AUTHENTICATED U.S. GOVERNMENT INFORMATION GPO

DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE–2017–BT–STD–0016]

RIN 1904–AD89

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

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy (DOE).

ACTION: Notice of proposed determination and request for comment.

SUMMARY: The Energy Policy and Conservation Act, as amended (''EPCA''), directs DOE to determine whether standards for metal halide lamp fixtures (''MHLFs'') should be amended. In this notice of proposed determination (''NOPD''), DOE has initially determined that the energy conservation standards for metal halide lamp fixtures do not need to be amended and also asks for comment on this proposed determination and associated analyses and results.

DATES:

Meeting: DOE will hold a webinar on Thursday, August 27, 2020, from 10:00 a.m. to 3:00 p.m. See section VII, ''Public Participation,'' for webinar registration information, participant instructions, and information about the capabilities available to webinar participants. If no participants register for the webinar than it will be cancelled. DOE will hold a public meeting on this proposed determination if one is requested by August 19, 2020.

Comments: DOE will accept comments, data, and information regarding this NOPD no later than October 19, 2020.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *http://www.regulations.gov.* Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2017–BT–STD–0016, by any of the following methods:

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

2. *Email: MHLF2017STD0016@ee.doe.gov.* Include the docket number EERE–2017–BT–STD–0016 in the subject line of the message.

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

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

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

Docket: The docket, which includes **Federal Register** notices, comments, and other supporting documents/materials, is available for review at *http://www.regulations.gov.* All documents in the docket are listed in the *http://www.regulations.gov* index. However, not all documents listed in the index may be publicly available, such as information that is exempt from public disclosure.

The docket web page can be found at *https://www.regulations.gov/docket?D=EERE-2017-BT-STD-0016.* The docket web page contains simple instructions on how to access all documents, including public comments, in the docket. See section VII, ''Public Participation,'' for further information on how to submit comments through *http://www.regulations.gov.*

FOR FURTHER INFORMATION CONTACT: Ms. Lucy deButts, 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) 287–1604. 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, review other public comments and the docket, or participate in the public meeting, contact the Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *ApplianceStandardsQuestions@ee.doe.gov.*

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Synopsis of the Proposed Determination
II. Introduction
A. Authority and Background
1. Current Standards
2. History of Standards Rulemaking for MHLFs
III. General Discussion
A. Product/Equipment Classes and Scope of Coverage
B. Test Procedure
C. Technological Feasibility
1. General
2. Maximum Technologically Feasible Levels
D. Energy Savings
1. Determination of Savings
2. Significance of Savings
E. Economic Justification
1. Specific Criteria
a. Economic Impact on Manufacturers and Consumers
b. Savings in Operating Costs Compared To Increase in Price (LCC and PBP)
c. Energy Savings
d. Lessening of Utility or Performance of Products
e. Impact of Any Lessening of Competition
f. Need for National Energy Conservation
g. Other Factors
2. Rebuttable Presumption
IV. Methodology and Discussion of Related Comments
A. Overall
B. Market and Technology Assessment
1. Scope of Coverage
2. Metric
3. Equipment Classes
a. Existing equipment classes
b. Summary
4. Technology Options
5. Screening Analysis
a. Screened-Out Technologies
b. Remaining Technologies
C. Engineering Analysis
1. Representative Equipment Classes
2. Baseline Ballasts
3. More-Efficient Ballasts
4. Efficiency Levels
5. Design Standard
6. Scaling to Other Equipment Classes
7. Manufacturer Selling Price
a. Fixtures
b. Ballasts
D. Markups Analysis
1. Distribution Channels
2. Estimation of Markups
3. Summary of Markups
E. Energy Use Analysis
F. Life-Cycle Cost and Payback Period Analysis
1. Equipment Cost
2. Installation Cost
3. Annual Energy Consumption
4. Energy Prices
5. Replacement Costs
6. Equipment Lifetime
7. Discount Rates
8. Energy Efficiency Distribution in the No-New-Standards Case
9. Payback Period Analysis
G. Shipments Analysis
H. National Impact Analysis
1. National Energy Savings
2. Net Present Value Analysis
V. Analytical Results and Conclusions
A. Trial Standard Levels

B. Economic Impacts on Individual Customers
1. Life-Cycle Cost and Payback Period
2. Rebuttable Presumption Payback
C. National Impact Analysis
1. Significance of Energy Savings
2. Net Present Value of Customer Costs and Benefits
D. Proposed Determination
1. Technological Feasibility
2. Significant Conservation of Energy
3. Economic Justification
4. Summary
VI. Procedural Issues and Regulatory Review
A. Review Under Executive Order 12866
B. Review Under Executive Orders 13771 and 13777
C. Review Under the Regulatory Flexibility Act
D. Review Under the National Environmental Policy Act
E. Review Under Executive Order 13132
F. Review Under Executive Order 12988
G. Review Under the Unfunded Mandates Reform Act of 1995
H. Review Under the Treasury and General Government Appropriations Act, 1999
I. Review Under Executive Order 12630
J. Review Under the Treasury and General Government Appropriations Act, 2001
K. Review Under Executive Order 13211
L. Information Quality
VII. Public Participation
A. Participation in the Webinar
B. Submission of Comments
C. Issues on Which DOE Seeks Comment
VIII. Approval of the Office of the Secretary

I. Synopsis of the Proposed Determination

Title III, Part B [1] of EPCA,[2] established the Energy Conservation Program for Consumer Products Other Than Automobiles. (42 U.S.C. 6291–6309) These products include metal halide lamp fixtures (''MHLFs''), the subject of this notice of proposed determination (''NOPD''). (42 U.S.C. 6292(a)(19))

EPCA established initial standards for MHLFs. (42 U.S.C. 6295(hh)(1)(A)) EPCA directed the U.S. Department of Energy (''DOE'') to conduct a review of the statutory standards to determine whether they should be amended, and a subsequent review to determine if the standards then in effect should be amended. (42 U.S.C. 6295(hh)(2) and (3)) DOE conducted the first review of MHLF energy conservation standards and published a final rule amending standards on February 10, 2014. 79 FR 7746.[3] DOE is issuing this NOPD pursuant to the EPCA requirement that DOE conduct a second review of MHLF energy conservation standards. (42 U.S.C. 6295(hh)(3)(A))

For this proposed determination, DOE analyzed MHLFs subject to standards specified in 10 CFR 431.326(c). DOE first analyzed the technological feasibility of more efficient MHLFs. For those MHLFs for which DOE determined higher standards to be technologically feasible, DOE estimated energy savings that could result from potential energy conservation standards by conducting a national impacts analysis (''NIA''). DOE evaluated whether higher standards would be cost effective by conducting life-cycle cost (''LCC'') and payback period (''PBP'') analyses, and estimated the net present value (''NPV'') of the total costs and benefits experienced by consumers.

Based on the results of these analyses, summarized in section V of this document, DOE has tentatively determined that current standards for metal halide lamp fixtures do not need to be amended because more stringent standards would not have significant energy savings and would not be economically justified.

II. Introduction

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

A. Authority and Background

EPCA authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part B of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles, which includes MHLFs that are the subject of this proposed determination. (42 U.S.C. 6292(a)(19)) EPCA, as amended by the Energy Independence and Security Act of 2007 (Pub. L. 110–140, EISA 2007), prescribed energy conservation standards for this equipment. (42 U.S.C. 6295(hh)(1)) EPCA directed DOE to conduct two rulemaking cycles to determine whether to amend these standards. (42 U.S.C. 6295(hh)(2)(A) and (3)(A)) DOE published a final rule amending the standards on February 10, 2014 (''2014 MHLF final rule''). 79 FR 7746. Under 42 U.S.C. 6295(hh)(3)(A), the agency must conduct a second review to determine whether current standards should be amended and publish a final rule. This second MHLF standards rulemaking was initiated through the publication of a request for information (''RFI'') document in the **Federal Register**. 84 FR 31231 (''July 2019 RFI'')

Pursuant to EPCA, DOE's energy conservation program for covered products, which as noted includes MHLFs, 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 the 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 instances for particular State laws or regulations, in accordance with the procedures and other provisions set forth under EPCA. (See 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, including MHLFs. (42 U.S.C. 6295(o)(3)(A) and (r)) Manufacturers of covered products must use the prescribed DOE test procedure as the basis for certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA and when making representations to the public regarding the energy use or efficiency of those products. (42 U.S.C. 6293(c) and 6295(s)) Similarly, DOE must use these test procedures to determine whether the products comply with standards adopted pursuant to EPCA. (42 U.S.C. 6295(s)) The DOE test procedures for MHLFs appear at 10 CFR 431.324.

DOE must follow specific statutory criteria for prescribing new or amended standards for covered products, which

[1] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

[2] All references to EPCA in this document refer to the statute as amended through America's Water Infrastructure Act of 2018, Public Law 115–270 (Oct. 23, 2018).

[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.

include MHLFs. Any new or amended standard for a covered product must be designed to achieve the maximum improvement in energy efficiency that the Secretary of Energy determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A) and (3)(B)) Furthermore, DOE may not adopt any standard that would not result in the significant conservation of energy. (42 U.S.C. 6295(o)(3)) Moreover, DOE may not prescribe a standard: (1) For certain products, including MHLFs, if no test procedure has been established for the product, or (2) if DOE determines by rule that the standard is not technologically feasible or economically justified. (42 U.S.C. 6295(o)(3)(A)–(B)) In deciding whether a proposed 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 products subject to the standard;

(2) The 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;

(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 products likely to result from the standard;

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

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

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

(42 U.S.C. 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))

EPCA also contains what is known as an ''anti-backsliding'' provision, which prevents the Secretary from prescribing any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. (42 U.S.C. 6295(o)(1)) Also, the Secretary may not prescribe an amended or new standard if interested persons have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States. (42 U.S.C. 6295(o)(4))

Additionally, EPCA specifies requirements when promulgating an energy conservation standard for a covered product that has two or more subcategories. DOE must specify a different standard level for a type or class of product 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 which 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)) In determining whether a performance-related feature justifies a different standard for a group of products, DOE must consider such factors as the utility to the consumer of the feature and other factors DOE deems appropriate. *Id.* Any rule prescribing such a standard must include an explanation of the basis on which such higher or lower level was established. (42 U.S.C. 6295(q)(2))

Pursuant to the amendments contained in the EISA 2007, 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 products, including MHLFs, 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. (42 U.S.C. 6295(gg)(3)(A)–(B)) DOE's current test procedure for MHLFs addresses standby mode energy use. However, in the 2014 MHLF final rule, DOE stated that it had yet to encounter an MHLF that used energy in standby mode and therefore concluded that it could not establish a standard that incorporated standby mode energy consumption. Regarding off mode, DOE concluded in the same final rule that it is not possible for MHLFs to meet off mode criteria because there is no condition in which the components of a MHLF are connected to the main power source and are not already in a mode accounted for in either active or standby mode. 79 FR 7757.

