DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE-2022-BT-STD-0023]

RIN 1904-AF44

Energy Conservation Program: Energy Conservation Standards for Metal Halide Lamp Fixtures

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

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy ("DOE") is initiating an effort to determine whether to amend the current energy conservation standards for metal halide lamp fixtures ("MHLF"). On October 25, 2021, DOE published a final determination concluding that energy conservation standards for MHLFs do not need to be amended because they are not economically justified. No later than 3 years after such a determination, under the Energy Policy and Conservation Act, as amended, DOE must periodically review these standards and publish either a notice of proposed rulemaking ("NOPR") to propose new standards for MHLFs or a notification of determination that the existing standards do not need to be amended. This request for information ("RFI") solicits information from the public to help DOE determine whether amended standards for MHLFs would result in significant energy savings and whether such standards would be technologically feasible and economically justified. As part of this RFI, DOE seeks comment on technological and market changes since the most recent standards update to consider in its evaluation of more stringent standards. DOE also welcomes written comments from the public on any subject within the scope of this document (including those topics not specifically raised), as well as the submission of data and other relevant information.

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

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov.* under docket number EERE-2022-BT-STD-0023. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments may submit comments, identified by docket number EERE-2022-BT-STD-0023, by any of the following methods:

Email: *MHLF2022STD0023@ee.doe.gov@ee.doe.gov*. Include the docket number EERE-2022-BT-STD-0023 in the subject line of the message.

Postal Mail: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1445. If possible, please submit all items on a compact disc ("CD"), in which case it is not necessary to include printed copies.

Hand Delivery/Courier: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC, 20024. Telephone: (202) 287-1445. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

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

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

index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket web page can be found at *www.regulations.gov/docket/EERE-2022-BT-STD-0023*. The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section III for information on how to submit comments through *www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT:

Mr. Bryan Berringer, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-0371. Email: *ApplianceStandardsQuestions@ee.doe.gov*.

Ms. Kathryn McIntosh, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-2002. Email: *Kathryn.McIntosh@hq.doe.gov*.

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

SUPPLEMENTARY INFORMATION:

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I. Introduction

A. Authority and Background

The Energy Policy and Conservation Act, as amended ("EPCA"),[1] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B[2] of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles. These products include MHLFs, the subject of this document. (42 U.S.C. 6292(a)(19))[3] EPCA prescribed initial energy conservation standards for MHLFs, and directed DOE to conduct two cycles of rulemakings to determine whether to amend these standards. (42 U.S.C. 6295(hh)(1)(A), 42 U.S.C. 6295(hh)(2)(A), and 42 U.S.C. 6295(hh)(3)(A)).

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

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[1] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020), which reflect 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.

[3] DOE notes that because of the codification of the MHLF provisions in 42 U.S.C. 6295, MHLF energy conservation standards and the associated test procedures are subject to the requirements of the consumer products provisions of Part B of Title III of EPCA. However, because MHLFs are generally considered to be commercial equipment, DOE established the requirements for MHLFs in 10 CFR part 431 ("Energy Efficiency Program for Certain Commercial and Industrial Equipment") for ease of reference. DOE notes that the location of the provisions within the CFR does not affect either the substance or applicable procedure for MHLFs. Based upon their placement into 10 CFR part 431, MHLFs are referred to as "equipment" throughout this document, although covered by the consumer product provisions of EPCA.

waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions set forth under EPCA. (42 U.S.C. 6297(d))

EPCA also requires that, not later than 6 years after the issuance of any final rule establishing or amending a standard, DOE evaluate the energy conservation standards for each type of covered product, including those at issue here, and publish either a notification of determination that the standards do not need to be amended, or a NOPR that includes new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6295(m)(1)). In making a determination that the standards do not need to be amended, DOE must evaluate whether amended standards (1) will result in significant conservation of energy, (2) are technologically feasible, and (3) are cost effective as described under 42 U.S.C. 6295(o)(2)(B)(i)(II). (42 U.S.C. 6295(m)(1)(A); 42 U.S.C. 6295(n)(2)). Under 42 U.S.C. 6295(o)(2)(B)(i)(II), DOE must determine whether the benefits of a standard exceed its burdens by, to the greatest extent practicable, considering the savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered products which are likely to result from the imposition of the standard. If DOE determines not to amend a standard based on the statutory criteria, not later than 3 years after 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 determination is based publicly available and provide an opportunity for written comment. (42 U.S.C. 6295(m)(2)).

In proposing new standards, DOE must evaluate that proposal against the criteria of 42 U.S.C. 6295(o), as described in the following section, and follow the rulemaking

procedures set out in 42 U.S.C. 6295(p). (42 U.S.C. 6295(m)(1)(B) If DOE decides to amend the standard based on the statutory criteria, DOE must publish a final rule not later than two years after energy conservation standards are proposed. (42 U.S.C. 6295(m)(3)(A)).

DOE completed the first of these required rulemaking cycles in 2014 by publishing a final rule amending performance standards for MHLFs manufactured on or after February 10, 2017. 79 FR 7746 (February 10, 2014) ("2014 Final Rule"). Additionally, DOE completed the second rulemaking cycle reviewing current standard and determined not to amend the energy conservation standards for MHLFs by publishing a final rule in 2021. 86 FR 58763 (October 25, 2021) ("2021 Final Determination"). The current energy conservation standards are located in title 10 of the Code of Federal Regulations ("CFR") part 431, section 31.326. The currently applicable DOE test procedures for MHLFs appear at 10 CFR 431.324.[4]

DOE is publishing this RFI pursuant to EPCA's requirement that DOE must reevaluate the energy conservation standards no later than 3 years after making a determination not to amend standards, (42 U.S.C. 6295(m)(3)(B), and to collect data and information to inform its decision consistent with its obligations under EPCA.

