015 billing data. These data are then normalized to match the average State marginal price factors, which are equivalent to a consumption-weighted average marginal price across all households in the State. For more details on the comparative analysis and updated marginal price analysis, *see* appendix 8D of the November 2022 Preliminary Analysis TSD.

To estimate energy prices in future years, DOE multiplied the 2022 energy prices by the projection of annual average price changes for each of the nine Census Divisions from the Reference case in *AEO 2023,* which has an end year of 2050.[23] To estimate price trends after 2050, DOE used the average annual rate of change in prices from 2046 through 2050.

To assess the impact of updated energy price estimates, DOE compared the energy price estimates in 2030 from the October 2023 NOPD to the projected estimates using updated EIA energy price data from 2023. The results of this comparison are presented in Table IV.23.

TABLE IV.23—SUMMARY OF ENERGY PRICE COMPARISON OF 2023 EIA DATA RELATIVE TO NOVEMBER 2023 NOPD

Energy type	Percentage change in 2030 energy price
Electricity	−20
Natural Gas	1
LPG	1
Fuel Oil	−16

Based upon this review, DOE has determined that energy prices have either not changed significantly, as in the case of natural gas and LPG, or have decreased, as in the case of electricity and fuel oil, relative to the energy prices used in the October 2023 NOPD. Consequently, updating energy prices would either have no impact on analytical results or decrease operating cost savings, thereby further justifying DOE's decision to not amend the existing energy conservation standards for consumer furnace fans. DOE did not receive comments regarding energy prices in response to the October 2023 NOPD. As a result, DOE has continued to use the energy prices from the October 2023 NOPD in this determination.

5. Maintenance and Repair Costs

The maintenance cost is the routine cost to the consumer of maintaining product operation. The regular furnace maintenance generally includes checking the furnace fan. As in the October 2023 NOPD, DOE assumes for this analysis that this maintenance cost is the same at all efficiency levels.

The repair cost is the cost to the consumer for replacing or repairing components in the consumer furnace fan that have failed. For the October 2023 NOPR, DOE included motor replacement as a repair cost for a fraction of furnace fans. To estimate rates of motor failure, DOE developed a distribution of fan motor lifetime (expressed in operating hours) by motor size using data from DOE's analysis for the March 9, 2010 Small Electric Motors Final Rule and manufacturer literature. (75 FR 10874) DOE then paired these data with the calculated number of annual operating hours for each sample furnace fan. Motor costs were based on costs developed in the engineering analysis and the replacement markups developed in the markup analysis. DOE assumed that the motor cost does not apply if motor failure occurs during the furnace warranty period (assumed to be at least one year, and five or more years for a fraction of installations).

For the October 2023 NOPD, the repair costs (including labor hours, component costs, and frequency) at each considered efficiency level were derived based on RSMeans data,[24] manufacturer literature, and a report from the Gas Research Institute.[25] DOE accounted for regional differences in labor costs. DOE did not receive comments related to its repair cost assumptions, and accordingly, the Department has maintained the same costs as used in the October 2023 NOPD for this final determination.

For a detailed discussion of the development of maintenance and repair costs, *see* appendix 8E of the November 2022 Preliminary Analysis TSD.

6. Product Lifetime

Product lifetime is the age at which an appliance is retired from service. Furnace fan lifetimes are considered equivalent to furnace lifetimes, so DOE modeled furnace fan lifetime based on estimated furnace lifetimes. Because product lifetime varies, DOE uses a lifetime distribution to characterize the probability that a product will be retired from service at a given age. DOE conducted an extensive literature review and took into account published studies. Because the basis for the estimates in the literature was uncertain, DOE developed a method using national survey data, along with shipment data, to estimate the distribution of consumer furnace lifetimes in the field.

[22] The Gas Technology Institute provided a reference located in the docket of DOE's 2016 rulemaking to develop energy conservation standards for residential boilers. (Docket No. EERE–2012–BT–STD–0047–0068) (Available at: *www.regulations.gov/document/EERE-2012-BT-STD-0047-0068*) (last accessed June 28, 2024).

[23] EIA, *Annual Energy Outlook 2023 with Projections to 2050,* Washington, DC (Available at: *www.eia.gov/forecasts/aeo/*) (last accessed June 11, 2024).

[24] RSMeans Company Inc., *RS Means Facilities Maintenance & Repair Cost Data* (2021) (Available at: *www.rsmeans.com/*) (last accessed June 1, 2024).

[25] Jakob, F.E., *et al., Assessment of Technology for Improving the Efficiency of Residential Gas Furnaces and Boilers, Volume I and II—Appendices* (September 1994), Gas Research Institute, Report No. GRI–94/0175 (Available at: *www.gti.energy/software-and-reports/*) (last accessed Feb. 15, 2022).

DOE assumed that the probability function for the annual survival of consumer furnaces would take the form of a Weibull distribution. For the October 2023 NOPD, DOE derived the Weibull distribution parameters by using stock and age data on consumer furnaces from the U.S. Census's biennial American Housing Survey (''AHS'') from 1974–2019 [26] and EIA's RECS 1990, 1993, 2001, 2005, 2009, and 2015.[27] DOE used the results from the 2022 American Home Comfort Survey (''AHCS'') to estimate the national average lifetime of 21.4 years.[28] DOE also determined the average lifetime for different regions: 22.5 years for the North region and 20.2 years for rest of the country. These results were used to scale the average lifetime for these regions.

DOE did not receive any comments on the lifetime distributions used in the October 2023 NOPD. As consumer furnace fans, and the furnaces in which they reside, have not changed significantly since the October 2023 NOPD, DOE has maintained the same lifetime distribution in this final determination.

7. Discount Rates

In the calculation of LCC, DOE applies discount rates appropriate to estimate the present value of future expenditures and savings. DOE estimated a distribution of discount rates for consumer furnace fans based on the opportunity cost of funds. DOE estimates discount rates separately for residential and commercial end users.

For residential end users, DOE applies weighted-average discount rates calculated from consumer debt and asset data, rather than marginal or implicit discount rates.[29] The LCC analysis estimates net present value over the lifetime of the product, 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 analysis, 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.

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 triennial Survey of Consumer Finances [30] (''SCF''). 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. DOE assigned each sample household a specific discount rate drawn from one of the distributions. The average rate across all types of household debt and equity and income groups, weighted by the shares of each type, is 4.1 percent.

To establish commercial discount rates for commercial end users in the small fraction of consumer furnace fans in commercial buildings, DOE estimated the weighted-average cost of capital using data from Damodaran Online.[31] The weighted-average cost of capital is commonly used 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 their cost of capital is the weighted average of the cost to the firm of equity and debt financing. DOE estimated the cost of equity using the capital asset pricing model, which assumes that the cost of equity for a particular company is proportional to the systematic risk faced by that company. The average rate for consumer furnace fans used in commercial applications in this analysis, across all business activity, is 7.2 percent. DOE did not receive comments regarding discount rates in response to the October 2023 NOPD.

See chapter 8 of the November 2022 Preliminary Analysis TSD for further details on the development of consumer and commercial discount rates.