EPCA further provides that, not later than 6 years after the issuance of any final rule establishing or amending a standard, DOE must publish either a notice 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)(1)). This NOPD also satisfies the 6-year review provision of EPCA.

1. Current Standards

In the 2014 MHLF final rule, DOE prescribed the current energy conservation standards for MHLFs manufactured on and after February 10, 2017. 79 FR 7746. These standards are set forth in DOE's regulations at 10 CFR 431.326 and are repeated in Table II.1.

TABLE II.1—CURRENT ENERGY CONSERVATION STANDARDS FOR MHLFS

Designed to be operated with lamps of the following rated lamp wattage	Tested input voltage *	Minimum standard equation * (%)
≥50W and ≤100W	480 V	(1/(1+1.24×P^(− 0.351))) − 0.0200.**
≥50W and ≤100W	All others	1/(1+1.24×P^(− 0.351)).
>100W and <150W †	480 V	(1/(1+1.24×P^(− 0.351))) − 0.0200.
>100W and <150W †	All others	1/(1+1.24×P^(− 0.351)).
≥150W ‡ and ≤250W	480 V	0.880.
≥150W ‡ and ≤250W	All others	For ≥150W and ≤200W: 0.880. For >200W and ≤250W: 1/(1+0.876×P^(− 0.351)).

TABLE II.1—CURRENT ENERGY CONSERVATION STANDARDS FOR MHLFS—Continued

Designed to be operated with lamps of the following rated lamp wattage	Tested input voltage *	Minimum standard equation * (%)
>250W and ≤500W	480 V	For >250W and <265W: 0.880. For ≥265W and ≤500W: (1/(1+0.876×P^(− 0.351))) − 0.0100.
>250W and ≤500W	All others	1/(1+0.876×P^(− 0.351)).
>500W and ≤1,000W	480 V	>500W and ≤750W: 0.900. >750W and ≤1,000W: 0.000104×P + 0.822. For >500W and ≤1,000W: may not utilize a probe-start ballast.
>500W and ≤1,000W	All others	For >500W and ≤750W: 0.910. For >750W and ≤1,000W: 0.000104×P+0.832. For >500W and ≤1,000W: may not utilize a probe-start ballast.

* Tested input voltage is specified in 10 CFR 431.324.

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

† Includes 150 watt (W) fixtures specified in paragraph (b)(3) of this section, that are fixtures rated only for 150W lamps; rated for use in wet locations, as specified by the National Fire Protection Association (''NFPA'') 70 (incorporated by reference, see § 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 Underwriters Laboratory (UL) 1029 (incorporated by reference, see § 431.323).

‡ Excludes 150W fixtures specified in paragraph (b)(3) of this section, that are fixtures rated only for 150W 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.

2. History of Standards Rulemaking for MHLFs

As described in section II.A, EPCA, as amended by Public Law 110–140, EISA 2007, prescribed energy conservation standards for MHLFs. (42 U.S.C. 6295(hh)(1)) EPCA directed DOE to conduct two rulemaking cycles to determine whether to amend these standards. (42 U.S.C. 6295(hh)(2)(A) and (3)(A)) DOE completed the first of these rulemaking cycles in 2014 by adopting amended performance standards for MHLFs manufactured on or after February 10, 2017. 79 FR 7746. The current energy conservation standards are located in 10 CFR part 431. *See* 10 CFR 431.326 (detailing the applicable energy conservation standards for different classes of MHLFs). The currently applicable DOE test procedures for MHLFs appear at 10 CFR 431.324. Under 42 U.S.C. 6295(hh)(3)(A), the agency is instructed to conduct a second review of its energy conservation standards for MHLFs and publish a final rule to determine whether to amend those standards. DOE initiated the second MHLF standards rulemaking process on July 1, 2019, by publishing the July 2019 RFI.

DOE received five comments in response to the July 2019 RFI from the interested parties listed in Table II.2.

TABLE II.2—JULY 2019 RFI WRITTEN COMMENTS

Organization(s)	Reference in this NOPD	Organization type
National Electrical Manufacturers Association	NEMA	Trade Association.
Edison Electric Institute	EEI	Utility Association.
The Institute for Policy Integrity at New York University School of Law	IPI	Think Tank.
Pacific Gas and Electric, Southern California Edison, San Diego Gas and Electric	CA IOUs	Utilities.
Signify North America Corporation	Signify	Manufacturer.

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

DOE developed this proposal after considering oral and written comments, data, and information from interested parties that represent a variety of interests. The following discussion addresses issues raised by these commenters.

A. Product/Equipment Classes and Scope of Coverage

When evaluating and establishing energy conservation standards, DOE divides covered product 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 such factors as the utility of the feature to the consumer and other factors DOE determines are appropriate. (42 U.S.C. 6295(q)) This proposed determination covers metal halide lamp fixtures defined as light fixtures 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. The scope of coverage is discussed in further detail in section IV.B.1 of this document.

B. 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 product must use these test procedures to certify to DOE that their product complies with energy conservation standards and to quantify the efficiency of their product. DOE will finalize a test procedure establishing methodologies used to evaluate proposed energy conservation standards at least 180 days prior to publication of a NOPR proposing new or amended energy conservation standards. Section 8(d) of appendix A to 10 CFR part 430 subpart C (''Process Rule''). DOE's current energy conservation standards for MHLFs are

[4] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop energy conservation standards for metal halide lamp fixtures. (Docket No. EERE–2017–BT–STD–0016, which is maintained at *www.regulations.gov/#!docketDetail;D=EERE-2017-BT-STD-0016*). The references are arranged as follows: (Commenter name, comment docket ID number, page of that document).

expressed in terms of the efficiency of the ballast contained within the fixture. (10 CFR 431.326)

DOE established an active mode and standby mode power test method in a final rule published on March 9, 2010. 75 FR 10950. The current test procedure for MHLFs appears in 10 CFR 431.324 and specifies the ballast efficiency calculation as lamp output power divided by the ballast input power.

DOE has since published an RFI to initiate a data collection process to consider whether to amend DOE's test procedure for MHLFs. 83 FR 24680 (May 30, 2018).

C. Technological Feasibility

1. General

In each energy conservation standards rulemaking, DOE conducts a screening analysis based on information gathered on all current technology options and prototype designs that could improve the efficiency of the equipment that are the subject of the rulemaking. As the first step in such an analysis, DOE develops a list of technology options for consideration in consultation with manufacturers, design engineers, and other interested parties. DOE then determines which of those means for improving efficiency are technologically feasible. DOE considers technologies incorporated in commercially-available equipment, or in working prototypes to be technologically feasible. Section 7(b)(1) of the Process Rule.

After DOE has determined that particular technology options are technologically feasible, it further evaluates each technology option in light of the following additional screening criteria: (1) Practicability to manufacture, install, and service; (2) adverse impacts on equipment utility or availability; (3) adverse impacts on health or safety, and (4) unique-pathway proprietary technologies. Section 7(b)(2)–(5) of the Process Rule. Section IV.B.5 of this document discusses the results of the screening analysis for MHLFs, particularly the designs DOE considered, those it screened out, and those that are considered in this proposed determination. For further details on the screening analysis for this proposed determination, see chapter 4 of the NOPD technical support document (''TSD'').

2. Maximum Technologically Feasible Levels

When DOE proposes to adopt an amended standard for a type or class of covered equipment, it must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for such equipment. (42 U.S.C. 6295(p)(1)) Accordingly, in the engineering analysis, DOE determined the maximum technologically feasible (''max-tech'') improvements in energy efficiency for MHLFs, using the design parameters for the most efficient equipment available on the market or in working prototypes. The max-tech levels that DOE determined for this analysis are described in section IV.C.4 and in chapter 5 of the NOPD TSD.

D. Energy Savings

1. Determination of Savings

For each trial standard level (''TSL''), DOE projected energy savings from application of the TSL to MHLFs purchased in the 30-year period that begins in the year of compliance with the potential standards (2025–2054).[5] The savings are measured over the entire lifetime of MHLFs purchased in the previous 30-year period. DOE quantified the energy savings attributable to each TSL 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 a product would likely evolve in the absence of amended energy conservation standards.

DOE used its NIA spreadsheet model to estimate national energy savings (''NES'') from potential amended or new standards for MHLFs. The NIA spreadsheet model (described in section IV.H of this document) calculates energy savings in terms of site energy, which is the energy directly consumed by equipment at the location where it is used. For electricity, DOE reports national energy savings in terms of site energy savings and source energy savings, the latter of which is the savings in the energy that is used to generate and transmit the site electricity. 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.[6] DOE's approach is based on the calculation of an FFC multiplier for each of the energy types used by covered products or equipment. For more information on FFC energy savings, see section IV.H.1 of this document.

[5] Each TSL is composed of specific efficiency levels for each product class. The TSLs considered for this NOPD are described in section V.A. DOE conducted a sensitivity analysis that considers impacts for products shipped in a 9-year period.

[6] The FFC metric is discussed in DOE's statement of policy and notice of policy amendment. 76 FR 51282 (Aug. 18, 2011), as amended at 77 FR 49701 (Aug. 17, 2012).