B. Rulemaking Process

DOE must follow specific statutory criteria for prescribing new or amended standards for covered products. EPCA requires that any new or amended energy conservation standard prescribed by the Secretary of Energy ("Secretary") be designed to achieve the maximum improvement in energy or water efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)). Furthermore, DOE may

[4] DOE also recently published a final rule adopting amendments to its test procedure for MHLFs to incorporate by reference new relevant industry standards as well as update to latest versions of existing references; clarify the selection of reference lamps used for testing; specify the light output level at which to test dimming ballasts; revise definitions and reorganize the content of the test procedure for better readability and clarity; and revise the standby mode test method for MHLFs. 87 FR 37685 (Jun. 24, 2022).

not prescribe an amended or new standard that will not result in significant conservation of energy or is not technologically feasible or economically justified. (42 U.S.C. 6295(o)(3)(B))

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.[5] For example, the United States has now rejoined the Paris Agreement on February 19, 2021. As part of that agreement, the United States has committed to reducing greenhouse gas ("GHG") emissions in order to limit the rise in mean global temperature.[6] As such, energy savings that reduce GHG emission have taken on greater importance. In evaluating the significance of energy savings, DOE considers primary energy and full-fuel cycle ("FFC") effects when determining whether energy savings are significant. Primary energy and FFC effects include the energy consumed in electricity production (depending on load shape), in distribution and transmission, and in extracting, processing, and transporting primary fuels (*i.e.,* coal, natural gas, petroleum fuels), and thus present a more complete picture of the impacts of energy conservation standards. Accordingly, DOE evaluates the significance of energy savings on a case-by-case basis.

To determine whether a standard is economically justified, EPCA requires that DOE determine whether the benefits of the standard exceed its burdens by considering, to the greatest extent practicable, the following seven factors:

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

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[5] Procedures, Interpretations, and Policies for Consideration in New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Commercial/Industrial Equipment, 86 FR 70892, 70901 (Dec. 13, 2021).

[6] *See* Executive Order 14008, 86 FR 7619 (Feb. 1, 2021) ("Tackling the Climate Crisis at Home and Abroad").

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

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

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

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

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

(7) Other factors the Secretary considers relevant.

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

Further, EPCA establishes a rebuttable presumption that a standard is economically justified if the Secretary finds that the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure. (42 U.S.C. 6295(o)(2)(B)(iii)).

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

Table I-1 EPCA Requirements and Corresponding DOE Analysis

EPCA Requirement	Corresponding DOE Analysis
Significant Energy Savings	• Shipments Analysis • National Impact Analysis • Energy and Water Use Determination
Technological Feasibility	• Market and Technology Assessment • Screening Analysis • Engineering Analysis
Economic Justification:	
1. Economic Impact on Manufacturers and Consumers	• Manufacturer Impact Analysis • Life-Cycle Cost and Payback Period Analysis • Life-Cycle Cost Subgroup Analysis • Shipments Analysis
2. Lifetime Operating Cost Savings Compared to Increased Cost for the Product	• Markups for Equipment Price Determination • Energy and Water Use Determination • Life-Cycle Cost and Payback Period Analysis
3. Total Projected Energy Savings	• Shipments Analysis • National Impact Analysis
4. Impact on Utility or Performance	• Screening Analysis • Engineering Analysis
5. Impact of Any Lessening of Competition	• Manufacturer Impact Analysis
6. Need for National Energy and Water Conservation	• Shipments Analysis • National Impact Analysis
7. Other Factors the Secretary Considers Relevant	• Employment Impact Analysis • Utility Impact Analysis • Emissions Analysis • Monetization of Emission Reductions Benefits[7] • Regulatory Impact Analysis

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

[7] On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22-30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana v. Biden*, No. 21-cv-1074-JDC-KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from "adopting, employing, treating as binding, or relying upon" the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible by law.

C. Deviation from Appendix A

In accordance with section 3(a) of 10 CFR part 430, subpart C, appendix A ("appendix A"), DOE notes that it is deviating from the provision in appendix A regarding the pre-NOPR stages for an energy conservation standards rulemaking. Section 6(d)(2) of appendix A states that the public comment period for pre-NOPR rulemaking documents will vary depending upon the circumstances of the particular rulemaking but will not be less than 75 calendar days. DOE is opting to deviate from this provision by specifying a public comment period of 30 days for this RFI. As noted, the 2021 Final Determination was published on October 25, 2021. The methodologies and information upon which DOE seeks comment in this RFI are based on the analysis conducted for the 2021 Final Determination. Because stakeholders have been made recently familiar with the subjects covered in this RFI through the 2021 Final Determination and are not reviewing new information, DOE has determined that 30 days is sufficient a period for providing comments.

II. Request for Information and Comments

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

A. Equipment Covered by This Process

This RFI covers equipment that meets the definition of MHLF, as codified at 10 CFR 430.2. An MHLF is defined as a light fixture for general lighting application designed to be operated with a metal halide lamp and a ballast for a metal halide lamp. 42 U.S.C. 6291(64); 10 CFR 431.322. DOE has also defined several terms related to MHLF in 10 CFR 431.322.

The Energy Independence and Security Act of 2007, Pub. L. 110-140 (December 19, 2007) ("EISA 2007"), established energy conservation standards for MHLFs with ballasts designed to operate lamps with rated wattages between 150 watts ("W") and 500 W and excluded three types of fixtures within the covered wattage range from energy conservation standards: (1) fixtures with regulated-lag ballasts; (2) fixtures that use electronic ballasts and operate at 480 volts ("V"); and (3) fixtures that are rated only for 150 watt lamps, are rated for use in wet locations as specified by the National Fire Protection Association ("NFPA") in NFPA 70, "National Electrical Code 2002 Edition," and contain a ballast that is rated to operate at ambient air temperatures above 50 Celsius ("°C") as specified by Underwriters Laboratory ("UL") in UL 1029, "Standard for Safety High-Intensity-Discharge Lamp Ballasts." (42 U.S.C. 6295(hh)(1)(A)-(B)). In the 2014 Final Rule, DOE also promulgated standards for the group of MHLFs with ballasts designed to operate lamps rated 50 W-150 W and 501 W-1,000 W. DOE also promulgated standards for one type of previously excluded fixture: A 150 W MHLF rated for use in wet locations and containing a ballast that is rated to operate at ambient air temperatures greater than 50 °C—*i.e.,* those fixtures that fall under 42 U.S.C. 6295(hh)(1)(B)(iii). DOE continued to exclude from standards MHLFs with regulated-lag ballasts and 480 V electronic ballasts. In addition, due to a lack of applicable test method for high-frequency electronic ("HFE") ballasts, in the 2014 Final Rule, DOE did not establish standards for MHLFs with HFE ballasts. 79 FR 7746, 7754-7756.

Although current standards for MHLFs require them to contain a ballast that meets or exceeds a minimum ballast efficiency, the entity responsible for certifying compliance with the applicable standard is the MHLF manufacturer or importer. The MHLF manufacturer may opt to use a third-party to certify on its behalf, such as the ballast manufacturer. However, the MHLF manufacturer or importer is ultimately

responsible for certifying compliance to DOE. *See generally* 42 U.S.C. 6291(10)-(12) and 10 CFR 429.12.