8. Energy-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 (*i.e.,* market shares) of product efficiencies under the no-new-standards case (*i.e.,* the case without amended or new energy conservation standards) in the compliance year (2030). This approach reflects the fact that some consumers may purchase products with efficiencies greater than the baseline levels, even in the absence of new or amended standards.

For consumer furnace fans, DOE does not have any shipments data by efficiency after the 2019 furnace fan standards became effective. Due to the lack of available shipments data, DOE used DOE's CCD for furnace fans and furnaces as a proxy to develop an efficiency distribution based on available models.

DOE did not receive additional data or comments on estimated market shares in the no-new-standard case in response to the October 2023 NOPD. Accordingly, DOE continued to use estimates from the October 2023 NOPD for this final determination.

Table IV.24 shows the resulting market shares by efficiency level. For a detailed discussion of the development of no-new-standards case distributions based on models, *see* appendix 7F of the November 2022 Preliminary Analysis TSD.

[26] U.S. Census Bureau: Housing and Household Economic Statistics Division, *American Housing Survey,* Multiple Years (1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1983, 1985, 1987, 1989, 1991, 1993, 1995, 1997, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013, 2015, 2017, 2019, and 2021) (Available at: *www.census.gov/programs-surveys/ahs.html*) (last accessed June 28, 2024).

[27] U.S. Department of Energy: Energy Information Administration, *Residential Energy Consumption Survey (''RECS''),* Multiple Years (1990, 1993, 1997, 2001, 2005, 2009, and 2015) (Available at: *www.eia.gov/consumption/residential/*) (last accessed June 28, 2024).

[28] Decision Analysts, 2022 American Home Comfort Study (2022) Arlington, Texas (Available at: *www.decisionanalyst.com/syndicated/homecomfort/*) (last accessed August 26, 2024).

[29] 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, and interest rates at which a consumer is able to borrow or lend. The implicit discount rate is not appropriate for the LCC analysis because it reflects a range of factors that influence consumer purchase decisions, rather than the opportunity cost of the funds that are used in purchases.

[30] U.S. Board of Governors of the Federal Reserve System, Survey of Consumer Finances, 1995, 1998, 2001, 2004, 2007, 2010, 2013, 2016, and 2019 (Available at: *www.federalreserve.gov/econresdata/scf/scfindex.htm*) (last accessed April 26, 2024).

[31] Damodaran, A. Data Page: Historical Returns on Stocks, Bonds and Bills-United States (2023) (Available at: *pages.stern.nyu.edu/~adamodar/*) (Last accessed June 1, 2024).

TABLE IV.24—NO-NEW-STANDARDS CASE ENERGY EFFICIENCY DISTRIBUTIONS IN 2030 FOR CONSUMER FURNACE FANS

Product class	EL	No-new-standards case (%)	Efficiency level (%)	
			1	2
Non-Weatherized, Non-Condensing Gas Furnace Fan	0	100		
	1		100	
NonWeatherized, Condensing Gas Furnace Fan	0	100		
	1		100	
Weatherized NonCondensing Gas Furnace Fan	0	100		
	1		100	
NonWeatherized, NonCondensing Oil Furnace Fan	0	46		
	1	54	100	
	2			100
NonWeatherized Electric Furnace/Modular Blower Fan	0	100		
	1		100	
Mobile Home NonWeatherized, NonCondensing Gas Furnace Fan	0	11		
	1	89	100	
	2			100
Mobile Home NonWeatherized, Condensing Gas Furnace Fan	0	8		
	1	92	100	
	2			100
Mobile Home NonWeatherized Oil Furnace Fan	0	90		
	1	10	100	
	2			100
Mobile Home Electric Furnace/Modular Blower Fan	0	100		
	1		100	

The LCC Monte Carlo simulations draw from the efficiency distributions and assign an efficiency to the consumer furnace fans purchased by each sample household or commercial business in the no-new-standards case. The resulting percentage shares within the sample match the market shares in the efficiency distributions.

9. Payback Period Analysis

The payback period is the amount of time (expressed in years) it takes the consumer to recover the additional installed cost of more-efficient products, compared to baseline products, through energy cost savings. Payback periods that exceed the life of the product mean that the increased total installed cost is not recovered in reduced operating expenses.

The inputs to the PBP calculation for each efficiency level are the change in total installed cost of the product and the change in the first-year annual operating expenditures relative to the baseline. DOE refers to this as a ''simple PBP'' because it does not consider changes over time in operating cost savings. The PBP calculation uses the same inputs as the LCC analysis when deriving first-year operating costs, except that discount rates are not needed. DOE did not receive comments regarding the payback period methodology in response to the October 2023 NOPD.

F. Shipments Analysis

DOE uses projections of annual product shipments to calculate the national impacts of potential amended or new energy conservation standards on energy use, NPV, and future manufacturer cash flows.[32] The shipments model takes an accounting approach, tracking market shares of each product class and the vintage of units in the stock. Stock accounting uses product shipments as inputs to estimate the age distribution of in-service product stocks for all years. The age distribution of in-service product stocks is a key input to calculations of both the NES and NPV, because operating costs for any year depend on the age distribution of the stock.

DOE developed shipment projections based on historical data and an analysis of key market drivers for each product. The vast majority of furnace fans are shipped installed in furnaces, so DOE estimated furnace fan shipments by projecting furnace shipments in three market segments: (1) replacements, (2) new housing, and (3) new owners in buildings that did not previously have a central furnace.

To project furnace replacement shipments, DOE developed retirement functions for furnaces from the lifetime estimates and applied them to the existing products in the housing stock. The existing stock of products is tracked by vintage and developed from historical shipments data. The shipments analysis uses a distribution of furnace lifetimes to estimate furnace replacement shipments. In addition, DOE adjusted replacement shipments by taking into account demolitions, using the estimated changes to the housing stock from *AEO 2023.*

DOE assembled historical shipments data for consumer furnaces from Appliance Magazine from 1954–2012,[33] AHRI from 1996–2022,[34] HARDI from 2013–2022,[35] and BRG from 2007–2022.[36] DOE also used the 1992 and 1994–2003 shipments data by State provided by AHRI [37] and 2004–2009 and 2010–2015 shipments data by the North region and the rest of country

[32] DOE uses data on manufacturer shipments as a proxy for national sales, as aggregate data on sales are lacking. In general, one would expect a close correspondence between shipments and sales.

[33] *Appliance Magazine,* Appliance Historical Statistical Review: 1954–2012 (2014).

[34] Air-Conditioning, Heating, & Refrigeration Institute (''AHRI''), *Furnace Historical Shipments Data* (1996–2022) (Available at: *www.ahrinet.org/analytics/statistics/historical-data/furnaces-historical-data*) (last accessed June 28, 2024).

[35] Heating, Air-conditioning and Refrigeration Distributors International (''HARDI''), *Gas Furnace Shipments Data from 2013–2022* (*Provided to Lawrence Berkeley National Laboratory*).

[36] BRG Building Solutions, The North American Heating & Cooling Product Markets (Available at: *www.brgbuildingsolutions.com/solutions/market-reports/*) (last accessed June 28, 2024).