2. Significance of Savings

To adopt any new or amended standards for a covered product, DOE must determine that such action would result in significant energy savings. (42 U.S.C. 6295(o)(3)(B)) The term ''significant'' is not defined in EPCA. DOE has established a significance threshold for energy savings. Section 6(b) of the Process Rule. In evaluating the significance of energy savings, DOE conducts a two-step approach that considers both an absolute site energy savings threshold and a threshold that is percent reduction in the covered energy use. *Id.* DOE first evaluates the projected energy savings from a potential max-tech standard over a 30-year period against a 0.3 quads of site energy threshold. Section 6(b)(2) of the Process Rule. If the 0.3 quad-threshold is not met, DOE then compares the max-tech savings to the total energy usage of the covered equipment to calculate a percentage reduction in energy usage. Section 6(b)(3) of the Process Rule. If this comparison does not yield a reduction in site energy use of at least 10 percent over a 30-year period, DOE proposes that no significant energy savings would likely result from setting new or amended standards. Section 6(b)(3) of the Process Rule. The two-step approach allows DOE to ascertain whether a potential standard satisfies EPCA's significant energy savings requirements in 42 U.S.C. 6295(o)(3)(B) to ensure that DOE avoids setting a standard that ''will not result in significant conservation of energy.''

EPCA defines ''energy efficiency'' as the ratio of the useful output of services from a product to the *energy use* of such product, measured according to the Federal test procedures. (42 U.S.C. 6291(5), *emphasis added*) EPCA defines ''energy use'' as the quantity of energy directly consumed by a consumer product at point of use, as measured by the Federal test procedures. (42 U.S.C. 6291(4)) Further, EPCA uses a household energy consumption metric as a threshold for setting standards for new covered products (42 U.S.C. 6295(l)(1)). Given this context, DOE relies on site energy as the appropriate metric for evaluating the significance of energy savings.

E. Economic Justification

1. Specific Criteria

As noted previously, EPCA provides seven factors to be evaluated in determining whether a potential energy conservation standard is economically justified. (42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII)) The following sections discuss how DOE has addressed each of those seven factors in this rulemaking.

a. Economic Impact on Manufacturers and Consumers

In determining the impacts of a potential amended standard on manufacturers, DOE conducts a manufacturer impact analysis (''MIA''). DOE first uses an annual cash-flow approach to determine the quantitative impacts. This step includes both a short-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. Second, DOE analyzes and reports the impacts on different types of manufacturers, including impacts on small manufacturers. Third, DOE considers the impact of standards on domestic manufacturer employment and manufacturing capacity, as well as the potential for standards to result in plant closures and loss of capital investment. Finally, DOE takes into account cumulative impacts of various DOE regulations and other regulatory requirements on manufacturers.

For individual consumers, measures of economic impact include the changes in the 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 net present value 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.

DOE has concluded amended standards for MHLFs would not result in significant energy savings and, as discussed further in section V.D of this document, would not be economically justified for the potential standard levels evaluated based on the PBP analysis. Therefore, DOE did not conduct an MIA analysis or LCC subgroup analysis for this NOPD.

b. Savings in Operating Costs Compared to Increase in Price (LCC and PBP)

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 product that are likely to result from a standard. (42 U.S.C. 6295(o)(2)(B)(i)(II)) DOE conducts this comparison in its LCC and PBP analysis.

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

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

For its LCC and PBP analysis, DOE assumes that consumers will purchase the covered products 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 analysis is discussed in further detail in section IV.F.

c. Energy Savings

Although significant conservation of energy is a separate statutory requirement for adopting an energy conservation standard, EPCA requires DOE, in determining the economic justification of a 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 III.D, DOE uses the NIA spreadsheet models to project national energy savings.

d. 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 products. (42 U.S.C. 6295(o)(2)(B)(i)(IV)) The Secretary may not prescribe an amended or new standard if the Secretary finds (and publishes such finding) that interested persons have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially similar in the United States at the time of the Secretary's finding. (42 U.S.C. 6295(o)(4))

e. 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 proposed standard. (42 U.S.C. 6295(o)(2)(B)(i)(V)) It also directs the Attorney General to determine the impact, if any, of any lessening of competition likely to result from a proposed standard and to transmit such determination to the Secretary within 60 days of the publication of a proposed rule, together with an analysis of the nature and extent of the impact. (42 U.S.C. 6295(o)(2)(B)(ii)) Because DOE is not proposing standards for MHLFs, DOE did not transmit a copy of its proposed determination to the Attorney General.

f. Need for National Energy Conservation

In evaluating the need for national energy conservation, 42 U.S.C. 6295(o)(2)(B)(i)(VI), DOE expects that energy savings from amended standards would likely 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. Energy savings from amended standards also would likely result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases primarily associated with fossil-fuel based energy production. Because DOE has tentatively concluded amended standards for MHLFs would not be economically justified, DOE did not conduct a utility impact analysis or emissions analysis for this NOPD.

g. 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))

2. Rebuttable Presumption

EPCA creates a rebuttable presumption that an energy conservation standard is economically justified if the additional cost to the consumer of a product that meets the standard is less than three times the value of the first year's energy savings resulting from the standard, as calculated under the applicable DOE test procedure. 42 U.S.C. 6295(o)(2)(B)(iii) DOE's LCC and PBP analyses generate values used to calculate the effects that proposed energy conservation standards would have on the payback period for consumers. These analyses include, but are not limited to, the 3-year payback period contemplated under the rebuttable-presumption test. In addition, DOE routinely conducts an economic analysis that considers the full range of impacts to consumers, manufacturers, the Nation, and the environment, as required under 42 U.S.C. 6295(o)(2)(B)(i). The results of this analysis serve as the basis for DOE's evaluation of the economic justification for a potential standard level (thereby supporting or rebutting the results of any preliminary determination of economic justification). The rebuttable presumption payback calculation is discussed in section V.B.2 of this document.

IV. Methodology and Discussion of Related Comments

This section addresses the analyses DOE has performed for this proposed determination with regard to MHLFs. Separate subsections address each component of DOE's analyses.

DOE used several analytical tools to estimate the impact of the standards proposed in this document. The first tool is a spreadsheet that calculates the LCC savings and PBP of potential amended or new energy conservation standards. The national impacts analysis uses a second spreadsheet set that provides shipments projections and calculates national energy savings and net present value of total consumer costs and savings expected to result from potential energy conservation standards. These spreadsheet tools are available on the DOE website for this proposed determination (see DOCKET section at the beginning of this proposed determination).

A. Overall

DOE received several comments from stakeholders in response to the July 2019 RFI stating that DOE should not amend standards for MHLFs. NEMA stated that MHLF technology has reached its practical limits in terms of performance. NEMA noted that further investment in efficiency for MHLF products is no longer justified given substantial market decline and the inability for relevant manufacturers and distributors to recover investments in relatively minor efficiency gains. NEMA pointed out that DOE has previously declined to amend standards for a product when it was deemed that no new investments in higher efficiency products is likely. (NEMA, No. 3 at pp. 2, 6)

NEMA also stated that a transition to light-emitting diode (''LED'') products is largely responsible for the declining market for MHLF products, and as a result, there is limited opportunity to recapture investments in new designs through sales of MHLF products. (NEMA, No. 3 at p. 2–3) NEMA noted that the decline of the MHLF market means relevant efficiency regulations have reached their end-states. (NEMA, No. 3 at p. 6) According to NEMA, the most likely outcome of strengthened efficiency standards for MHLFs is accelerated obsolescence of products unable to meet new standards and an accelerated decline of a market already in decline. (NEMA, No. 3 at p. 6–7) NEMA asserted that DOE does not need to further accelerate the decline of the MHLF market by further strengthening MHLF efficiency requirements. (NEMA, No. 3 at p. 9)

EEI and Signify both argue that the best course of action is for DOE to issue a ''no new standard'' determination for MHLFs. EEI and Signify identified the significant decline in the MHLF market as a reason DOE should not consider standards for MHLFs. (EEI, No. 2 at p. 3, Signify, No. 6 at p. 1) EEI added that the market for lighting products has outpaced the relevant regulatory framework and market forces alone have pushed customers away from MHLF products, so there is no need for further regulations. EEI commented that amending standards for MHLFs could be an inefficient and ineffective expenditure of DOE's resources. (EEI, No. 2 at p. 3).

As discussed in section II.A, DOE is required to conduct two rulemaking cycles to determine whether to amend standards for MHLFs. (42 U.S.C. 6295(hh)(2)(A) and (3)(A)) DOE completed the first rulemaking cycle by publishing a final rule amending MHLF standards on February 10, 2014. 79 FR 7746. This determination represents the second rulemaking cycle for MHLFs. DOE discusses the methodology used to analyze potential standards in section IV and the results of the analysis in section V.

Commenting on the analyses conducted by DOE to evaluate standards for MHLFs, IPI stated that DOE should (1) continue to monetize the full climate benefits of greenhouse gas emissions reductions, using the best estimates, which were derived by the Interagency Working Group; (2) continue to use the global estimate of the social cost of greenhouse gases; and (3) rely only on the best available science and economics, and not on any ''interim'' estimates that do not include a range of discount rates or global climate impacts. They stated that DOE should factor these benefits into its choice of the maximum efficiency level that is economically justified, consistent with its statutory requirement to assess the national need to conserve energy. (IPI, No. 4, pp. 1–5)

In response, DOE notes that it has not conducted an analysis of emissions impacts that may result from amended standards for MHLFs. As discussed further in the document, DOE has tentatively concluded that imposition of a standard at any of the TSLs considered is not economically justified because the operating costs of the covered product are insufficient to recover the upfront cost. DOE continues to be of the view that failure to meet one aspect of the seven factors in EPCA's consideration of economic justification means that a revised standard is not economically justified without considering all of the other factors. For example, on October 17, 2016, DOE published in the **Federal Register** a final determination that more stringent energy conservation standards for direct heating equipment (''DHE'') would not be economically justified, and based this determination solely on manufacturer impacts, the first EPCA factor that DOE is required to evaluate in 42 U.S.C. 6295(o)(2)(B)(i)(I). 81 FR 71325. Specifically, due to the lack of advancement in the DHE industry in terms of product offerings, available technology options and associated costs, and declining shipment volumes, DOE concluded that amending the DHE energy conservation standards would impose a substantial burden on manufacturers of DHE, particularly to small manufacturers. Id. at 81 FR 71328. Notably, DOE received no stakeholder comments in opposition to its conclusions regarding economic justification in the DHE standards rulemaking.