DOE seeks feedback on whether definitions related to MHLFs in 10 CFR 431.322 require any revisions—and if so, how those definitions should be revised. DOE also seeks input on whether additional definitions are necessary for DOE to clarify or otherwise implement its regulatory requirements related to MHLFs.

B. Market and Technology Assessment

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

1. Equipment Classes

When evaluating and establishing energy conservation standards, DOE may divide covered products into classes based on the type of energy used, or by capacity or other performance-related features that justify a different standard. (42 U.S.C. 6295(q)(1)). In making a determination whether capacity or another performance-related feature justifies a different standard, DOE must consider such factors as the utility of the feature to the consumer and other factors DOE deems appropriate. (*Id.*)

For MHLF, the current energy conservation standards specified in 10 CFR 431.326 are based on 24 equipment classes determined according to performance-related features that provide utility to the consumer, in terms of input voltage, rated lamp wattage, and designation for indoor versus outdoor applications. Table II-1 lists the current 24 equipment classes for MHLFs.

Table II-1 Current MHLF Equipment Classes

Designed to be operated with lamps of the following rated lamp wattage	Indoor/outdoor	Input voltage type***
≥50 W and ≤100 W	Indoor	Tested at 480 V.
≥50 W and ≤100 W	Indoor	All others.
≥50 W and ≤100 W	Outdoor	Tested at 480 V.
≥50 W and ≤100 W	Outdoor	All others.
>100 W and <150 W *	Indoor	Tested at 480 V.
>100 W and <150 W *	Indoor	All others.
>100 W and <150 W *	Outdoor	Tested at 480 V.
>100 W and <150 W *	Outdoor	All others.
≥150 W ** and ≤250 W	Indoor	Tested at 480 V.
≥150 W ** and ≤250 W	Indoor	All others.
≥150 W ** and ≤250 W	Outdoor	Tested at 480 V.
≥150 W ** and ≤250 W	Outdoor	All others.
>250 W and ≤500 W	Indoor	Tested at 480 V.
>250 W and ≤500 W	Indoor	All others.
>250 W and ≤500 W	Outdoor	Tested at 480 V.
>250 W and ≤500 W	Outdoor	All others.
>500 W and ≤1,000 W	Indoor	Tested at 480 V.
>500 W and ≤1,000 W	Indoor	All others.
>500 W and ≤1,000 W	Outdoor	Tested at 480 V.
>500 W and ≤1,000 W	Outdoor	All others.
>1,000 W and ≤2,000 W	Indoor	Tested at 480 V.
>1,000 W and ≤2,000 W	Indoor	All others.
>1,000 W and ≤2,000 W	Outdoor	Tested at 480 V.
>1,000 W and ≤2,000 W	Outdoor	All others.

*Includes 150 W fixtures that are fixtures rated only for 150 W lamps; rated for use in wet locations, as specified by the NFPA 70 (incorporated by reference, see 10 CFR 431.323), section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029 (incorporated by reference, see 10 CFR 431.323).
**Excludes 150 W fixtures that are fixtures rated only for 150 W lamps; rated for use in wet locations, as specified by the NFPA 70, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029.
*** Input voltage for testing is specified by the test procedures. Ballasts rated to operate lamps less than 150 W must be tested at 120 V, and ballasts rated to operate lamps ≥150 W must be tested at 277 V. Ballasts not designed to operate at either of these voltages must be tested at the highest voltage the ballast is designed to operate.

In the 2014 Final Rule, DOE adopted standards that would result in the benefits of energy savings, emissions reductions, and net present value ("NPV") at each representative equipment class that outweighed the potential reduction in industry net

present value ("INPV") for manufacturers. In doing so, DOE did not adopt standards for MHLFs designed to be operated with lamps rated greater than 1,000 W and less than or equal to 2,000 W. 79 FR 7746, 7834-7836. Furthermore, because DOE adopted the same standards for indoor and outdoor equipment classes that are tested at the same input voltage and operate lamps of the same wattage, DOE omitted the indoor/outdoor distinction when codifying the table of standards into 10 CFR 431.326(c). In the 2014 Final Rule, DOE analyzed indoor and outdoor fixtures separately because these two types of fixtures offer different performance-related features. When electronic ballasts are used in outdoor applications, they require additional transient protection because of the potential for voltage surges in outdoor locations. Indoor fixtures with electronic ballasts also have an added feature to provide 120 V auxiliary power functionality for use in the event of a power outage. Based on these different features, DOE established separate equipment classes for indoor and outdoor fixtures, but adopted the same minimum energy conservation standards for these classes. 79 FR 7746, 7763-7764. In the 2021 Final Determination, for the same reasons noted above, DOE continued to analyze MHLFs under separate equipment classes for indoor and outdoor fixtures. 86 FR 58763, 58769. As noted previously, DOE did not amend standards in the 2021 Final Determination.

DOE seeks feedback on the current MHLF equipment classes and whether changes to these individual equipment classes and their descriptions should be made or whether certain classes should be merged or separated (*e.g.,* indoor and outdoor, wattage ranges). Specifically, DOE requests comment on whether the features associated with indoor and/or outdoor fixtures (*e.g.,* thermal management, transient protection, auxiliary power functionality) remain in the market today.

DOE is also aware that new configurations and features are available for MHLFs that may not have been available at the time of the last energy conservation standards analysis. Based on DOE's review of the market, DOE found metal halide dimming ballasts available from multiple manufacturers that could be used in MHLFs. DOE has identified both step-level dimming and continuous dimming metal halide systems that are dimmable down to 50 percent of rated power.

DOE seeks information regarding any new equipment classes it should consider for inclusion in its analysis. Specifically, DOE requests information on any performance-related features (*e.g.,* dimmability, *etc.*) that may provide unique consumer utility and data detailing the corresponding impacts on energy use that would justify separate equipment classes (*i.e.,* explanation for why the presence of these performance-related features would increase energy consumption).