[37] AHRI (formerly Gas Appliance Manufacturers Association (''GAMA'')), *Updated Shipments Data for Residential Furnaces and Boilers* (April 25, 2005) (Available at: *www.regulations.gov/document/EERE-2006-STD-0102-0138*) (last accessed June 28, 2024).

provided by AHRI,[38] as well as HARDI shipments data that is disaggregated by region and most States to disaggregate shipments by region. DOE also used CBECS 2012 data and BRG shipments data to estimate the commercial fraction of shipments. Disaggregated shipments for mobile home gas furnaces (''MHGFs'') are not available, so DOE disaggregated MHGF shipments from the total by using a combination of data from the U.S. Census,[39 40] AHS,[41] RECS,[42] and a 2014 MHGF shipments estimate by Mortex.[43]

To project shipments to the new housing market, DOE utilized a projection of new housing construction and historic saturation rates of various furnaces in new housing. DOE used the *AEO 2023* housing starts and commercial building floor space projections and data from the U.S. Census Bureau's Characteristics of New Housing,[44 45] Home Innovation Research Labs Annual Builder Practices Survey,[46] RECS 2015, AHS 2021, and CBECS 2012 to estimate new construction saturations. DOE also estimated future furnace saturation rates in new single-family housing based on a weighted average of values from the U.S. Census Bureau's Characteristics of New Housing from 1999 through 2022, and for multi-family buildings using data from the Census Bureau's Characteristics of New Housing (Multi-Family Units) from 1973 through 2022.[47]

To project shipments to the new-owner market, DOE estimated the new owners based on the residual shipments from the calculated replacement and new construction shipments compared to historical shipments over five years (2018–2022). DOE compared this with data from Decision Analyst's 2002 to 2022 AHCS,[48] 2023 BRG data,[49] and AHRI's estimated shipments in 2000,[50] which showed similar historical fractions of new owners. DOE assumed that the new-owner fraction would be the 10-year average (2013–2022) in 2030 and then decrease to zero by the end of the analysis period (2059).

DOE did not receive comments on the shipments methodology in response to the October 2023 NOPD. DOE notes that although there may be additional historical data available for 2023, including an additional year of historical data would have a minimal impact to projected shipments over the shipments analysis period (2030–2059). Additionally, the October 2023 NOPD relied on *AEO 2023,* which remains the most recent available edition for *AEO* for many key inputs for future product demand. For these reasons, DOE continued to use shipments from the October 2023 NOPD for this final determination.

G. National Impact Analysis

The NIA assesses the NES and the NPV from a national perspective of total consumer costs and savings that would be expected to result from new or amended energy conservation standards at specific efficiency levels.[51] (''Consumer'' in this context refers to consumers of the product being regulated.) DOE calculates the NES and NPV for the potential standard levels considered based on projections of annual product shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses.[52] For the present analysis, DOE projected the energy savings, operating cost savings, product costs, and NPV of consumer benefits over the lifetime of consumer furnace fans sold from 2030 through 2059.

DOE evaluates the impacts of new or amended standards by comparing a case without such standards with standards-case projections. The no-new-standards case characterizes energy use and consumer costs for each product class in the absence of new or amended energy conservation standards. For this projection, DOE considers historical trends in efficiency and various forces that are likely to affect the mix of efficiencies over time. DOE compares the no-new-standards case with projections characterizing the market for each product class if DOE adopted new or amended standards at specific energy efficiency levels (*i.e.,* the candidate standards levels (''CSLs'') or standards cases) for that class. For the standards cases, DOE considers how a given standard would likely affect the market shares of products with efficiencies greater than the standard.

DOE uses a spreadsheet model to calculate the energy savings and the national consumer costs and savings from each CSL. Interested parties can review DOE's analyses by changing various input quantities within the spreadsheet. The NIA spreadsheet model uses typical values (as opposed to probability distributions) as inputs.

Table IV.25 summarizes the inputs and methods DOE used for the NIA for the final determination. Discussion of these inputs and methods follows the table. *See* chapter 10 of the November 2022 Preliminary Analysis TSD for details.

TABLE IV.25—SUMMARY OF INPUTS AND METHODS FOR THE NATIONAL IMPACT ANALYSIS

Input	Method
Shipments	Annual shipments from shipments model.

[38] AHRI, Non-Condensing and Condensing Regional Gas Furnace Shipments for 2004–2009 and 2010–2015 Data Provided to DOE contractors (July 20, 2010 and November 26, 2016).

[39] U.S. Census Bureau, Manufactured Homes Survey: Annual Shipments to States from 1994–2022 (Available at: *www.census.gov/data/tables/time-series/econ/mhs/latest-data.html*) (last accessed June 28, 2024).

[40] U.S. Census Bureau, Manufactured Homes Survey: Historical Annual Placements by State from 1980–2013 (Available at: *www.census.gov/data/tables/time-series/econ/mhs/historical-annual-placements.html*) (last accessed June 28, 2024).

[41] U.S. Census Bureau—Housing and Household Economic Statistics Division, American Housing Survey, multiple years from 1973–2021 (Available at: *www.census.gov/programs-surveys/ahs/data.html*) (last accessed June 28, 2024).

[42] EIA, Residential Energy Consumption Survey (RECS), multiple years from 1979–2015 (Available at: *www.eia.gov/consumption/residential/*) (last accessed June 28, 2024).

[43] Mortex estimated that the total number of MHGFs manufactured in 2014 was about 54,000, and about two-thirds were sold to the replacement market. Mortex also stated that MHGF sales have not been growing. (Mortex, No. 157 at p. 3) (Available at: *www.regulations.gov/document/EERE-2014-BT-STD-0031-0157*) (last accessed June 28, 2024).

[44] U.S. Census, Characteristics of New Housing from 1999–2022 (Available at: *www.census.gov/construction/chars/*) (last accessed June 1, 2023).

[45] U.S. Census, Characteristics of New Housing (Multi-Family Units) from 1973–2022 (Available at: *www.census.gov/construction/chars/mfu.html*) (last accessed June 1, 2023).

[46] Home Innovation Research Labs (independent subsidiary of the National Association of Home Builders (NAHB), Annual Builder Practices Survey (2015–2019) (Available at: *www.homeinnovation.com/trends_and_reports/data/new_construction*) (last accessed June 28, 2024).

[47] U.S. Census Bureau, Characteristics of New Housing (Available at: *www.census.gov/construction/chars/*) (last accessed June 28, 2024).

[48] Decision Analyst, 2002, 2004, 2006, 2008, 2010, 2013, 2016, 2019, and 2022 American Home Comfort Study (Available at: *www.decisionanalyst.com/syndicated/homecomfort/*) (last accessed June 28, 2024).

[49] BRG data (Available at: *www.brgbuildingsolutions.com/*) (last accessed June 28, 2024).

[50] AHRI (formerly GAMA), Furnace and Boiler Shipments data provided to DOE for Furnace and Boiler ANOPR (Jan. 23, 2002).

[51] The NIA accounts for impacts in the United States and U.S. territories.

[52] For the NIA, DOE adjusts the installed cost data from the LCC analysis to exclude sales tax, which is a transfer.