In this NOPD, DOE remains consistent with its approach in the DHE rule, and finds no economic justification for amending standards based on one of the seven factors in 42 U.S.C. 6295(o)(2)(B)(i), namely, that the energy savings in operating costs of the covered product are insufficient to recover the upfront cost.

B. Market and Technology Assessment

DOE develops information in the market and technology assessment that provides an overall picture of the market for the equipment concerned, including the purpose of the equipment, the industry structure, manufacturers, market characteristics, and technologies used in the equipment. This activity includes both quantitative and qualitative assessments, based primarily on publicly-available information. The key findings of DOE's market assessment are summarized in the following sections. See chapter 3 of the NOPD TSD for further discussion of the market and technology assessment.

1. Scope of Coverage

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. Any equipment meeting the definition of MHLF is included in DOE's scope of coverage, though all equipment within the scope of coverage may not be subject to standards.

In the July 2019 RFI, DOE requested comments on whether definitions related to MHLFs in 10 CFR 431.322 require any revisions or whether additional definitions are necessary for DOE to clarify or otherwise implement its regulatory requirements related to MHLFs. 84 FR 31234. NEMA commented that the MHLF technology is mature and noted that no relevant definitions have emerged since the last rulemaking. (NEMA, No. 3 at p. 4–5) DOE agrees with NEMA and is not proposing to add any new definitions or update any existing definitions for MHLFs in this determination.

In response to the July 2019 RFI, CA IOUs argued that DOE should consider adopting a technology-agnostic approach that groups together all products used for the same application. CA IOUs pointed out the transition away from MHLF products and toward LED products and suggested that DOE establish a class of products based on lumen output that would include all technologies that serve the same application. (CA IOUs, No. 5 at p. 1–2)

DOE agrees with CA IOUs that a technology-agnostic approach that groups together all products used for the same application could potentially have benefits with regards to energy savings. However, DOE notes that this proposed determination addresses only metal halide lamp fixtures defined as light fixtures 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 is not authorized to consider any product not meeting this definition, such as LED fixtures, as a part of this determination.

CA IOUs also urged DOE to consider agricultural applications when developing an updated technology-agnostic standard for MHLFs. CA IOUs noted that in agricultural applications, there are limitations with LED technology for certain indoor growing operations that demand the use of high-intensity discharge (''HID'') products, and DOE should ensure that any new standards will not eliminate these HID products from the market (metal halide products are a type of HID product). (CA IOUs, No. 5 at p. 1–2)

DOE reviewed commercially available MHLFs and found about 50 products marketed for use in agricultural applications (compared to 3,521 products in DOE's compliance certification database). The agricultural MHLFs range in wattage from 175 watts (''W'') to 1000 W. DOE did not find any performance characteristics or features of the agricultural MHLFs that would prevent them from being used in general lighting applications (*i.e.,* providing an interior or exterior area with overall illumination). DOE reviewed available agricultural MHLFs in light of the efficiency levels discussed in section IV.C.4 and determined that agricultural MHLFs already meet or could meet the efficiency levels considered in this determination.

EISA 2007 established energy conservation standards for MHLFs with ballasts designed to operate lamps with rated wattages between 150 W and 500 W and excluded three types of fixtures within that wattage range from energy conservation standards: (1) MHLFs with regulated-lag ballasts; (2) MHLFs that use electronic ballasts and operate at 480 volts; and (3) MHLFs 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,'' [7] and contain a ballast that is rated to operate at ambient air temperatures above 50 degrees 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))

In the 2014 MHLF final rule, DOE 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 volt (''V'') electronic ballasts. In addition, due to a lack of applicable test method for high-frequency electronic (''HFE'') ballasts, in the 2014 MHLF final rule, DOE did not establish standards for MHLFs with HFE ballasts. 79 FR 7754–7756 (February 10, 2014).

In this analysis, based on a review of manufacturer catalogs DOE again found a range of efficiencies for MHLFs with ballasts designed to operate lamps with rated wattages >1000 W to ≤2000 W. Hence, in this determination, DOE assesses potential standards for this equipment.

In summary, this proposed determination evaluates MHLFs with ballasts designed to operate lamps with rated wattages ≥50 W to ≤2000 W with the exception of MHLFs with regulated-lag ballasts and MHLFs that use electronic ballasts that operate at 480 volts.

In response to the July 2019 RFI, EEI suggested that DOE adopt a more accurate description of the regulatory category for which it is issuing standards for MHLFs. EEI noted that DOE is specifically reviewing standards for metal halide ballasts, and not for metal halide fixtures. (EEI, No. 2 at p. 2) EEI also noted that the focus on metal halide ballasts and not fixtures during the 2014 MHLF rulemaking produced arguably flawed conclusions regarding the payback period for the MHLF efficiency standard adopted. (EEI, No. 2 at p. 2) In a comment on the previous

[7] DOE notes that although the exclusion in 42 U.S.C. 6295(hh)(1)(B)(iii)(II) identifies those fixtures that are rated for use in wet locations as specified by the National Electrical Code 2002 section 410.4(A), the NFPA is responsible for authoring the National Electrical Code, which is identified as NFPA 70. Accordingly, DOE's use of NFPA 70 under the MHLF-related provision in 10 CFR 431.326(b)(3)(iii) is identical to the statutory exclusion set out by Congress.

rulemaking, EEI stated that it is unclear whether manufacturers will devote resources to make new ballasts to meet the standard *and* keep producing replacement ballasts. EEI noted that replacement costs increase substantially if the entire fixture needs to be replaced after ballast failure rather than just the ballast. (EEI, No. 53 at pp. 3–4) [8]

DOE prescribes efficiency standards for MHLFs but, as noted by EEI, standards for MHLFs are applicable to the ballast contained within the MHLF and not replacement metal halide ballasts sold separately. In this proposed determination DOE only has the authority to evaluate amended standards for MHLFs, not metal halide ballasts sold outside of MHLFs. In section IV.B.2, DOE considers other metrics for MHLFs that pertain to the performance of the fixture rather than the ballast contained within the fixture. In section IV.F.6, DOE discusses the lifetime of ballasts and fixtures and in section IV.F.9, DOE discusses the payback period analysis.

2. Metric

Current energy conservation standards for MHLFs are based on minimum allowable ballast efficiencies. The ballast efficiency for the fixture is calculated as the measured ballast output power divided by the measured ballast input power. The measurement of ballast output power (approximated in the test procedure as lamp output power) and ballast input power and the calculation of ballast efficiency for MHLFs is included in the current test procedure at 10 CFR 431.324.

In response to the July 2019 RFI, CA IOUs recommended that DOE adopt a new standard for MHLFs based on a lumens-per-watt metric to align with standards for other lighting products. In addition, regarding agricultural MHLFs, CA IOUs suggested that DOE evaluate the metrics developed by the American National Standards Institute (''ANSI'') and the American Society of Agricultural and Biological Engineers for evaluating performance related to agricultural operations. (CA IOUs, No. 5 at p. 1–2) CA IOUs noted that the current ballast efficiency metric for MHLFs does not promote more efficient fixture designs, more efficient lamps, or higher efficiency technologies such as LEDs. CA IOUs also pointed out that EISA 2007 gives DOE permission to expand the scope of regulation for MHLFs and to propose not only performance requirements, but also design requirements. CA IOUs noted that a fixture-level metric could save up to 50 percent more energy than the current approach that only considers ballast efficiency and provide a standardized metric to assess and compare the performance of a product. (CA IOUs, No. 5 at p. 2–3)

DOE agrees that a fixture metric effectively accounts for the efficiency of a fixture in different applications, provides more technological flexibility, and has the potential to yield overall higher performance and energy savings. DOE notes that metrics for agricultural MHLFs focus on performance characteristics that affect the photosynthesis of plants and therefore are not appropriate for MHLFs used in general lighting applications. Instead, as part of this determination, DOE evaluated several alternative fixture performance metrics, including lumens per watt (''lm/W''), luminaire efficacy rating (''LER''), target efficacy rating (''TER''), and fitted target efficacy (''FTE'').

A lumens-per-watt metric reflects the light produced and energy consumed for a lamp-and-ballast pairing. An increase in lm/W could reflect the use of a more efficacious lamp, a more efficient ballast, or both. Although DOE's current test procedure does not measure lm/W, ANSI C82.6–2015 [9] and IES LM–51–2013 [10] provide a test method that could be used to determine lm/W for lamp-and-ballast pairings. The inclusion of lumen output in the metric necessitates photometric measurements as part of the test procedure whereas the measurement of ballast efficiency requires only electrical measurements. Photometric measurements are more expensive to conduct than electrical measurements because of the equipment and time required. While a lumens-per-watt metric is based on more than just ballast performance, lm/W still does not account for directionality of a fixture (*i.e.,* the fixture's effectiveness in delivering light to a specific target). Because the covered product is a fixture, DOE evaluated metrics that captured the performance of the lamp, ballast, and optics of a fixture.

DOE next considered the LER metric, developed by NEMA in 1998. LER is expressed in units of lm/W but in addition to the lamp-and-ballast pairing described in the previous paragraph, LER includes a factor that accounts for luminaire efficiency, which is the ratio of the lumens emitted from a luminaire to the lumens emitted by the lamps alone. LER is used to establish minimum requirements for the Federal Energy Management Program (''FEMP'') for industrial luminaires.[11] NEMA has developed a test procedure for LER in NEMA LE 5B–1998.[12] The inclusion of lumen output and luminaire efficiency in the metric necessitates photometric measurements. As stated previously, photometric measurements are more expensive to conduct than electrical measurements. NEMA has since developed a TER metric which is similar to LER, but better accounts for directionality. DOE determined that TER would be a more applicable alternative metric to measure the performance of MHLFs.