In describing which MHLFs are included in each equipment class, DOE incorporates by reference the 2002 version of NFPA 70, "National Electrical Code[8]" and the 2007 version of UL 1029, "High-Intensity-Discharge Lamp Ballasts"[9] in DOE's regulations through 10 CFR 431.323. NFPA 70 is a national safety standard for electrical design, installation, and inspection, and is also known as the National Electrical Code. UL 1029 is a safety standard specific to high intensity discharge ("HID") lamp ballasts; a metal halide lamp ballast is a type of HID lamp ballast. Both NFPA 70 and UL 1029 are used to describe the applicable equipment class for MHLFs (see section II.B.1 of this

[8] National Fire Protection Association, NFPA 70-2002 ("NFPA 70"), National Electrical Code 2002 Edition.
[9] Underwriters Laboratories, UL 1029 (ANSI/UL 1029-2007) ("UL 1029"), Standard for Safety High-Intensity-Discharge Lamp Ballasts, 5th edition, Approved May 25, 1994.

document). DOE has found that a 2020 version of NFPA 70[10] ("NFPA 70-2020") and a 2022 version of UL 1029[11] ("UL 1029-2022") are now available.

DOE seeks comment on whether incorporating by reference the updated industry standards, NFPA 70-2020 and UL 1029-2022, will impact the MHLFs included in each equipment class in DOE's regulations.

2. Technology Assessment

In analyzing the feasibility of potential new or amended energy conservation standards, DOE uses information about existing and past technology options and prototype designs to help identify technologies that manufacturers could use to meet and/or exceed a given set of energy conservation standards under consideration. In consultation with interested parties, DOE intends to develop a list of technologies to consider in its analysis. That analysis will likely include a number of the technology options DOE previously considered during the 2021 Final Determination for MHLFs. A complete list of those prior options appears in Table II-2.

[10] National Fire Protection Association, NFPA 70-2020 ("NFPA 70"), National Electrical Code 2020 Edition.
[11] Underwriters Laboratories, UL 1029 (ANSI/UL 1029-2007) ("UL 1029"), Standard for Safety High-Intensity-Discharge Lamp Ballasts, 5th edition, Revised July 15, 2022.

Table II-2 Technology Options for MHLFs Considered in the Development of the 2021 Final Determination

Ballast type	Design option	Description
Magnetic	Improved Core Steel	
	Grain-Oriented Silicon Steel	Use a higher grade of electrical steel, including grain-oriented silicon steel, to lower core losses.
	Amorphous Steel	Create the core of the inductor from laminated sheets of amorphous steel insulated from each other.
	Improved Steel Laminations	Add steel laminations to lower core losses by using thinner laminations.
	Copper Wiring	Use copper wiring in place of aluminum wiring to lower resistive losses.
	Improved Windings	Use of optimized-gauge copper wire; multiple, smaller coils; shape-optimized coils to reduce winding losses.
	Electronic Ballast	Replace magnetic ballasts with electronic ballasts.
Electronic	Improved Components	
	Magnetics	Improved Windings: Use of optimized-gauge copper wire; multiple, smaller coils; shape-optimized coils; litz wire to reduce winding losses.
	Diodes	Use diodes with lower losses.
	Capacitors	Use capacitors with a lower effective series resistance and output capacitance.
	Transistors	Use transistors with lower drain-to-source resistance.
	Improved Circuit Design	
	Integrated Circuits	Substitute discrete components with an integrated circuit.

DOE seeks information on the technologies listed in Table II-2 regarding their applicability to the current market and how these technologies may impact the efficiency of MHLFs as measured according to the DOE test procedure. DOE also seeks information on how these technologies may have changed since they were considered in the 2021 Final Determination analysis. Specifically, DOE seeks information on the range

of efficiencies or performance characteristics that are currently available for each technology option.

DOE seeks comment on other technology options that it should consider for inclusion in its analysis and if these technologies may impact equipment features or consumer utility of MHLFs.

C. Screening Analysis

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

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

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

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

(3) *Impacts on equipment utility or equipment availability.* If a technology is determined to have significant adverse impact on the utility of the equipment to significant subgroups of consumers, or result in the unavailability of any covered equipment type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the

same as equipment generally available in the United States at the time, it will not be considered further.

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

(5) *Unique-Pathway Proprietary Technologies.* If a design option utilizes proprietary technology that represents a unique pathway to achieving a given efficiency level, that technology will not be considered further due to the potential for monopolistic concerns.

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

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

In the 2021 Final Determination, for magnetic ballasts, DOE screened out the technology option of using laminated sheets of amorphous steel. DOE determined that using amorphous steel could have adverse impacts on consumer utility because increasing the size and weight of the ballast may limit the places a consumer could use the ballast. DOE did not screen out any other technology options in that rulemaking. 86 FR 58763, 58771.

DOE requests feedback on what impact, if any, the five screening criteria described in this section would have on each of the technology options listed in Table

II-2 with respect to MHLFs. Similarly, DOE seeks information regarding how these same criteria would affect any other technology options not already identified in this document with respect to their potential use in MHLFs.

With respect to the screened-out technology option of laminated sheets of amorphous steel, DOE seeks information on whether this option would, based on current and projected assessments, remain screened out under the five screening criteria described in this section. Additionally, DOE seeks information on what steps, if any, could be (or have already been) taken to facilitate the introduction of this technology option as a means to improve the energy performance of MHLFs and the potential to impact consumer utility of MHLFs.

D. Engineering Analysis

The purpose of the engineering analysis is to establish the relationship between the efficiency and cost of MHLFs. There are two elements to consider in the engineering analysis; the selection of efficiency levels to analyze (*i.e.*, the "efficiency analysis") and the determination of equipment cost at each efficiency level (*i.e.*, the "cost analysis"). In determining the performance of higher-efficiency equipment, DOE considers technologies and design option combinations not eliminated by the screening analysis. For each equipment class, DOE estimates the baseline cost, as well as the incremental cost for the equipment 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 life-cycle cost ("LCC") and payback period ("PBP") analyses and the national impact analysis ("NIA")). The following sections provide further detail on DOE's engineering analysis and seek public input on specific issues pertinent to MHLFs, the subject of this rulemaking.

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 equipment (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 equipment 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 maximum technologically feasible ("max-tech") efficiency level (particularly in cases where the max-tech level exceeds the maximum efficiency level currently available on the market).

2. Baseline Models

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

went into effect February 10, 2017) to establish the baseline efficiency levels for each equipment class. 79 FR 7749. The current standards for each equipment class are based on ballast efficiency. The current standards for MHLFs are found at 10 CFR 431.326.

DOE requests feedback on whether the current energy conservation standards for MHLFs are the appropriate baseline efficiency levels for DOE to apply to each equipment class in evaluating whether to amend the current energy conservation standards for these equipment classes.