TABLE IV.25—SUMMARY OF INPUTS AND METHODS FOR THE NATIONAL IMPACT ANALYSIS—Continued

Input	Method
Compliance Date of Standard	2030.
Efficiency Trends	No-new-standards case based on historical shipment data and on current consumer furnace fans model availability by efficiency level (*see* chapter 8 of the November 2022 Preliminary Analysis TSD). Roll-up in the compliance year for standards cases.
Annual Energy Consumption per Unit	Annual weighted-average values are a function of shipments-weighted unit energy use consumption.
Total Installed Cost per Unit	Annual weighted-average values as a function of the efficiency distribution (*see* chapter 8 of the November 2022 Preliminary Analysis TSD).
Annual Energy Cost per Unit	Annual weighted-average values as a function of the annual energy consumption per unit and energy prices.
Repair and Maintenance Cost per Unit	Annual values as a function of efficiency level (*see* chapter 8 of the November 2022 Preliminary Analysis TSD).
Energy Price Trends	*AEO 2023* projections to 2050 and extrapolation thereafter.
Energy Site-to-Primary and FFC Conversion	A time-series conversion factor based on *AEO 2023*.
Discount Rate	3 percent and 7 percent.
Present Year	2023.

1. Product Efficiency Trends

A key component of the NIA is the trend in energy efficiency projected for the no-new-standards case and each of the standards cases. Section IV.E.8 of this document describes how DOE developed an energy efficiency distribution for the no-new-standards case (which yields a shipment-weighted average efficiency) for each of the considered product classes for the year of anticipated compliance with an amended or new standard (2030). To project efficiencies for the no-new-standards case, DOE used historical shipment data and current consumer furnace fan model availability by efficiency level (*see* chapter 8 of the November 2022 Preliminary Analysis TSD).

To develop standards-case efficiency trends, DOE used a ''roll-up'' scenario to establish the shipment-weighted efficiency for the year that standards are assumed to become effective (2030). In this scenario, the market shares of products in the no-new-standards case that do not meet the standard under consideration would ''roll up'' to meet the new standard level, and the market share of products above the standard would remain unchanged.

2. National Energy Savings

The NES analysis involves a comparison of national energy consumption of the considered products between each potential standards case (*i.e.,* CSL) and the case with no new or amended energy conservation standards. DOE calculated the national energy consumption by multiplying the number of units (*i.e.,* stock) of each product (by vintage or age) by the unit energy consumption (also by vintage). DOE calculated annual NES based on the difference in national energy consumption for the no-new-standards case and for each higher-efficiency standards case. DOE estimated energy consumption and savings based on site energy and converted the electricity consumption and savings to primary energy (*i.e.,* the energy consumed by power plants to generate site electricity) using annual conversion factors derived from *AEO 2023.* For natural gas and LPG, primary energy consumption is the same as site energy consumption. Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

Use of higher-efficiency products is sometimes associated with a direct rebound effect, which refers to an increase in utilization of the product due to the increase in efficiency and reduction in operating cost. A rebound effect reduces the energy savings attributable to a standard. Where appropriate, DOE accounts for the direct rebound effect when estimating the NES from potential standards. In the October 2023 NOPD, DOE applied a rebound effect in the residential sector for those standards cases that require a BPM motor furnace fan for product classes that currently have an improved PSC motor standard. A rebound effect factor of 16 percent was determined by calculating the additional electricity use that is required from a doubling of the use of continuous fan circulation compared to the average use assumed in the energy use analysis.[53] Although a lower value might be warranted, DOE preferred to be conservative and not risk understating the rebound effect. For commercial applications, DOE applied no rebound effect, a decision consistent with other recent energy conservation standards rulemakings.[54 55 56]

DOE did not receive comments on rebound in response to the October 2023 NOPD. Consequently, DOE maintained the same approach for this final determination.

In 2011, in response to the recommendations of a committee on ''Point-of-Use and Full-Fuel-Cycle Measurement Approaches to Energy Efficiency Standards'' appointed by the National Academy of Sciences, DOE announced its intention to use FFC measures of energy use and greenhouse gas and other emissions in the NIAs and emissions analyses included in future energy conservation standards rulemakings. 76 FR 51281 (August 18, 2011). After evaluating the approaches

[53] DOE reviewed an evaluation report from Wisconsin that indicates that a considerable number of homeowners who purchase constant-airflow BPM furnaces significantly increase the frequency with which they operate their furnace fan subsequent to the installation of the constant-airflow BPM furnace. This report indicates that, on average, there is a doubling in the amount of continuous fan circulation use. DOE assumed that this doubling was the same for all types of furnace fans that had a significant decrease in energy use in the continuous fan circulation mode. (Evaluation report available at: *www.focusonenergy.com/sites/default/files/emcfurnaceimpactassessment_evaluationreport.pdf*) (last accessed August 26, 2024).

[54] DOE, Energy Conservation Program for Certain Industrial Equipment: Energy Conservation Standards for Small, Large, and Very Large Air-Cooled Commercial Package Air Conditioning and Heating Equipment and Commercial Warm Air Furnaces; Direct Final Rule. 81 FR 2419 (Jan. 15, 2016) (Available at: *www.regulations.gov/document/EERE-2013-BT-STD-0021-0055*) (last accessed June 28, 2024).

[55] DOE, Energy Conservation Program: Energy Conservation Standards for Residential Boilers; Final Rule. 81 FR 2319 (Jan. 15, 2016) (Available at: *www.regulations.gov/document/EERE-2012-BT-STD-0047-0078*) (last accessed June 11, 2024).

[56] DOE, Energy Conservation Program: Energy Conservation Standards for Commercial Packaged Boilers; Final Rule. 85 FR 1592 (Jan. 10, 2020) (Available at: *www.regulations.gov/document/EERE-2013-BT-STD-0030-0099*) (last accessed June 11, 2024).

discussed in the August 18, 2011 notice, DOE published a statement of amended policy in which DOE explained its determination that EIA's National Energy Modeling System (''NEMS'') is the most appropriate tool for its FFC analysis and its intention to use NEMS for that purpose. 77 FR 49701 (August 17, 2012). NEMS is a public domain, multi-sector, partial equilibrium model of the U.S. energy sector[57] that EIA uses to prepare its *Annual Energy Outlook.* The FFC factors incorporate losses in production and delivery in the case of natural gas (including fugitive emissions) and additional energy used to produce and deliver the various fuels used by power plants. The approach used for deriving FFC measures of energy use and emissions is described in appendix 10B of the November 2022 Preliminary Analysis TSD.

3. Net Present Value Analysis

The inputs for determining the NPV of the total costs and benefits experienced by consumers are: (1) total annual installed cost, (2) total annual operating costs (which include energy costs and repair and maintenance costs), and (3) a discount factor to calculate the present value of costs and savings. DOE calculates net savings each year as the difference between the no-new-standards case and each standards case in terms of total savings in operating costs versus total increases in installed costs. DOE calculates operating cost savings over the lifetime of each product shipped during the projection period.

The operating cost savings are energy cost savings, which are calculated using the estimated energy savings in each year and the projected price of the appropriate form of energy. To estimate energy prices in future years, DOE multiplied the average regional energy prices by the projection of annual national-average residential energy price changes in the *AEO 2023* Reference case, which has an end year of 2050. To estimate price trends after 2050, DOE used the average annual rate of change in prices from 2020 through 2050.