The TER metric was developed by NEMA's luminaire division to succeed the LER rating. TER calculates fixture efficacy by multiplying the lamp lumens by the coefficient of utilization (''CU''), which factors in the percentage of rated lumens reaching a specific target (that varies based on the type of fixture). The inclusion of lumen output and CU in the metric necessitates photometric measurements, which are more expensive to conduct than electrical measurements. NEMA developed the NEMA LE–6–2014 standard [13] to provide a test procedure for determining the TER of commercial, industrial, and residential luminaires. TER has 22 different types of luminaire classifications, each with a different CU. Despite the variety of luminaire classifications available, TER explicitly excludes fixtures intended to be aimed, accent luminaires, rough or hazardous use luminaires, and emergency lighting. In the 2014 MHLF final rule, DOE considered the TER metric but ultimately chose not to adopt it out of concern that certain fixtures could fall within multiple luminaire classifications due to their designs. DOE

[8] The full written comment in response to the Notice of Proposed Rulemaking for MHLFs published at 78 FR 51164 (August 20, 2013) can be found in Docket No. EERE–2009–BT–STD–0018.

[9] American National Standards Institute. *American National Standard for lamp ballasts—Ballasts for High-Intensity Discharge Lamps—Methods of Measurement.* Approved September 17, 2015 available at *www.ansi.org.*

[10] Illuminating Engineering Society. *IES Approved Method—The Electrical and Photometric Measurement of High-Intensity Discharge Lamps.* Approved January 7, 2013 available at *https://webstore.iec.ch/home.*

[11] FEMP provides guidance for purchasing Energy-Efficient Industrial Luminaires (High/Low Bay) with specifications in LER available here: *https://www.energy.gov/eere/femp/purchasing-energy-efficient-industrial-luminaires-highlow-bay.*

[12] National Electrical Manufacturers Association. *LE 5B—Procedure for Determining Luminaire Efficacy Ratings for High-Intensity Discharge Industrial Luminaires.* Published January 1998 available at *www.nema.org.*

[13] National Electrical Manufacturers Association. *LE 6—Procedure for Determining Target Efficacy Ratings for Commercial, Industrial, and Residential Luminaires.* Published June 10, 2015 available at *www.nema.org.*

also determined that the exclusion of certain fixture types such as fixtures designed to be aimed does not allow all MHLFs to be measured using TER. 79 FR 7757. DOE has not found any new information since the 2014 MHLF final rule regarding the TER metric. Therefore, DOE considers these reasons to still be valid and tentatively concludes that TER is not a suitable metric for measuring the performance of MHLFs.

The FTE metric was developed by DOE to quantify outdoor pole-mounted fixture performance for ENERGY STAR qualification purposes.[14] In the FTE approach, fixture performance is measured by the amount of light hitting a specified target. The target is defined as the rectangle enclosing the uniform ''pool'' of light produced by the unique intensity distribution of each luminaire. FTE is calculated by multiplying the luminous flux landing in this pool by the percent coverage of the rectangular target, and then dividing by input power to the fixture. The inclusion of lumen output in the metric necessitates photometric measurements. As stated previously, photometric measurements are more expensive to conduct than electrical measurements. In the 2014 MHLF final rule, DOE considered the FTE metric but ultimately chose not to adopt it because FTE is calculated using a rectangular area. 79 FR 7757. Therefore, fixtures designed to light non-rectangular areas, produce a large amount of unlighted area within the rectangle, or produce specific light patterns that light both a horizontal plane and a vertical plane, or even above the fixture would be at a disadvantage. DOE continues to find this rationale to be valid today. In addition, currently, there is no industry standard for determining FTE. For these reasons, DOE determined that FTE is not suitable for measuring the performance of MHLFs.

In summary, DOE reviewed several alternative metrics to ballast efficiency in this proposed determination. Changing metrics would impose a significant burden on manufacturers. A change in metric would require retesting all MHLFs. While industry test procedures exist for many of the metrics, an industry-accepted test procedure does not exist for the FTE metric. Further, all metrics would require photometric testing in addition to the electrical measurements currently required. Photometric measurements are more expensive to conduct than electrical measurements. While some fixture manufacturers provide photometric data, the information is not available for all fixtures, all lamp-and-ballast pairings within fixtures, and all performance characteristics required to calculate the metrics described in this section. For example, the CU needed to calculate the TER metric is not available publicly. Finally, because the metrics account for the performance of both the lamp and ballast components of the fixture, adopting one of the metrics described in this section would require manufacturers to ship fixtures with lamps in addition to ballasts. Therefore, for the reasons described in this paragraph, DOE has tentatively concluded to maintain the current ballast efficiency metric for MHLFs.

In addition to a metric that represents fixture-level performance, CA IOUs stated that DOE should consider the benefits of fixtures with good lumen maintenance because this will enable lighting designers avoid over-lighting spaces in anticipation of lumen depreciation. (CA IOUs, No. 5 at p. 3) DOE notes that lumen maintenance is the ratio of lumen output at a certain period in time during the life of a lamp to the initial lumen output. Because lumen maintenance requires conducting photometric testing, and because the testing must be conducted more than once and with a potentially significant period of time between tests, DOE tentatively concludes that lumen maintenance represents a significant test burden for manufacturers. For this reason, DOE did not consider adopting a metric based on lumen maintenance in this determination.

3. Equipment Classes

When evaluating and establishing energy conservation standards, DOE may divide covered products into product classes by the type of energy used, or by capacity or other performance-related features that justify a different standard. (42 U.S.C. 6295(q)) 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.*)

In describing which MHLFs are included in current equipment classes, DOE incorporates by reference the 2002 version of NFPA 70 and the 2007 version of UL 1029 in DOE's regulations. NFPA 70 is a national safety standard for electrical design, installation, and inspection, and is also known as the 2002 National Electrical Code. UL 1029 is a safety standard specific to 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 that EISA 2007 excluded from the statutory standards enacted by Congress but that were later included as part of the 2014 MHLF final rule. In the July 2019 RFI, DOE found that a 2017 version of NFPA 70 (NFPA 70–2017) ''NFPA 70 National Electrical Code 2017 Edition'' [15] and a 2014 version of UL 1029 (UL 1029–2014) ''Standard for Safety High-Intensity-Discharge Lamp Ballasts'' [16] are now available.

In response to the July 2019 RFI, NEMA commented that updating the industry standards incorporated by reference in DOE's regulations, NFPA 70 and UL 1029, to the newer versions, NFPA 70–2017 and UL 1029–2014, is unlikely to have any impact on MHLFs included in each equipment class. However, NEMA pointed out that any updates could impose financial and administrative burdens on manufacturers, especially given the general market decline of MHLF technology. (NEMA, No. 3 at p. 3–4)

DOE agrees with NEMA that there is unlikely to be any impact on MHLFs included in each equipment class. Consequentially, DOE has not been able to identify any additional financial or administrative burden as testing requirements and equipment classes will remain unaffected. However, as discussed in section V.D, because DOE is not proposing to amend standards for MHLFs, DOE is not proposing to incorporate by reference the updated industry standards NFPA 70–2017 and UL 1029–2014 in this determination.

In this analysis, DOE reviewed metal halide lamp fixtures and the ballasts contained within them to identify performance-related features that could potentially justify a separate equipment class. In the following sections, DOE discusses the equipment classes considered in this analysis.

a. Existing Equipment Classes

The current equipment classes are based on input voltage, rated lamp wattage, and designation for indoor versus outdoor application. NEMA commented in response to the July 2019 RFI that the current equipment classes for MHLFs remain viable and do not need to be changed. NEMA also noted that there are no new products that will benefit from an additional equipment class. (NEMA, No. 3 at p. 3; NEMA, No. 3 at p. 5)

[14] Overview of FTE metric available at: *http://www.illinoislighting.org/resources/FTEoverview01Jul09.pdf.*

[15] Approved August 24, 2016.

[16] Approved December 6, 2013.

Regarding input voltage, MHLFs are available in a variety of input voltages (most commonly 120 V, 208 V, 240 V, 277 V, and 480 V), and the majority of fixtures are equipped with ballasts that are capable of operating at multiple input voltages (for example, quad-input-voltage ballasts are able to operate at 120 V, 208 V, 240 V, and 277 V). DOE determined in the 2014 MHLF final rule that the input voltage at which a MHLF is capable of operating represents a performance-related feature that affects consumer utility as certain applications demand specific input voltages. 79 FR 7762. In the 2014 MHLF final rule, DOE's ballast testing did not indicate a prevailing relationship between discrete input voltages and ballast efficiencies (*e.g.,* higher voltages are not always more efficient), with one exception. DOE found that ballasts tested at 480 V were less efficient on average than ballasts tested at 120 V or 277 V. 79 FR 7781. NEMA stated that it remains appropriate to include separate classes for 480 V products given the differences in how those products perform in testing. (NEMA, No. 3 at p. 6) Because dedicated 480 V ballasts have a distinct utility in that certain applications require 480 V operation and a difference in efficiency relative to ballasts tested at 120 V and 277 V, DOE maintains separate equipment classes for ballasts tested at 480 V in this determination. See chapter 3 of the NOPD TSD for further details.

As lamp wattage increases, lamp-and-ballast systems generally produce increasing amounts of light (lumens). Because certain applications require more light than others, wattage often varies by application. For example, low-wattage (less than 150 W) lamps are typically used in commercial applications. Medium-wattage (150 W–500 W) lamps are commonly used in warehouse, street, and commercial lighting. High-wattage (greater than 500 W) lamps are used in searchlights, stadiums, and other applications that require powerful white light. Because different applications require different amounts of light and the light output of lamp-and-ballast systems is typically reflected by the wattage, wattage represents consumer utility. The wattage operated by a ballast is correlated with the ballast efficiency; ballast efficiency generally increases as lamp wattage increases. Therefore, DOE maintains separation of equipment classes by wattage. See chapter 3 of the NOPD TSD for further details.