DOE requests feedback on the appropriate baseline efficiency levels for any newly analyzed equipment classes that are not currently in place or for the contemplated combined equipment classes, as discussed in section II.B.1 of this document.

3. Efficiency Levels and Maximum Technologically Feasible Levels

As part of DOE's analysis, the maximum available efficiency level is the highest efficiency unit currently available on the market. DOE selects certain equipment classes as "representative" to focus its analysis. DOE chooses equipment classes as representative primarily because of their high market volumes and/or unique characteristics. In the 2021 Final Determination analysis, DOE did not directly analyze the equipment classes containing fixtures with ballasts tested at 480 V due to low shipment volumes. DOE selected all other equipment classes as representative, resulting in a total of 12 representative classes covering the full range of lamp wattages, as well as indoor and outdoor designations. DOE then scaled the efficiency levels ("ELs") from representative equipment classes to those equipment classes it did not analyze directly (see section II.D.4 for further details on scaling). 86 FR 58763, 58771-58772, 58776.

In the 2021 Final Determination, based on the more-efficient ballasts selected for the analysis, DOE developed ELs for the representative equipment classes. DOE found the more-efficient magnetic EL represented a magnetic ballast with a higher grade of steel compared to the baseline. DOE identified a second EL (an electronic EL) for the

≥150 W and ≤250 W and >250 W and ≤500 W equipment classes. The standard electronic level represented a ballast with standard electronic circuitry. DOE identified a third EL (a more efficient electronic EL) in the ≥50 W and ≤ 100 W and >100 W and <150 W equipment classes. The more-efficient electronic EL represented an electronic ballast with an improved circuit design and/or more efficient components compared to the standard electronic level. The maximum available ELs identified for the 12 analyzed equipment classes in the 2021 Final Determination are specified in Table II-3. 86 FR 58763, 58774, 58776.

Table II-3 Maximum Efficiency Levels From 2021 Final Determination

Designed to be operated with lamps of the following rated lamp wattage	Indoor/outdoor	Input voltage type	Maximum efficiency level
≥50 W and ≤100 W	Indoor/Outdoor	All others except 480 V	1/(1+0.4*P^(−0.3))
>100 W and <150 W	Indoor/Outdoor	All others except 480 V	1/(1+0.4*P^(−0.3))
≥150 W and ≤250 W	Indoor/Outdoor	All others except 480 V	1/(1+0.4*P^(−0.3))
>250 W and ≤500 W	Indoor/Outdoor	All others except 480 V	1/(1+0.4*P^(−0.3))
>500 W and ≤1,000 W	Indoor/Outdoor	All others except 480 V	0.000057*P+0.881
>1,000 W and ≤2,000 W	Indoor/Outdoor	All others except 480 V	−0.000008*P+0.946

P is defined as the rated wattage of the lamp the fixture is designed to operate.

DOE defines a max-tech efficiency level to represent the theoretical maximum possible efficiency if all available design options are incorporated in a model. In applying these design options, DOE would only include those that are compatible with each other that when combined, would represent the theoretical maximum possible efficiency. In many cases, the max-tech efficiency level is not commercially available because it is not economically feasible to implement. In the 2021 Final Determination, DOE determined max-tech efficiency levels based on commercially available ballasts.

DOE seeks input on whether the max-tech efficiency levels presented in Table II-3 are appropriate and technologically feasible for potential consideration as possible energy conservation standards for the equipment at issue – and if not, why not.

DOE also requests feedback on whether the max-tech efficiency levels presented in Table II-3 are representative of those for the equipment classes not directly analyzed in the 2021 Final Determination (*i.e.,* ballasts tested at 480 V). If the range of possible efficiencies is different for the other equipment classes not directly analyzed, what alternative approaches should DOE consider using for those equipment classes and why?

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

4. Scaling Non-representative equipment classes

After developing ELs, DOE then scales the ELs from representative equipment classes to those equipment classes it does not analyze directly. As discussed in section II.D.3 of this document, DOE did not directly analyze the equipment classes containing fixtures with ballasts tested at 480 V and instead scaled them from the ELs of equipment classes analyzed in the 2021 Final Determination. Specifically, DOE developed a scaling factor by comparing quad-voltage ballasts[12] over all representative wattages to their 480 V ballast counterparts. DOE found that the difference in efficiency between ballasts tested at 480 V and ballasts tested at other input voltages varied based on the wattage of the ballast. Based on this analysis and comments from manufacturers DOE concluded a scaling factor of 12.0 percent (in the form of a subtraction of 12 percent from the representative equipment class ELs) to be appropriate from 50 W-150 W, a scaling factor of 4.0 percent to be appropriate from 150 W to 1,000 W, and a scaling factor of 0.0

[12] Quad-voltage ballasts are capable of operating at 120 V or 277 V.

percent (*i.e.,* no reduction) to be appropriate from 1,001 W to 2,000 W. 86 FR 58763, 58776-58777.

DOE requests comment on whether it is necessary to individually analyze all 24 equipment classes used in the 2021 Final Determination. Additionally, DOE welcomes comment on whether the approach used to apply the analyzed equipment class results to the other equipment classes is appropriate – and if not, why not? For example, if it is necessary to individually analyze more than 12 equipment classes used in the 2021 Final Determination, please provide information on why aggregating certain equipment is not appropriate. If this approach is not appropriate, what alternative approaches should DOE consider using and why?

DOE requests feedback on how the performance of ballasts that are tested at 480 V compares to ballasts of the same wattage and indoor/outdoor classification that are in other equipment classes. DOE also requests comment on the scaling factors used to develop ELs for the equipment classes containing fixtures with ballasts tested at 480 V.

5. 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 availability and reliability of public information, characteristics of the regulated equipment, and the availability and timeliness of purchasing the equipment on the market. The cost approaches are summarized as follows:

- *Physical teardowns*: Under this approach, DOE physically dismantles a commercially available equipment, component-by-component, to develop a detailed bill of materials for the equipment.
- *Catalog teardowns*: In lieu of physically deconstructing an equipment, 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 equipment.

- *Price surveys*: If neither a physical nor catalog teardown is feasible (for example, for tightly integrated equipment such as fluorescent lamps, which are infeasible to disassemble and for which parts diagrams are unavailable) or cost-prohibitive and 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.