In calculating the NPV, DOE multiplies the net savings in future years by a discount factor to determine their present value. For this final determination, DOE estimated the NPV of consumer benefits using both a 3-percent and a 7-percent real discount rate. DOE uses these discount rates in accordance with guidance provided by the Office of Management and Budget (''OMB'') to Federal agencies on the development of regulatory analysis.[58] The discount rates for the determination of NPV are in contrast to the discount rates used in the LCC analysis, which are designed to reflect a consumer's perspective. The 7-percent real value is an estimate of the average before-tax rate of return to private capital in the U.S. economy. The 3-percent real value represents the ''social rate of time preference,'' which is the rate at which society discounts future consumption flows to their present value. DOE did not receive comments regarding the NIA methodology in response to the October 2023 NOPD.

H. Other Factors Related to Backward-Inclined Impellers

In this analysis, although DOE did not screen out backward-inclined impellers from further considerations in this analysis (for the reasons discussed in section IV.A.4.b of this document), DOE is aware of several points of uncertainty related to the impacts of a potential standard that would require the use of this technology. First, DOE understands that there may be uncertainty related to whether this technology can be implemented across all input capacities and cabinet sizes. Second, as discussed in the October 2023 NOPD, manufacturers raised concerns about the potential negative impacts on consumer features because of increased noise in certain sizes of furnaces (although DOE is not aware of data on this subject). 88 FR 69826, 69836, 69861 (Oct. 6, 2023). Additionally, the incorporation of backward-inclined impellers could require system changes to the furnace system that expand beyond the scope of the furnace fan. Manufacturers noted that adoption of backward-inclined impellers could necessitate system considerations to ensure reliability of heat exchanger performance, acceptable sound performance, and ease of installation. Manufacturers also raised concerns that constraints of backward-inclined impeller designs could impede the flexibility of installation configurations, as discussed in the October 2023 NOPD. *Id.* For a fraction of the market, complete furnace redesign would be required to accommodate the backward-inclined impellers design option.

Finally, as discussed in section IV.B.1.c of this document, DOE understands that there is uncertainty associated with the estimated 10-percent reduction in FER for fans using a backward-inclined impeller as compared to models that include forward-inclined impellers. Uncertainty related to the results of the energy use analysis contributes uncertainty to all the conclusions of DOE's subsequent analyses, including the LCC and PBP analyses and the NIA.

In commenting on the October 2023 NOPD, Ravnitzky supported DOE's consideration of unintended consequences such as limiting small cabinet-size options and increased noise associated with specific design options, including backward-inclined impellers, so as to ensure that standards did not limit the performance of consumer furnace fans or place excessive burden on manufacturers and consumers. (Ravnitzky, No. 29 at p. 1) Lennox commented that it agrees with DOE's conclusions that the limited number of backward-inclined impellers on the market, concerns about feasibility of implementing the technology across all input capacities and cabinet sizes, unavailability of certain furnace product sizes, and uncertainty of estimates of energy reduction associated with backward-inclined impellers suggest that amended standards may not be appropriate. (Lennox, No. 30 at pp. 2–3)

In response, as discussed in section V.C of this document, DOE has considered these uncertainties in its decision of whether to amend the energy conservation standards for consumer furnace fans.

V. Analytical Results and Conclusions

The following section addresses the results from DOE's analyses with respect to the considered energy conservation standards for consumer furnace fans. It addresses the CSLs examined by DOE (see section IV.B.1 of this document) and the projected impacts of each of these levels if adopted as energy conservation standards for the subject consumer furnace fans. To estimate the impacts of amended standards for consumer furnace fans, DOE compared the no-new-standards case to scenarios in which specific CSLs are implemented. CSL 1 analyzes a scenario in which standards corresponding to EL 1 are adopted for the NWO–NC, MH–NWG–NC, MH–NWG–C, and MH–NWO product classes and standards are not amended for the NWG–NC, NWG–C,

[57] For more information on NEMS, refer to *The National Energy Modeling System: An Overview May 2023,* DOE/EIA (May 2023) (Available at: *www.eia.gov/outlooks/archive/0581(2023).pdf*) (last accessed June 11, 2024).

[58] United States Office of Management and Budget, *Circular A–4: Regulatory Analysis* (Sept. 17, 2003) Section E. (Available at: *www.whitehouse.gov/omb/information-for-agencies/circulars*) (last accessed June 28, 2024). DOE used the prior version of Circular A–4 (September 17, 2003) in accordance with the effective date of the November 9, 2023 version (Available at: *www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf*) (last accessed June 28, 2024).

WG–NC, NWEF/NWMB, and MH–EF/MB product classes. CSL 2 analyzes a scenario in which standards are adopted corresponding to EL 1 for the NWG–NC, NWG–C, WG–NC, NWEF/NWMB, and MH–EF/MB product classes and as EL 2 for the NWO–NC, MH–NWG–NC, MH–NWG–C, and MH–NWO product classes. In other words, CSL 1 analyzes a scenario with standards set at a level at which BPM motors are effectively required for all product classes, and CSL 2 analyzes a scenario with standards set at a level at which BPM motors with backward-inclined impellers are effectively required for all product classes, corresponding to the max-tech efficiency level for all product classes. Additional details regarding DOE's analyses are contained in the November 2022 Preliminary Analysis TSD supporting this document.

A. Economic Impacts on Individual Consumers

DOE analyzed the economic impacts on furnace fan consumers by looking at the effects that potential amended energy conservation standards at each EL would have on the LCC and PBP. This approach allowed DOE to assess the potential standards' cost-effectiveness (*i.e.,* the savings in operating costs throughout the estimated average life of consumer furnace fans compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the consumer furnace fans that are likely to result from the imposition of a standard). These analyses are discussed in the following sections.

In general, higher-efficiency products typically affect consumers in two ways: (1) purchase price increases, and (2) annual operating costs decrease. Inputs used for calculating the LCC and PBP include total installed costs (*i.e.,* product price plus installation costs), and operating costs (*i.e.,* annual energy use, energy prices, energy price trends, repair costs, and maintenance costs). The LCC calculation also uses product lifetime and a discount rate. Section IV.E of this final determination and chapter 8 of the November 2022 Preliminary Analysis TSD provide detailed information on the LCC and PBP analyses.

Table V.1 through Table V.18 show the average LCC and PBP results for the ELs considered for each product class of consumer furnace fans. In the first of each pair of tables, the simple payback is measured relative to the baseline level. In the second table, the impacts are measured relative to the efficiency distribution in the no-new-standards case in the compliance year. The LCC and PBP results for consumer furnace fans include both residential and commercial users. Because some consumers purchase products with higher efficiency in the no-new-standards case, the average savings are less than the difference between the average LCC of the baseline product 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 products 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 NON-WEATHERIZED, NON-CONDENSING GAS FURNACE FANS (NWG–NC)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	403	67	1,160	1,563		20.9
1	495	60	1,069	1,565	12.9	20.9

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.2—AVERAGE LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR NON-WEATHERIZED, NON-CONDENSING GAS FURNACE FANS (NWG–NC)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	68.4	(1)

* The savings represent the average LCC for affected consumers. Parentheses indicate negative (−) values.