DOE determined in the 2014 MHLF final rule that indoor and outdoor MHLFs are subject to separate cost-efficiency relationships at electronic ballast levels. 79 FR 7763–7764. First, as outdoor applications can be subject to large voltage transients, MHLFs in such applications require 10 kV voltage transient protection. Magnetic metal halide ballasts are typically resistant to voltage variations of this magnitude, while electronic metal halide ballasts are generally not as resilient. Therefore, in order to address large voltage transients, electronic ballasts in outdoor MHLFs would need either (1) an external surge protection device or (2) internal transient protection of the ballast using metal-oxide varistors (''MOVs'') in conjunction with other inductors and capacitors. Second, DOE noted that indoor fixtures can require the inclusion of a 120 V auxiliary tap. 79 FR 7763. This output is used to operate emergency lighting after a temporary loss of power while the metal halide lamp is still too hot to restart. These taps are generally required for only one out of every ten indoor lamp fixtures. A 120 V tap is easily incorporated into a magnetic ballast due to its traditional core and coil design, and incurs a negligible incremental cost. Electronic ballasts, however, require additional design to add this 120 V auxiliary power functionality. These added features impose an incremental cost to the ballast or fixture (further discussed in section IV.C.7 of this NOPD). As these incremental costs could affect the cost-effectiveness of fixtures for indoor versus outdoor applications, DOE maintains separate equipment classes for indoor and outdoor fixtures. See chapter 3 of the NOPD TSD for further details.

b. Summary

In summary, for the purpose of this proposed determination DOE considered equipment classes using three class-setting factors: Input voltage, rated lamp wattage, and fixture application. DOE presents the resulting equipment classes in Table IV.1.

TABLE IV.1—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 ≤1000 W	Indoor	Tested at 480 V.
>500 W and ≤1000 W	Indoor	All others.
>500 W and ≤1000 W	Outdoor	Tested at 480 V.
>500 W and ≤1000 W	Outdoor	All others.
>1000 W and ≤2000 W	Indoor	Tested at 480 V.
>1000 W and ≤2000 W	Indoor	All others.
>1000 W and ≤2000 W	Outdoor	Tested at 480 V.

TABLE IV.1—EQUIPMENT CLASSES—Continued

Designed to be operated with lamps of the following rated lamp wattage	Indoor/outdoor	Input voltage type ‡
>1000 W and ≤2000 W	Outdoor	All others.

* Includes 150 W MHLFs initially exempted by EISA 2007, which are MHLFs rated only for 150 W lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A);); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

** Excludes 150 W MHLFs initially exempted by EISA 2007, which are MHLFs rated only for 150 W lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A);); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

‡ Input voltage for testing would be specified by the test procedures. Ballasts rated to operate lamps less than 150 W would be tested at 120 V, and ballasts rated to operate lamps ≥150 W would be tested at 277 V. Ballasts not designed to operate at either of these voltages would be tested at the highest voltage the ballast is designed to operate.

4. Technology Options

In the technology assessment, DOE identifies technology options that would be expected to improve the efficiency of MHLFs, as measured by the DOE test procedure. The energy conservation standard requirements and DOE test procedure for MHLFs are based on the efficiency of the metal halide ballast contained within the fixture. Hence DOE identified technology options that would improve the efficiency of metal halide ballasts. To develop a list of technology options, DOE reviewed manufacturer catalogs, recent trade publications and technical journals, and consulted with technical experts.

In response to the July 2019 RFI, NEMA commented that there are no new technology options for MHLFs given the maturity of MHLF technology. NEMA added that technology options such as ''increased stack height'' and ''increased conductor cross sections'' lead to an increase in the size of the ballast and have been implemented in accordance with 2014 MHLF final rule to the limit of their practicality. (NEMA, No. 3 at p. 4)

DOE's review of technology options for this determination indicates that the technology options identified in the 2014 MHLF final rule remain valid with certain clarifications and additional detail. Specifically, DOE is revising ''increased stack height'' to be ''improved steel laminations.'' As described for the 2014 MHLF final rule, increased stack height is adding steel laminations to increase the core cross-section and thereby lower the flux density and losses.[17] Hence the mechanism for efficiency improvement is the addition of steel laminations. The 2014 MHLF final rule also noted that use of thinner laminations allows for maintaining the stack height and thereby ballast footprint.[18] In addition thinner laminations and well insulated will reduce eddy current losses.[19] To more appropriately reflect the technology in this document, DOE refers to this option as ''improved steel laminations'' and describes it as adding steel laminations to lower core losses by using thin and insulated laminations.

In the 2014 MHLF final rule ''increased conductor cross section'' was described as reducing winding losses through use of larger wire gauges, multiple strands of wire operating in parallel as well use of litz wire for electronic ballasts.[20] In this analysis, DOE notes that improvements in windings can also be achieved by using multiple smaller coils to increase the number of turns and thereby increase the induced voltage. Additionally, optimizing the shape of the wires by wrapping them close together makes transfer of power through the core more efficient. Hence, to more appropriately reflect the technology, in this document DOE refers to this option as ''improved windings'' and describes it as use of optimized-gauge copper wire; multiple, smaller coils; shape-optimized coils to reduce winding losses for magnetic and electronic ballasts; and in addition, for electronic ballasts, the use of litz wire.

NEMA commented that technology options such as improved core steel, and copper winding have been implemented in accordance with the 2014 MHLF final rule and reached the limit of their practicality. (NEMA, No. 3 at p. 4) In this determination, DOE found magnetic ballasts with varying levels of efficiency in its compliance certification database. Therefore, DOE has tentatively determined that technology options, such as a higher grade of steel could still be used to improve the efficiency of magnetic ballasts. DOE's research has not indicated any technological issues with utilizing higher-grade steel in magnetic ballasts. In addition, based on teardowns conducted in 2019, DOE determined that magnetic ballast manufacturers still utilize aluminum wiring in their ballasts. DOE determined that incorporating copper wiring in all magnetic ballasts can still be considered a technology option to improve the efficiency of magnetic ballasts. DOE has tentatively determined that it will continue to consider improved core steel and copper wiring as technology options to improve the efficiency of magnetic ballasts.

NEMA noted that the use of electronic ballasts in new metal halide fixtures has declined significantly and at the same pace as magnetic ballasts and provided data to illustrate this. (NEMA, No. 3 at p. 4)

DOE agrees that there has been a decline in the use of metal halide technology as whole affecting both electronic and magnetic metal halide ballasts. However, DOE determined that electronic ballast technology remains a viable technology option to improve the efficiency of MHLFs with magnetic ballasts, therefore, DOE considered electronic ballasts as a technology option in its analysis.

DOE is removing the technology option of laminated grain-oriented silicon steel and amorphous steel for electronic ballasts. In the context of this determination, DOE has tentatively determined that using laminated sheets of steel (silicon or amorphous) to create the core of the inductor may not minimize losses in ballasts that operate at high frequencies.[21] Because electronic ballasts operate at high frequencies, DOE is not considering improved steel laminations or amorphous steel laminations as technology options for improving the efficiency of these ballasts.

[17] See chapter 3 of 2014 MHLF final rule TSD, available at *https://www.regulations.gov/docket?D=EERE-2009-BT-STD-0018.*

[18] See chapter 3 of 2014 MHLF final rule TSD, available at *https://www.regulations.gov/docket?D=EERE-2009-BT-STD-0018.*

[19] AK Steel, *Selection of Electrical Steels for Magnetic Cores.*

[20] See chapter 3 of 2014 MHLF final rule TSD.

[21] DOE came to the same conclusion for fluorescent lamp ballasts. See notice of proposed determination for fluorescent lamp ballasts at 84 FR 56540, 56552 (October 22, 2019); available at *https://www.regulations.gov/document?D=EERE-2015-BT-STD-0006-0019.*

A complete list of technology options DOE considered for this analysis appears in Table IV.2.

TABLE IV.2—TECHNOLOGY OPTIONS

Ballast type	Design option		Description
Magnetic	Improved Core Steel		Use a higher grade of electrical steel, including grain-oriented silicon steel, to lower core losses.
	Copper Wiring		Use copper wiring in place of aluminum wiring to lower resistive losses.
	Improved Steel Laminations		Add steel laminations to lower core losses by using thin and insulated laminations.
	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.
	Amorphous Steel		Create the core of the inductor from laminated sheets of amorphous steel insulated from each other.
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.

5. Screening Analysis

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 commercial products or in working prototypes will not be considered further.

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

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

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

(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.

Sections 6(c)(3) and 7(b) of the Process Rule.

In sum, if DOE determines that a technology, or a combination of technologies, fails to meet one or more of the listed five criteria, it will be excluded from further consideration in the engineering analysis. DOE only considers potential efficiency levels achieved through the use of proprietary designs in the engineering analysis if they are not part of a unique pathway to achieve that efficiency level (*i.e.,* if there are other non-proprietary technologies capable of achieving the same efficiency level).

The subsequent sections include comments from interested parties pertinent to the screening criteria and whether DOE determined that a technology option should be excluded (''screened out'') based on the screening criteria.

a. Screened-Out Technologies

For magnetic ballasts, DOE is screening out the technology option of using laminated sheets of amorphous steel. Due to the random arrangement of molecules allowing for an easier switch from magnetization to de-magnetization of the material, amorphous steel results in lower core losses than the commonly-used silicon steel. In the 2014 MHLF final rule, DOE screened out amorphous steel technology because it failed to pass the ''practicable to manufacture, install, and service'' criterion. Additionally, 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 customer could use the ballast. 79 FR 7766.

In response to the July 2019 RFI, NEMA commented that amorphous steel technology was screened out in the 2014 MHLF final rule because it increases the size and weight of metal halide ballasts, which remains true today. NEMA added that the current cost of amorphous steel ribbon that is used as a raw material for making magnetic cores is 20 to 30 times higher than the cost of other higher-grade steel used in magnetic ballasts. (NEMA, No. 3 at p. 4)

In its assessment for this analysis, DOE found that brittleness remained an issue in using amorphous steel in metal halide ballasts.[22] Further amorphous steel is implemented as laminations to ensure losses due to eddy currents do not offset efficiency gains. Typically, amorphous steel laminations have a larger cross-sectional area, which increases the overall size of the ballast, when compared to silicon steel

[22] Technical Editor, ''Advantages and disadvantages of an amorphous metal transformer.'' *Polytechnic Hub,* March 8, 2018, available at *https://www.polytechnichub.com/advantages-disadvantages-amorphous-metal-transformer/.*

laminations. Hence, in this analysis, DOE continues to screen out the use of amorphous steel due to practicability to manufacture and adverse impacts on equipment utility.

b. Remaining Technologies

DOE tentatively concludes that all of the other identified technologies listed in section IV.B.4 meet all five screening criteria to be examined further as design options. In summary, DOE did not screen out the following technology options:

- Magnetic Ballasts
  - Improved Core Steel
  - Copper Wiring
  - Improved Steel Laminations
  - Improved Windings
  - Electronic Ballast
- Electronic Ballasts
  - Improved Components
  - Improved Circuit Design

For additional details, see chapter 4 of the NOPD TSD.