The bill of materials provides the basis for the manufacturer production cost ("MPC") estimates. DOE then applies a manufacturer markup to convert the MPC to manufacturer selling price ("MSP"). The manufacturer markup accounts for costs such as overhead and profit. The resulting bill of materials provides the basis for the MPC estimates.

For the 2021 Final Determination, DOE conducted teardown analyses on commercially available MHLFs, and the ballasts included in these fixtures. Using the information from these teardowns, DOE summed the direct material, labor, and overhead costs used to manufacture a MHLF or metal halide ("MH") ballast, to calculate the MPC. DOE then determined the MSPs of fixture components and more-efficient MH ballasts identified for each EL. To determine the fixture components MSPs, DOE conducted fixture teardowns to derive MPCs of empty fixtures (*i.e.,* lamp enclosure and optics). The empty fixture does not include the ballast or lamp. DOE then added the other components required by the system (including ballast and any cost adders associated with electronically ballasted systems) and applied appropriate markups to obtain a final MSP for the entire fixture. 86 FR 58763, 58777.

DOE requests feedback on how manufacturers would incorporate the technology options listed in Table II-2 to increase energy efficiency in MHLFs beyond the baseline. This includes information on the sequencing manufacturers would follow when incorporating the different technologies to incrementally improve MHLF efficiency. DOE also requests feedback on whether increased energy efficiency would lead to other design changes that would not occur otherwise. DOE is interested in information regarding any potential impact of design options on a manufacturer's ability to incorporate additional functions or attributes in response to consumer demand. DOE is also interested in the extent to which (if at all) any design changes may adversely impact the ability of a given MHLF to operate with currently compatible applications.

DOE seeks input on the increase in MPC associated with incorporating each particular design option (*e.g.,* improved core steel). Specifically, DOE is interested in whether and how the costs estimated for design options in the 2021 Final Determination have changed since the time of that analysis. DOE also requests information on the investments necessary to incorporate specific design options, including, but not limited to, costs related to new or modified tooling (if any), materials, engineering and development efforts to implement each design option, and manufacturing/production impacts.

DOE requests comment on whether certain design options may not be applicable to (or incompatible with) certain equipment classes.

DOE seeks input on any relevant cost adders necessary based on ballast and fixture type (*e.g.,* electronic or magnetic ballast, indoor or outdoor fixture). Specifically, DOE is interested in whether and how the incremental costs for electronically ballasted fixtures in the 2021 Final Determination have changed since the time of that analysis.

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 MSP is the price at which the manufacturer distributes a unit into commerce. For the 2021 Final Determination DOE used separate markups for ballast manufacturers (1.47) and fixture manufacturers (1.58). 86 FR 58763, 58778.

DOE requests feedback on whether its assumptions regarding manufacturer markups and the values of the markups (1.47 and 1.58) are appropriate for ballast manufacturers and fixture manufacturers, respectively—with the 1.58 markup applying to fixtures with and without ballasts). If they are appropriate, why—and if not, why not? If they are not appropriate, what should they be and why?

E. Markup Analysis

DOE derives consumer prices based on manufacturer markups, retailer markups, distributor markups, contractor markups (where appropriate), and sales taxes. In deriving these markups, DOE determines the major distribution channels for equipment sales, the markup associated with each party in each distribution channel, and the existence and magnitude of differences between markups for baseline equipment ("baseline markups") and higher-efficiency equipment ("incremental markups"). The identified distribution channels (*i.e.*, how the equipment is distributed from the manufacturer to the consumer), and estimated relative sales volumes through each channel are used in generating consumer price inputs for the LCC analysis and NIA.

DOE tentatively plans to use the same distribution channels and wholesaler and contractor markups as in the 2021 Final Determination. In an electrical wholesaler distribution channel, DOE assumed the fixture manufacturer sells the fixture to an electrical wholesaler (*i.e.,* distributor), who in turn sells it to a contractor, who sells it to the consumer. In a contractor distribution channel, DOE assumed the fixture manufacturer sells the fixture directly to a contractor, who sells it to the consumer. In a utility distribution channel, DOE assumed the fixture manufacturer sells the fixture directly to the consumer (*i.e.,* electrical utility). Indoor fixtures are all assumed to go

through the electrical wholesaler distribution channel. Outdoor fixtures are assumed to go through all three distribution channels as follows: 60 percent electrical wholesaler, 20 percent contractor, and 20 percent utility. 86 FR 58763, 58778-58779.

In the 2021 Final Determination, DOE used the same wholesaler and contractor markups as the 2014 Final Rule and assumed a wholesaler baseline markup of 1.23 and a contractor markup of 1.13, yielding a total wholesaler distribution channel baseline markup of 1.49. The lower wholesaler incremental markup of 1.05 yields a lower total incremental markup through this distribution channel of 1.27. DOE also assumed a utility markup of 1.00 for the utility distribution channel in which the manufacturer sells a fixture directly to the consumer. DOE again assumed a contractor markup of 1.13 for the utility distribution channel in which a manufacturer sells a fixture to a contractor who in turn sells it to the consumer yielding an overall markup of 1.21 for this channel. 86 FR 58763, 58779.

DOE requests information and data on any changes to the distribution channels or wholesaler or contractor markups.

F. Energy Use Analysis

As part of the rulemaking process, DOE conducts an energy use analysis to identify how the equipment is used by consumers, and thereby determine the energy savings potential of energy efficiency improvements. DOE bases the energy consumption of metal halide lamp fixtures on the rated annual energy consumption as determined by the DOE test procedure. Along similar lines, the energy use analysis is meant to represent typical energy consumption in the field.

DOE tentatively plans to use the same energy use methodology as in the 2021 Final Determination. To develop annual energy use estimates, DOE multiplied the lamp-and-ballast system input power (in watts) by annual usage (in hours per year). DOE characterized representative lamp-and-ballast systems in the engineering analysis, which

provided measured input power ratings. To characterize the country's average usage of fixtures for a typical year, DOE developed annual operating hour distributions by sector, using data published in the 2015 U.S. Lighting Market Characterization ("LMC").[13] For the ≥ 50 W and ≤ 100 W to > 500 W and ≤ 1000 W equipment classes, DOE obtained weighted-average annual operating hours for the commercial, industrial, and outdoor stationary sectors of approximately 2,300 hours, 5,100 hours, and 5,000 hours, respectively. For the 1,500 W equipment class, DOE assigned annual operating hours of approximately 770 hours for all lamps according to the 2015 LMC estimate of 2.1 hours per day for sports field lighting. 86 FR 58763, 58779.