TABLE V.3—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR NON-WEATHERIZED, CONDENSING GAS FURNACE FANS (NWG–C)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	420	61	1,106	1,525		21.9
1	501	55	1,024	1,526	13.3	21.9

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.4—AVERAGE LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR NON-WEATHERIZED, CONDENSING GAS FURNACE FANS (NWG–C)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	70.7	(0)

* The savings represent the average LCC for affected consumers. Parentheses indicate negative (−) values.

TABLE V.5—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR MOBILE HOME NON-WEATHERIZED, NON-CONDENSING GAS FURNACE FANS (MH–NWG–NC)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	212	54	884	1,096		20.7
1	258	35	589	847	2.3	20.7
2	332	30	530	863	5.0	20.7

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.6—AVERAGE LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR MOBILE HOME NON-WEATHERIZED, NON-CONDENSING GAS FURNACE FANS (MH–NWG–NC)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	3.8	231
2	76.1	9

* The savings represent the average LCC for affected consumers.

TABLE V.7—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR MOBILE HOME NON-WEATHERIZED, CONDENSING GAS FURNACE FANS (MH–NWG–C)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	238	62	1,039	1,277		21.5
1	300	37	666	966	2.5	21.5
2	364	34	631	995	4.6	21.5

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.8—AVERAGE LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR MOBILE HOME NON-WEATHERIZED, CONDENSING GAS FURNACE FANS (MH–NWG–C)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	1.5	292
2	82.1	(7)

* The savings represent the average LCC for affected consumers. Parentheses indicate negative (−) values.

TABLE V.9—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR MOBILE HOME ELECTRIC FURNACE/MODULAR BLOWER FANS (MH–EF/MB)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	255	36	629	885		20.7

TABLE V.9—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR MOBILE HOME ELECTRIC FURNACE/MODULAR BLOWER FANS (MH–EF/MB)—Continued

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
1	315	32	578	893	14.7	20.7

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.10—LCC AVERAGE SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR MOBILE HOME ELECTRIC FURNACE/MODULAR BLOWER FANS (MH–EF/MB)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	71.5	(8)

* The savings represent the average LCC for affected consumers. Parentheses indicate negative (−) values.

TABLE V.11—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR NON-WEATHERIZED, NON-CONDENSING OIL FURNACE FANS (NWO–NC)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	568	151	2,601	3,169		22.2
1	654	110	1,940	2,594	2.1	22.2
2	765	103	1,840	2,605	4.1	22.2

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.12—AVERAGE LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR NON-WEATHERIZED, NON-CONDENSING OIL FURNACE FANS (NWO–NC)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	4.4	618
2	52.2	274

* The savings represent the average LCC for affected consumers.

TABLE V.13—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR WEATHERIZED, NON-CONDENSING GAS FURNACE FANS (WG–NC)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	385	81	1,322	1,706		20.6
1	478	71	1,188	1,666	9.1	20.6

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.14—AVERAGE LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR WEATHERIZED, NON-CONDENSING GAS FURNACE FANS (WG–NC)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	54.9	40

* The savings represent the average LCC for affected consumers.

TABLE V.15—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR ELECTRIC FURNACE/MODULAR BLOWERS (NWEF/NWMB)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	305	43	726	1,031		20.7
1	371	39	673	1,045	16.0	20.7

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.16—AVERAGE LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR ELECTRIC FURNACE/MODULAR BLOWERS (NWEF/NWMB)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	77.5	(14)

* The savings represent the average LCC for affected consumers. Parentheses indicate negative (−) values.

TABLE V.17—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR MOBILE HOME NON-WEATHERIZED, NON-CONDENSING OIL FURNACE FANS (MH–NWO–NC)

Efficiency level	Average costs (2022$)				Simple payback period (years)	Average lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	491	88	1,539	2,030		22.5
1	541	66	1,187	1,728	2.3	22.5
2	624	61	1,105	1,729	5.0	22.5

Note: The results for each EL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline product.

TABLE V.18—AVERAGE LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR MOBILE HOME NON-WEATHERIZED, NON-CONDENSING OIL FURNACE FAN (MH–NWO–NC)

Efficiency level	Percentage of consumers with net cost	Average savings—impacted consumers (2022$) *
1	21.0	308
2	54.7	276

* The savings represent the average LCC for affected consumers.

B. National Impact Analysis

This section presents DOE's estimates of the NES and the NPV of consumer benefits that would result from each of the CSLs considered as potential amended standards.

1. National Energy Savings

To estimate the energy savings attributable to potential amended energy conservation standards for consumer furnace fans, DOE compared their energy consumption under the no-new-standards case to their anticipated energy consumption under each CSL. The savings are measured over the entire lifetime of products purchased during the 30-year period that begins in the year of anticipated compliance with amended standards (2030–2059).

Table V.19 presents DOE's projections of the national energy savings for each CSL considered for the analysis. The savings were calculated using the approach described in section IV.G.2 of this document.

TABLE V.19—CUMULATIVE NATIONAL ENERGY SAVINGS FOR CONSUMER FURNACE FANS; 30 YEARS OF SHIPMENTS

[2030–2059]

	Candidate standards level	
	1	2
	(quads)	
Primary energy	0.013	1.355
FFC energy	0.013	1.374

OMB Circular A–4 [59] requires agencies to present analytical results, including separate schedules of the monetized benefits and costs that show the type and timing of benefits and costs. Circular A–4 also directs agencies to consider the variability of key elements underlying the estimates of benefits and costs. For this final determination, DOE undertook a sensitivity analysis using nine years, rather than 30 years, of product shipments. The choice of a nine-year period is a proxy for the timeline in EPCA for the review of certain energy conservation standards and potential revision of and compliance with such revised standards.[60] The review timeframe established in EPCA is generally not synchronized with the product lifetime, product manufacturing cycles, or other factors specific to consumer furnace fans. Thus, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology. The NES sensitivity analysis results based on a nine-year analytical period are presented in Table V.20. The impacts are counted over the lifetime of consumer furnace fans purchased during the period 2030–2038.

TABLE V.20—CUMULATIVE NATIONAL ENERGY SAVINGS FOR CONSUMER FURNACE FANS; 9 YEARS OF SHIPMENTS

[2030–2038]

	Candidate standards level	
	1	2
	(quads)	
Primary energy	0.005	0.376
FFC energy	0.005	0.381

2. Net Present Value of Consumer Costs and Benefits

DOE estimated the cumulative NPV of the total costs and savings for consumers that would result from the CSLs considered for consumer furnace fans. In accordance with OMB Circular A–4, DOE calculated NPV using both a 7-percent and a 3-percent real discount rate. Table V.21 shows the consumer NPV results with impacts counted over the lifetime of products purchased during the period 2030–2059.

TABLE V.21—CUMULATIVE NET PRESENT VALUE OF CONSUMER BENEFITS FOR CONSUMER FURNACE FANS; 30 YEARS OF SHIPMENTS

[2030–2059]

Discount rate	Candidate standards level	
	1	2
	(billion 2022$)	
3 percent	0.112	1.821
7 percent	0.042	(0.150)

Note: Parentheses indicate negative (−) values.