C. Engineering Analysis

In the engineering analysis, DOE develops cost-efficiency relationships characterizing the incremental costs of achieving increased ballast efficiency. This relationship serves as the basis for cost-benefit calculations for individual consumers and the nation. The methodology for the engineering analysis consists of the following steps: (1) Selecting representative equipment classes; (2) selecting baseline metal halide ballasts; (3) identifying more efficient substitutes; (4) developing efficiency levels; and (5) scaling efficiency levels to non-representative equipment classes. The details of the engineering analysis are discussed in chapter 5 of the NOPD TSD.

1. Representative Equipment Classes

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. DOE established 24 equipment classes based on input voltage, rated lamp wattage, and indoor/outdoor designation. DOE did not directly analyze the equipment classes containing only fixtures with ballasts tested at 480 V due to low shipment volumes. DOE determined that only 19 percent of fixtures in its compliance certification database are fixtures with ballasts tested at 480 V. 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.

In summary, DOE directly analyzed the equipment classes shown in gray in Table IV.3 of this document. See chapter 5 of the NOPD TSD for further discussion.

BILLING CODE 6450–01–P

Table IV.3 Equipment Classes

Representative Equipment Class	Indoor/Outdoor	Input Voltage Type
≥50 W and ≤100 W	Indoor	Tested at 480 V
		All others
	Outdoor	Tested at 480 V
		All others
>100 W and <150 W*	Indoor	Tested at 480 V
		All others
	Outdoor	Tested at 480 V
		All others
≥150 W and ≤250 W**	Indoor	Tested at 480 V
		All others
	Outdoor	Tested at 480 V
		All others
>250 W and ≤500 W	Indoor	Tested at 480 V
		All others
	Outdoor	Tested at 480 V
		All others
>500 W and ≤1000 W	Indoor	Tested at 480 V
		All others
	Outdoor	Tested at 480 V
		All others
>1000 W and ≤2000 W	Indoor	Tested at 480 V
		All others
	Outdoor	Tested at 480 V
		All others

*Includes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50°C, as specified by UL 1029–2007.

**Excludes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50°C, as specified by UL 1029–2007.

BILLING CODE 6450–01–C

Metal halide lamp fixtures are designed to be operated with lamps of certain rated lamp wattages and contain ballasts that can operate lamps at these wattages. To further focus the analysis, DOE selected a representative rated wattage in each equipment class. Each representative wattage was the most common wattage within each equipment class. DOE found that common wattages within each equipment class were the same for outdoor and indoor fixtures. Specifically, DOE selected 70 W, 150 W, 250 W, 400 W, 1000 W and 1500 W as representative wattages to analyze.

The >100 W and <150 W equipment class includes fixtures designed to operate 150 W lamps that are rated for use in wet locations, as specified by the National Electrical Code 2002, section 410.4(A) and contain a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007. These fixtures were initially exempted by EISA 2007. (42 U.S.C. 6295(hh)(1)(B)(iii)) In the 2014 MHLF final rule, DOE included 150 W MHLFs previously exempted by EISA 2007 in the >100 W and <150 W equipment class. 79 FR 7754–7755. In this analysis, DOE found that 150 W was the most common wattage in this equipment class and selected it as the representative wattage.

The representative wattages for each equipment class are summarized in Table IV.4 of this document. See chapter 5 of the NOPD TSD for further discussion.

TABLE IV.4—REPRESENTATIVE WATTAGES

Representative equipment class	Representative wattage
≥50 W and ≤100 W	70 W
>100 W and <150 W*	150 W
≥150 W and ≤250 W**	250 W
>250 W and ≤500 W	400 W
>500 W and ≤1000 W	1000 W

TABLE IV.4—REPRESENTATIVE WATTAGES—Continued

Representative equipment class	Representative wattage
>1000 W and ≤2000 W	1500 W

* Includes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

** Excludes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

2. Baseline Ballasts

For each representative equipment class, DOE selected baseline ballasts to serve as reference points against which DOE measured changes from potential amended energy conservation standards. Typically, the baseline ballast is the most common, least efficient ballast that meets existing energy conservation standards. In this analysis, DOE selected as baselines the least efficient ballast meeting standards that have common attributes for ballasts in each equipment class such as circuit type, input voltage and ballast type.

DOE used the efficiency values of ballasts contained in MHLFs certified in DOE's compliance certification database to identify baseline ballasts for all equipment classes except the >1000 W and ≤2000 W equipment class. Because fixtures in this equipment class are not currently subject to standards, and therefore do not have DOE certification data, DOE determined ballast efficiency values by using catalog data. In summary, DOE directly analyzed the baseline ballasts shown in Table IV.5 of this document. See chapter 5 of the NOPD TSD for more detail.

TABLE IV.5—BASELINE MODELS

Representative equipment class	Wattage	Ballast type	Circuit type	Starting method	Input voltage	System input power	Ballast efficiency
≥50 W and ≤100 W	70	Magnetic	HX–HPF	Pulse	Quad	89.5	0.782
>100 W and <150 W*	150	Magnetic	HX–HPF	Pulse	Quad	182.0	0.824
≥150 W and ≤250 W**	250	Magnetic	CWA	Pulse	Quad	281.5	0.888
>250 W and ≤500 W	400	Magnetic	CWA	Pulse	Quad	443.0	0.903
>500 W and ≤1000 W	1000	Magnetic	CWA	Pulse	Quad	1068.4	0.936
>1000 W and ≤2000 W	1500	Magnetic	CWA	Probe	Quad	1625.0	0.923

* Includes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

** Excludes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

3. More-Efficient Ballasts

DOE selected more-efficient ballasts as replacements for each of the baseline ballasts by considering commercially available ballasts. DOE also selected more-efficient ballasts with similar attributes as the baseline ballast when possible (*e.g.,* circuit type, input voltage). As with the baseline ballasts, DOE used the ballast efficiency values from the compliance certification database to identify more efficient ballasts for all equipment classes except the >1000 W and ≤2000 W equipment class which does not have certification data available. For this equipment class, DOE determined ballast efficiency values by first gathering and analyzing catalog data. DOE then tested the ballasts to verify the ballast efficiency reported by the manufacturer. For instances where the catalog data did not align with the tested data, DOE selected more-efficient ballasts based on the tested ballast efficiency.

As noted in section IV.C.1, the representative wattage for the >100 W and <150 W equipment class is 150 W. This equipment class includes 150 W MHLFs that are rated for wet-location and high-temperature. All other 150 W MHLFs are included in the ≥150 W and ≤250 W equipment class. In the 2014 MHLF final rule, based on test data of wet-location and high-temperature 150 W ballasts, DOE identified two efficiency levels for electronic ballasts in the >100 W and <150 W equipment class. 79 FR 7777. In this analysis, based on its review of the compliance certification database DOE was unable to identify 150 W MHLFs rated for wet-location and high-temperature that contain electronic ballasts. DOE then assessed the efficiencies of 150 W electronic ballasts not rated for wet-location and high temperature that are certified in the compliance certification database. DOE found these electronic ballast efficiencies to be similar to those identified in the 2014 MHLF final rule for the >100 W and <150 W equipment class. Hence, for the >100 W and <150 W equipment class, DOE selected more-efficient electronic ballasts based on compliance-certification-database efficiencies of 150 W MHLFs not rated for wet-locations and high temperatures.

In response to the July 2019 RFI, EEI commented that there is minimal energy savings potential for MHLF technology. EEI also expressed concerns about whether the metal halide ballasts reported in the RFI to be 0.8 percent to 3.3 percent more efficient than the maximum efficiency levels from the 2014 MHLF final rule are commercially available for all lamp wattages. EEI also raised questions about the possibility of these more efficient metal halide ballasts including proprietary technology or being exclusively manufactured by one company. (EEI, No. 2 at p. 2–3)

DOE agrees with EEI that commercially available metal halide ballasts are not up to 0.8 percent to 3.3 percent more efficient than the maximum efficiency levels analyzed in the 2014 MHLF final rule. Since the July 2019 RFI, DOE updated its analysis and found that metal halide ballasts that were more efficient than the maximum efficiency levels analyzed in the 2014 MHLF final rule no longer appear in its compliance certification database. (See section IV.C.4 for further details.)

4. Efficiency Levels

Based on the more-efficient ballasts selected for analysis, DOE developed ELs for the representative equipment classes. DOE identified one magnetic EL in every equipment class. The more-efficient magnetic EL represents a magnetic ballast with a higher grade of steel compared to the baseline. DOE identified one electronic EL for the ≥150 W and ≤250 W and >250 W and ≤500 W equipment classes. The standard electronic level represents a ballast with standard electronic circuitry. DOE identified 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 represents an electronic ballast with an improved circuit design and/or more efficient components compared to the standard electronic level.

The characteristics of the more-efficient representative units are summarized in Table IV.6 through Table IV.11 of this document. See chapter 5 of the NOPD TSD for more detail.