DOE requests information and data on any changes to the operating hours for metal halide lamp fixtures.

G. Life-Cycle Cost and Payback Analysis

DOE conducts the LCC and PBP analysis to evaluate the economic effects of potential energy conservation standards for metal halide lamp fixtures on individual consumers. For any given efficiency level, DOE measures the PBP and the change in LCC relative to an estimated baseline level. The LCC is the total consumer expense over the life of the equipment, consisting of purchase, installation, and operating costs (expenses for energy use, maintenance, and repair). Inputs to the calculation of total installed cost include the cost of the equipment—which includes MSPs, distribution channel markups, and sales taxes—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy prices and price projections, repair and maintenance costs, equipment lifetimes, discount rates, and the year that compliance with new and amended standards is required. DOE tentatively plans

[13] Navigant Consulting, Inc. *2015 U.S. Lighting Market Characterization*. 2017. U.S. Department of Energy: Washington, D.C. Report No. DOE/EE-1719. (Last accessed February 3, 2020.) *https://energy.gov/eere/ssl/downloads/2015-us-lighting-market-characterization*.

to develop inputs for the LCC analysis similarly to the 2021 Final Determination, as discussed in the following subsections.

1. Equipment Cost

In the 2021 Final Determination, to calculate consumer equipment costs, DOE multiplied the MSPs developed in the engineering analysis by the markups described previously (along with sales taxes). DOE used different markups for baseline equipment and higher-efficiency equipment because DOE applies an incremental markup to the increase in MSP associated with higher-efficiency equipment. 86 FR 58763, 58779, 58780-58781.

2. Installation Cost

Installation cost is the cost to install the fixture such as the labor, overhead, and any miscellaneous materials and parts needed. In the 2021 Final Determination, DOE used the installation costs from the 2014 Final Rule but inflated to 2020$ using the GDP price deflator. 86 FR 58763, 58780-58781.

DOE requests information and data on any changes to the installation cost for metal halide lamp fixtures.

3. Annual Energy Consumption

In the 2021 Final Determination, for each sampled consumer, DOE determined the energy consumption for an MHLF at different efficiency levels using the approach described previously in section II.F of this document. DOE used operating hour (and, by extension, energy use) distributions to better characterize the potential range of operating conditions faced by MHLF consumers. 86 FR 58763, 58779-58781.

4. Energy Prices

DOE applied average electricity prices for the energy use of the equipment purchased in the no-new-standards case, and marginal electricity prices for the incremental change in energy use associated with the other efficiency levels considered in

the 2021 Final Determination. DOE derived annual electricity prices for each census division using data from the Edison Electric Institute ("EEI") Typical Bills and Average Rates reports.[14] To estimate energy prices in future years, DOE multiplied the average regional energy prices by a projection of annual change in national-average commercial and industrial energy prices in the Reference case of *Annual Energy Outlook 2021* ("AEO 2021").[15] AEO 2021 has an end year of 2050. DOE assumed regional electricity prices after 2050 are constant at their 2050 price. 86 FR 58763, 58780-58781.

5. Replacement Costs

Replacement costs include the labor and materials costs associated with replacing a ballast or lamp at the end of their lifetimes and are annualized across the years preceding and including the actual year in which equipment is replaced. In the 2021 Final Determination, the costs were taken from the 2014 Final Rule but inflated to 2020$ using the GDP price deflator. For the LCC and PBP analysis, the analysis period corresponds with the fixture lifetime that is assumed to be longer than that of either the lamp or the ballast. For this reason, ballast and lamp prices and labor costs associated with lamp or ballast replacements are included in the calculation of operating costs. *Id*.

DOE requests information and data on any changes to the replacement costs for metal halide lamp fixtures.

6. Equipment Lifetime

DOE defines equipment lifetime as the age when a fixture, ballast, or lamp is retired from service. In the 2021 Final Determination, for fixtures in all equipment classes, DOE assumed average lifetimes for indoor and outdoor fixtures of 20 and 25 years, respectively. DOE also assumed that magnetic ballasts had a rated lifetime of

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[14] Edison Electric Institute. Typical Bills and Average Rates Report. 2019. Winter 2019, Summer 2019: Washington, DC.

[15] U.S. Energy Information Administration. *Annual Energy Outlook 2021 with Projections to 2050.* 2021. Washington, D.C. (Last accessed March 18, 2021.) *https://www.eia.gov/outlooks/aeo/*.

50,000 hours and electronic ballasts had a rated lifetime of 40,000 hours. DOE used manufacturer catalog data to obtain rated lifetime estimates (in hours) for lamps in each equipment class. DOE accounted for uncertainty in the fixture, ballast, and lamp lifetimes by applying Weibull survival distributions to the components' rated lifetimes. Furthermore, DOE included a residual value calculation for lamps and ballasts to account for the residual monetary value associated with the remaining life in the lamp and ballast at the end of the fixture lifetime. *Id.*

DOE requests information and data on any changes to the equipment lifetime for metal halide lamp fixtures.

7. Discount Rates

The discount rate is the rate at which future expenditures are discounted to estimate their present value. In the 2021 Final Determination, DOE estimated separate discount rates for commercial, industrial, and outdoor stationary applications. DOE used discount rate data from a 2019 Lawrence Berkeley National Laboratory report.[16] The average discount rates, weighted by the shares of each rate value in the sectoral distributions, are 8.3 percent for commercial consumers, 8.8 percent for industrial consumers, and 3.2 percent for outdoor stationary consumers. 86 FR 58763, 58781-58782.

8. Energy Efficiency Distribution in the No-New-Standards Case

For the 2021 Final Determination, DOE developed a no-new-standards case efficiency distribution using model count data from DOE's compliance certification database collected on May 5, 2021. The compliance certification database does not contain models in the > 1000 W and ≤ 2000 W equipment class; therefore, DOE assumed 56 percent of the market is at the baseline and 44 percent of the market is at EL 1, based

[16] Fujita, K. S. Commercial, Industrial, and Institutional Discount Rate Estimation for Efficiency Standards Analysis: Sector-Level Data 1998 – 2018. 2019. Lawrence Berkeley National Laboratory: Berkeley, CA. (Last accessed January 15, 2020.) *https://eta.lbl.gov/publications/commercial-industrial-institutional*.

on MHLF catalog data. The complete efficiency distribution for 2025 that DOE used in the 2021 Final Determination is shown in Table II-4. 86 FR 58763, 58782.