The NPV results based on the aforementioned nine-year analytical period are presented in Table V.22. The impacts are counted over the lifetime of consumer furnace fan products purchased during the period 2030–2038. As mentioned previously, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology or decision criteria.

TABLE V.22—CUMULATIVE NET PRESENT VALUE OF CONSUMER BENEFITS FOR CONSUMER FURNACE FANS; 9 YEARS OF SHIPMENTS

[2030–2038]

Discount rate	Candidate standards level	
	1	2
	(billion 2022$)	
3 percent	0.056	0.716
7 percent	0.026	(0.071)

Note: Parentheses indicate negative (−) values.

C. Final Determination

As discussed previously, in order to make a final determination that the energy conservation standards for consumer furnace fans do not need to be amended, EPCA requires that DOE analyze whether amended standards would result in significant conservation of energy, be technologically feasible, and be cost-effective. (42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295(n)(2))

DOE has determined that technology options are available that can improve the efficacy of consumer furnace fans. These technology options are being used in commercially-available consumer furnace fans and, therefore, are technologically feasible. (See section IV.A.4 of this document for further information.) Hence, DOE has determined that amended energy conservation standards for consumer furnace fans would be technologically feasible.

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, initial charges, or maintenance expenses for the covered product that are likely to result from the standard. (42 U.S.C. 6295(n)(2)(C) and 42 U.S.C. 6295(o)(2)(B)(i)(II)) DOE conducted an LCC analysis to estimate the net costs/benefits to users from increased efficiency in the considered consumer furnace fan product classes, the results of which are shown in Table V.1 through Table V.18. DOE then aggregated the results from the LCC analysis to estimate the NPV of the total costs and benefits experienced by the Nation. (*See* results in Table V.21.) As noted, the inputs for determining the NPV are: (1) total annual installed cost, (2) total annual operating costs (energy costs and repair and maintenance costs),

[59] U.S. Office of Management and Budget, *Circular A–4: Regulatory Analysis* (Available at: *www.whitehouse.gov/omb/information-for-agencies/circulars*) (last accessed Sept. 9, 2021). DOE used the prior version of Circular A–4 (Sept. 17, 2003) in accordance with the effective date of the November 9, 2023 version (Available at: *www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf*) (last accessed June 11, 2024).

[60] EPCA requires DOE to review its standards at least once every six years, and requires, for certain products, a three-year period after any new standard is promulgated before compliance is required, except that in no case may any new standards be required within six years of the compliance date of the previous standards. (42 U.S.C. 6295(m)) If DOE makes a determination that amended standards are not needed, it must conduct a subsequent review within three years following such a determination. As DOE is evaluating the need to amend the standards, the sensitivity analysis is based on the review timeframe associated with amended standards. While adding a six-year review to the three-year compliance period adds up to nine years, DOE notes that it may undertake reviews at any time within the six-year period and that the three-year compliance date may yield to the six-year backstop. A nine-year analysis period may not be appropriate given the variability that occurs in the timing of standards reviews and the fact that for some products, the compliance period is five years rather than three years.

and (3) a discount factor to calculate the present value of costs and savings.

EPCA also requires that DOE consider whether amended energy conservation standards for the subject consumer furnace fans would result in significant conservation of energy. (42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295(n)(2)(A)) To estimate the energy savings attributable to potential amended standards for consumer furnace fans, DOE compared their energy consumption under the no-new-standards case to their anticipated energy consumption under each potential standard level. The savings are measured over the entire lifetime of products purchased in the 30-year period that begins in the year of anticipated compliance with amended standards (2030–2059). The results of this analysis are shown in Table V.19.

Because an analysis of potential cost-effectiveness and energy savings first requires an evaluation of the relevant technology, DOE typically first discusses the technological feasibility of amended standards. DOE then typically addresses the cost-effectiveness and energy savings associated with potential amended standards. For this final determination, DOE reviewed the impacts of amended standards corresponding to the implementation of the two design options analyzed in this proceeding separately (*i.e.,* BPM motor with forward-curved impellers and BPM motor with backward-inclined impellers, as discussed in section IV.B.1 of this document). For each design option, DOE considered the technological feasibility, cost-effectiveness, and significance of energy savings.

1. BPM Motor With Backward-Inclined Impellers

BPM motors with backward-inclined impellers are included in the current analysis as the max-tech design option for all furnace fan product classes. In other words, they are analyzed as EL 1 for the NWG–NC, NWG–C, WG–NC, NWEF/NWMB, and MH–EF/MB product classes and as EL 2 for the NWO–NC, MH–NWG–NC, MH–NWG–C, and MH–NWO product classes. As discussed in section IV.A.4 of this document, DOE is aware of BPM motors with backward-inclined impellers being used in commercially-available consumer furnace fans, and, therefore, this technology is technologically feasible.

As seen in Table V.19, DOE estimates that amended standards for consumer furnace fans would result in FFC energy savings of 1.374 quads at max-tech levels over a 30-year analysis period (2030–2059). However, as seen in Table V.1 through Table V.18 and Table V.21, these efficiency levels result in net LCC costs for the majority of consumers and negative net present value at a 7-percent discount rate. Therefore, DOE finds that the max-tech ELs (which would require the use of backward-inclined impellers) are not cost-effective.

Additionally, as discussed in section IV.H of this document, there is a significant amount of uncertainty associated with the inputs and results of this analysis. At this time, DOE has concerns about the feasibility of implementing backward-inclined impellers across all input capacities and cabinet sizes and the unavailability of certain furnace product sizes, concerns about potential negative impacts on consumer features, and uncertainty related to its assumptions about the energy reduction associated with backward-inclined impellers as opposed to forward-curved impellers.

2. BPM Motors With Forward-Inclined Impellers

BPM motors with forward-curved impellers (which is the type of impeller used in the vast majority of consumer furnace fans on the market today) are included in the current analysis as the design option analyzed in CSL 1. For these product classes, the current standards can be met using less-efficient PSC motors, so replacing the motor with a BPM motor can improve the efficiency of the furnace fan. BPM motors are widely used in commercially-available consumer furnace fans and, therefore, are technologically feasible.

As seen in Table V.21, CSL 1 results in positive NPV at the 3-percent and 7-percent discount rates. And, as seen in Table V.19, DOE estimates that amended standards for consumer furnace fans would result in energy savings of 0.013 quads at CSL 1 over a 30-year analysis period (2030–2059). However, as discussed in section IV.F of this document, shipments in the affected product classes have declined over the past 20 years and could decline faster than current shipment projections, which may lead to reductions in energy savings from amended standards. Given the small role of NWO–NC, MH–NWG–NC, MH–NWG–C, and MH–NWO in the overall furnace market and the low sales relative to the consumer boiler and consumer water heater markets, manufacturers may deprioritize furnace fan updates for these product classes. Depending on how companies prioritize resources, there could be reduced availability of NWO–NC, MH–NWG–NC, and MH–NWO products in the marketplace after 2030. Additionally, there is a potential risk that some manufacturers would choose to exit these markets rather than redesign affected products, given the low shipment volumes, lack of anticipated growth, limited potential for cost recovery, and need to prioritize technical resources. In particular, the loss of a few manufacturers in the NWO–NC market could lead to changes in competition and shifts toward the market becoming highly concentrated. Based on the declining shipments of the affected product classes and uncertainty over whether manufacturers will choose to remain in a shrinking market, DOE has determined that it is unable to conclude that amended standards for consumer furnace fans would be economically justified.