Table II-4 MHLF Efficiency Distribution by Equipment Class for 2025 from the 2021 Final Determination

Efficiency Level	Equipment Class*					
	≥50 W and ≤100 W	>100 W and <150 W	≥150 W and ≤250 W	>250 W and ≤500 W	>500 W and ≤1000 W	>1000 W and ≤2000 W
0	82.0%	16.4%	53.6%	95.6%	97.1%	56.0%
1	1.2%	32.9%	40.1%	1.1%	2.9%	44.0%
2	9.5%	0.0%	6.3%	3.3%		
3	7.4%	50.7%				

* Columns may not sum to 100% due to rounding.

DOE requests information and data on any changes to the no-new-standards efficiency distribution for metal halide lamp fixtures.

9. Payback Period Analysis

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

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

As noted previously, EPCA establishes a rebuttable presumption that a standard is economically justified if the Secretary finds that the additional cost to the consumer of

purchasing equipment complying with an energy conservation standard level will be less than three times the value of the first year's energy savings resulting from the standard, as calculated under the applicable test procedure. (42 U.S.C. 6295(o)(2)(B)(iii)). For each considered efficiency level, DOE determines the value of the first year's energy savings by calculating the energy savings in accordance with the applicable DOE test procedure, and multiplying those savings by the average energy price projection for the year in which compliance with the amended standards would be required.

H. Shipments

DOE develops shipments forecasts of MHLFs to calculate the national impacts of potential amended energy conservation standards on energy consumption, NPV, and future manufacturer cash flows. Using a three-step process, in the 2021 Final Determination, DOE developed projections of future fixture shipments using historical data as the basis. First, DOE used U.S. Census Bureau fixture shipment data, National Electrical Manufacturers Association ("NEMA") lamp shipment data, and NEMA ballast sales trends to estimate historical shipments of each fixture type analyzed. Second, DOE estimated the installed stock for each fixture in 2021 based on the average service lifetime of each fixture type. Third, DOE developed annual shipment projections for 2021–2052 by modeling fixture purchasing events, such as replacement and new construction, and applying estimates of the building stock growth rate, MHLF replacement rate, and penetration rate of light emitting diode ("LED") alternatives. 86 FR 58763, 58782-58783. DOE used model counts from data downloaded from DOE's compliance certification database for MHLFs to estimate market shares by equipment class as shown in Table II-5. *Id*.

Table II-5 Market Share by Equipment Class for Shipments in 2021 from the 2021 Final Determination

	≥50 W and ≤100 W	>100 W and <150 W	≥150 W and ≤250 W	>250 W and ≤500 W	>500 W and ≤1000 W	>1000 W and ≤2000 W
Market Share	25.5%	8.2%	24.9%	31.2%	9.7%	0.5%

DOE seeks any information or data on updates to the market share by equipment class relative to the market shares estimated in the 2021 Final Determination.

Current sales estimates allow for a more accurate model that captures recent trends in the market. In the 2021 Final Determination, DOE projected a faster decline in MHLF shipments compared to what it had projected in the notice of proposed determination for the rule (*see* 85 FR 47472 (August 5, 2020)), based on updated NEMA sales indices, that resulted in a decline of 2030 shipments of metal halide lamps by more than 99 percent relative to shipments in 2021, due to the incursion of out-of-scope LED equipment.[17] 86 FR 58763, 58782-58783.

DOE seeks data on MHLF and metal halide lamp ballast shipments, as well as the projected shipment values from the 2021 Final Determination as compared to actual recent shipments of MHLFs.

I. National Impact Analysis

The purpose of the NIA is to estimate the aggregate economic impacts of potential efficiency standards at the national level. The NIA assesses the national energy savings and the national NPV of total consumer costs and savings that would be expected

[17] See chapter 9 of the 2021 Final Determination Technical Support Document: *https://www.regulations.gov/document/EERE-2017-BT-STD-0016-0017.*

to result over 30 years of shipments from new or amended standards at specific efficiency levels.

DOE evaluates the impacts of new and amended standards by comparing no-new-standards-case projections with standards-case projections. The no-new-standards-case projections characterize energy use and consumer costs for each equipment class in the absence of new or amended energy conservation standards. DOE compares the no-new-standards-case with projections characterizing the market for each equipment class if DOE adopts new or amended standards at specific energy efficiency levels (*i.e.*, the trial standard levels ("TSLs") or standards cases) for that class. In characterizing the no-new-standards and standards cases, DOE considers historical shipments, the mix of efficiencies sold in the absence of amended standards, penetration into the market from out-of-scope LED alternatives, and how the market may evolve over time.

J. Manufacturer Impact Analysis

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

As part of the MIA, DOE intends to analyze impacts of amended energy conservation standards on subgroups of manufacturers of covered equipment, including small business manufacturers. DOE uses the Small Business Administration's ("SBA")

small business size standards to determine whether manufacturers qualify as small businesses, which are listed by the applicable North American Industry Classification System ("NAICS") code.[18] Manufacturing of consumer MHLF is classified under NAICS 335122, "Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing," and the SBA sets a threshold of 500 employees or less for a domestic entity to be considered as a small business. Manufacturing of metal halide ballasts is classified under NAICS 335311, "Power, Distribution and Specialty Transformer Manufacturing," and the SBA sets a threshold of 750 employees or less for a domestic entity to be considered as a small business. The employee threshold includes all employees in a business' parent company and any other subsidiaries.

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

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

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[18] Available online at *www.sba.gov/document/support--table-size-standards* (last accessed August 9, 2022).

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

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

III. Submission of Comments

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

Submitting comments via www.regulations.gov. The *www.regulations.gov* web page requires you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies Office staff only. Your contact information will not be publicly viewable except for your first and last names,

organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

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

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

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

Submitting comments via email, hand delivery/courier, or postal mail. Comments and documents submitted via email, hand delivery/courier, or postal mail also will be posted to *www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your

first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

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

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

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

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email to *MHLF2022STD0023@ee.doe.gov@ee.doe.gov,* two well-marked copies: one copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

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

DOE considers public participation to be a very important part of the process for developing energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in this process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this process or would like to request a public meeting should contact Appliance and Equipment Standards Program staff at (202) 287-1445 or via email at *ApplianceStandardsQuestions@ee.doe.gov*.

Signing Authority

This document of the Department of Energy was signed on September 28, 2022, by Francisco Alejandro Moreno, Acting 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 September 30, 2022.

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

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