3. Summary

As discussed previously, a determination that amended standards are not needed must be based on consideration of whether amended standards will result in significant conservation of energy, are technologically feasible, and are cost-effective. (42 U.S.C. 6295(m)(1)(A) and 42 U.S.C. 6295(n)(2)) Additionally, DOE can only propose an amended standards if it is, among other things, economically justified. (42 U.S.C. 6295(m)(1)(B); 42 U.S.C. 6295(o)(2)(A)) However, for the reasons discussed in the preceding sections, DOE is unable to conclude that amended standards for furnace fans at any of the CSLs analyzed would result in significant conservation of energy, be technologically feasible, and also be cost-effective. Therefore, DOE has determined that energy conservation standards for consumer furnace fans do not need to be amended at this time.

VI. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866, 13563, and 14094

Executive Order (''E.O.'') 12866, ''Regulatory Planning and Review,'' 58 FR 51735 (Oct. 4, 1993), as supplemented and reaffirmed by E.O. 13563, ''Improving Regulation and Regulatory Review,'' 76 FR 3821 (Jan. 21, 2011) and amended by E.O. 14094, ''Modernizing Regulatory Review,'' 88 FR 21879 (April 11, 2023), requires agencies, to the extent permitted by law, to: (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public. DOE emphasizes as well that E.O. 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs (''OIRA'') in the OMB has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in this preamble, this final regulatory action is consistent with these principles.

Section 6(a) of E.O. 12866 also requires agencies to submit ''significant regulatory actions'' to OIRA for review. OIRA has determined that this final regulatory action does not constitute a ''significant regulatory action'' under section 3(f) of E.O. 12866, as amended by E.O. 14094. Accordingly, this action was not submitted to OIRA for review under E.O. 12866.

B. 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 E.O. 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (August 16, 2002), DOE published procedures and policies in the **Federal Register** 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 (*www.energy.gov/gc/office-general-counsel*).

DOE reviewed this final determination under the provisions of the Regulatory Flexibility Act and the policies and procedures published on February 19, 2003. Because DOE is not amending standards for consumer furnace fans, the determination will not amend any energy conservation standards. On the basis of the foregoing, DOE certifies that the final determination will have no significant economic impact on a substantial number of small entities. Accordingly, DOE has not prepared an FRFA for this final determination. DOE has transmitted 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).

C. Review Under the Paperwork Reduction Act of 1995

This final determination, which concludes that no amended energy conservation standards for consumer furnace fans are needed, imposes no new informational or recordkeeping requirements. Accordingly, OMB clearance is not required under the Paperwork Reduction Act. (44 U.S.C. 3501 *et seq.*)

D. Review Under the National Environmental Policy Act of 1969

DOE has analyzed this final action in accordance with the National Environmental Policy Act of 1969 (''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 has determined that this rule qualifies for categorical exclusion A4 because it is an interpretation or ruling in regard to an existing regulation and otherwise meets the requirements for application of a categorical exclusion. *See* 10 CFR 1021.410. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

E.O. 13132, ''Federalism,'' 64 FR 43255 (August 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. DOE has examined this final determination and has determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this final determination. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297) Therefore, no further action is required by E.O. 13132.

F. Review Under Executive Order 12988

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of E.O. 12988, ''Civil Justice Reform,'' 61 FR 4729 (Feb. 7, 1996), 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. Regarding the review required by section 3(a), section 3(b) of E.O. 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 E.O. 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 final determination meets the relevant standards of E.O. 12988.

G. 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)) 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 proposed ''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 *www.energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf.*

DOE examined this final determination according to UMRA and its statement of policy and determined that the final 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 State, local, and Tribal governments, in the aggregate, or by the private sector. As a result, the analytical requirements of UMRA do not apply.

H. 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 proposed rule or policy that may affect family well-being. When developing a Family Policymaking Assessment, agencies must assess whether: (1) the action strengthens or erodes the stability or safety of the family and, particularly, the marital commitment; (2) the action strengthens or erodes the authority and rights of parents in the education, nurture, and supervision of their children; (3) the action helps the family perform its functions, or substitutes governmental activity for the function; (4) the action increases or decreases disposable income or poverty of families and children; (5) the proposed benefits of the action justify the financial impact on the family; (6) the action may be carried out by State or local government or by the family, and whether (7) the action establishes an implicit or explicit policy concerning the relationship between the behavior and personal responsibility of youth, and the norms of society. In evaluating the above factors, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment as none of the above factors are implicated. Further, this final determination would not have any financial impact on families nor any impact on the autonomy or integrity of the family as an institution.

I. Review Under Executive Order 12630

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

J. 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). Pursuant to OMB Memorandum M–19–15, ''Improving Implementation of the Information Quality Act'' (April 24, 2019), DOE published updated guidelines, which are available at *www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf.* DOE has reviewed this final determination under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

E.O. 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 OIRA at OMB a Statement of Energy Effects for any proposed 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 is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) 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.

This final determination, which does not amend energy conservation standards for consumer furnace fans, is not a significant regulatory action under E.O. 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as such by the Administrator at OIRA. Therefore, it is not a significant energy action, and accordingly, DOE has not prepared a Statement of Energy Effects.

L. 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.'' *Id.* at 70 FR 2667.

In response to OMB's Bulletin, DOE conducted formal peer reviews of the energy conservation standards development process and the analyses that are typically used and has prepared a peer review report pertaining to the energy conservation standards rulemaking analyses.[61] 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. Because available data, models, and technological understanding have changed since 2007, DOE has engaged with the National Academy of Sciences (''NAS'') to review DOE's analytical methodologies to ascertain whether modifications are needed to improve DOE's analyses. DOE is in the process of evaluating the resulting December 2021 report.[62]

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this final determination prior to its effective date. The Office of Information and Regulatory Affairs has determined that this rule does not meet the criteria set forth in 5 U.S.C. 804(2).

VII. Approval of the Office of the Secretary

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

Signing Authority

This document of the Department of Energy was signed on October 10, 2024, by Jeffrey Marootian, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the **Federal Register**.

Signed in Washington, DC, on October 10, 2024.

Treena V. Garrett,

Federal Register Liaison Officer, U.S. Department of Energy.

[FR Doc. 2024–23907 Filed 10–17–24; 8:45 am]

BILLING CODE 6450–01–P

[61] ''Energy Conservation Standards Rulemaking Peer Review Report'' (2007) (Available at: *www.energy.gov/eere/buildings/downloads/energy-conservation-standards-rulemaking-peer-review-report-0*) (last accessed June 28, 2024).

[62] The December 2021 NAS report is available at *www.nationalacademies.org/our-work/review-of-methods-for-setting-building-and-equipment-performance-standards* (Last accessed August 28, 2024).