TABLE IV.6—70 W REPRESENTATIVE UNITS

Equipment class	EL	Technology	Rated wattage	Starting method	Input voltage	System input power	Ballast efficiency
≥50 W and ≤100 W	EL1	More Efficient Magnetic	70	Pulse	Tri	88.3	0.793
	EL2	Standard Electronic	70	Pulse	Quad	0.814	0.860
	EL3	Electronic Max Tech	70	Pulse	Quad	77.7	0.901

TABLE IV.7—150 W REPRESENTATIVE UNITS

Equipment class	EL	Technology	Rated wattage	Starting method	Input voltage	System input power	Ballast efficiency
>100 W and <150 W *	EL1	More Efficient Magnetic	150	Pulse	Quad	178.6	0.84
	EL2	Standard Electronic	150	Pulse	Quad	166.7	0.9
	EL3	Electronic Max Tech	150	Pulse	Quad	162.2	0.925

* Includes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

TABLE IV.8—250 W REPRESENTATIVE UNITS

Equipment class	EL	Technology	Rated wattage	Starting method	Input voltage	System input power	Ballast efficiency
≥150 W and ≤250 W *	EL1	More Efficient Magnetic	250	Pulse	Quad	276.5	0.904
	EL2	Electronic Max Tech	250	Pulse	Tri	266.2	0.939

* Excludes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

TABLE IV.9—400 W REPRESENTATIVE UNITS

Equipment class	EL	Technology	Rated wattage	Starting method	Input voltage	System input power	Ballast efficiency
>250 W and ≤500 W	EL1	More Efficient Magnetic	400	Pulse	Quad	440.5	0.908
	EL2	Electronic Max Tech	400	Pulse	Tri	426.0	0.939

TABLE IV.10—1000 W REPRESENTATIVE UNITS

Equipment class	EL	Technology	Rated wattage	Starting method	Input voltage	System input power	Ballast efficiency
>500 W and ≤1000 W	EL1	More Efficient Magnetic	1000	Pulse	Quad	1063.8	0.94

TABLE IV.11—1500 W REPRESENTATIVE UNITS

Equipment class	EL	Technology	Rated wattage	Starting method	Input voltage	System input power	Ballast efficiency
>500 W and ≤1000 W	EL1	More Efficient Magnetic	1000	Pulse	Quad	1063.8	0.94

In the 2014 MHLF final rule, DOE determined that except in a few cases where the linear form was more appropriate, a power-law equation best captured the metal halide ballast efficiency data. 79 FR 7777. In this analysis, DOE determined that the power-law equation and in some cases the linear equation remain valid representations of the metal halide ballast efficiency data. DOE ensured that equations best fit the more-efficient representative units identified in each equipment class while forming one continuous equation across equipment classes, where possible.

Table IV.12 summarizes the efficiency requirements and associated equations at each EL for the representative equipment classes. DOE requests comment on the ELs under consideration for the representative equipment classes, including the max-tech levels.

TABLE IV.12—SUMMARY OF ELS FOR REPRESENTATIVE EQUIPMENT CLASSES

Equipment class	EL	Technology	Minimum efficiency equation for ballasts not tested at 480 V *
≥50 W and ≤100 W	EL1	More Efficient Magnetic	1/1+1.16*P∧(−0.345))†
	EL2	Standard Electronic	1/(1+1*P∧(−0.42))
	EL3	Electronic Max Tech	1/(1+0.4*P∧(−0.3))

TABLE IV.12—SUMMARY OF ELS FOR REPRESENTATIVE EQUIPMENT CLASSES—Continued

Equipment class	EL	Technology	Minimum efficiency equation for ballasts not tested at 480 V *
>100 W and <150 W	EL1	More Efficient Magnetic	1/(1+1.16*P∧(−0.345))
	EL2	Standard Electronic	1/(1+1*P∧(−0.42))
	EL3	Electronic Max Tech	1/(1+0.4*P∧(−0.3))
≥150 W and ≤250 W	EL1	More Efficient Magnetic	1/(1+0.5017*P∧(−0.26))
	EL2	Standard Electronic	1/(1+1*P∧(−0.42))
	EL3	Electronic Max Tech	1/(1+0.4*P∧(−0.3))
>250 W and ≤500 W	EL1	More Efficient Magnetic	1/(1+0.5017*P∧(−0.26))
	EL2	Standard Electronic	1/(1+1*P∧(-0.42))
	EL3	Electronic Max Tech	1/(1+0.4*P∧(−0.3))
>500 W and ≤1000 W	EL1	More Efficient Magnetic	0.000057*P+0.881
>1000 W and ≤2000 W	EL1	More Efficient Magnetic	−0.000008*P+0.946

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

CA IOUs recommended that DOE consider fixtures that include ballasts meeting the 90–92 percent efficiency California Appliance Efficiency Standards for fixtures between 13,050 and 43,500 lumens when determining new efficiency levels. (CA IOUs, No. 5 at p. 2–3) CA IOUs also commented that if DOE is unable to move toward a technology-agnostic standard that incorporates the entire fixture, DOE should at least adopt efficiency levels based on electronic ballast technology and not magnetic ballast technology. (CA IOUs, No. 5 at p. 3)

Table IV.6 through Table IV.11 in this section describe the more efficient ballasts analyzed at each EL, including the ballast efficiency of each unit. As described in this section, some ELs can only be met by electronic ballast technology. DOE considers the benefits and burdens of each level in section V.D of this document.

5. Design Standard

Under 42 U.S.C. 6295(hh)(4), DOE is permitted to establish a standard based on both design and performance requirements. Existing design standards for MHLFs relate to fixtures that contain probe-start ballasts. EISA 2007 required that MHLFs designed to operate lamps rated at or above 150 W but at or less than 500 W contain magnetic probe-start ballasts that are at least 94 percent efficient. (42 U.S.C. 6295(hh)(1)(A)(ii)) In the 2014 MHLF final rule, DOE adopted a design standard that prohibits the sale of probe-start ballasts in newly sold fixtures that are designed to operate rated lamp wattages from 501 W–1000 W. 79 FR 7778; 10 CFR 431.326(d). DOE reviewed MHLFs currently offered on the market and did not find any ballast characteristics or other performance features of the fixtures during the analysis for this NOPD to lead it to conclude that a new design standard would result in significant energy savings. Therefore, in this analysis, DOE is not proposing any new design standards for MHLFs.

6. Scaling to Other Equipment Classes

DOE did not directly analyze MHLFs with ballasts that would be tested at an input voltage of 480 V. Thus, it was necessary to develop a scaling relationship to establish ELs for these equipment classes. To do so, for each representative wattage certified to DOE, DOE compared quad-voltage ballasts from the representative equipment classes to their 480 V ballast counterparts using information from the compliance certification database. Ballasts capable of operating 120 V or 277 V are predominantly quad-voltage ballasts, therefore, DOE chose to compare quad-voltage ballasts with 480 V ballasts to develop a scaling factor.

Based on its review of the compliance certification database, DOE determined that the average reduction in ballast efficiency for 480 V ballasts compared to quad ballasts is greater for ballasts designed to operate lamps rated less than 150 W compared to ballasts designed to operate lamps rated greater than or equal to 150 W. Hence, using the method described above, DOE developed two separate scaling factors, one for the 50 W–150 W range and the second for the 150 W–1000 W range. For non-representative equipment classes in the 50 W–150 W range, DOE found the average reduction in ballast efficiency to be 3.0 percent, and for those in the 150 W–1000 W range, DOE found the average reduction in ballast efficiency to be 1.0 percent. DOE applied these scaling factors to the representative equipment class EL equations to develop corresponding EL equations for ballasts tested at an input voltage of 480V. Specifically, for the non-representative equipment classes in the 50 W–150 W range, DOE used a multiplier of 0.97, and for those in the 150 W–1000 W range, DOE used a multiplier of 0.99.

For ballasts greater than 1000 W, DOE determined the need for a scaling factor based on manufacturer catalog data. DOE determined that ballasts greater than 1000 W do not show a difference in efficiency between 480 V and non-480 V ballasts. DOE did not apply a scaling factor to develop efficiency levels for 480 V ballasts in this equipment class, however, DOE continues to consider the 480 V and non-480 V equipment classes separately for MHLFs greater than 1000 W for the purposes of this analysis.

Additionally, for the ≥150 W and ≤250 W non-representative equipment class, DOE adjusted the resulting scaled equations to ensure all ELs were equal to or more stringent than the EISA 2007 minimum ballast efficiency standard. See chapter 5 of the NOPD TSD for additional details.

Table IV.13 summarizes the efficiency requirements at each EL for the non-representative equipment classes. DOE requests comment on the ELs under consideration for the non-representative equipment classes, including the max-tech levels.

TABLE IV.13—SUMMARY OF ELS FOR NON-REPRESENTATIVE EQUIPMENT CLASSES

Equipment class	EL	Technology	Minimum efficiency equation for ballasts tested at 480 V
≥50 W and ≤100 W	EL1	Improved magnetic	0.97/(1+1.16*P∧(−0.345))

TABLE IV.13—SUMMARY OF ELs FOR NON-REPRESENTATIVE EQUIPMENT CLASSES—Continued

Equipment class	EL	Technology	Minimum efficiency equation for ballasts tested at 480 V
	EL2	Standard Electronic	0.97/(1+1*P∧(−0.42))
	EL3	Electronic Max Tech	0.97/(1+0.4*P∧(−0.3))
>100 W and <150 W *	EL1	Improved magnetic	0.97*(0.0006*P+0.748)
	EL2	Standard Electronic	0.97/(1+1*P∧(−0.42))
	EL3	Electronic Max Tech	0.97/(1+0.4*P∧(−0.3))
≥150 W and ≤250 W **	EL1	Improved magnetic	≥150 W and <210 W: 0.88 ≥210 W and ≤250 W: 0.99/(1+0.5017*P∧(−0.26))
	EL2	Standard Electronic	0.99/(1+1*P∧(−0.42))
	EL3	Electronic Max Tech	0.99/(1+0.4*P∧(−0.3))
>250 W and ≤500 W	EL1	Improved magnetic	0.99/(1+0.5017*P∧(−0.26))
	EL2	Standard Electronic	0.99/(1+1*P∧(−0.42))
	EL3	Electronic Max Tech	0.99/(1+0.4*P∧(−0.3))
>500 W and ≤1000W	EL1	Improved magnetic	0.99*(0.0001*P+0.881)
>1000 W and ≤2000 W	EL1	Improved magnetic	0.99*(−0.000008*P+0.946)

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

7. Manufacturer Selling Price

DOE develops manufacturer selling prices (''MSPs'') for covered equipment and applies markups to create end-user prices to use as inputs to the LCC analysis and NIA. The MSP of a MHLF comprises of the MSP of the fixture components including any necessary additional features and the MSP of the metal halide ballast contained in the fixture. For this analysis, DOE conducted teardown analyses on 31 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 ballast, to calculate the manufacturing production cost (''MPC'').[23] The following sections describe the development of MSPs of fixture components and more-efficient MH ballasts identified for each efficiency level considered in this analysis.

a. Fixtures

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.

To calculate an empty fixture price, DOE identified the applications commonly served by the representative wattage in each equipment class. DOE recognizes that technological changes in the ballast, specifically moving from magnetic ballasts to electronic ballasts, can necessitate alterations to the fixture. These changes often incur additional costs that are dependent on the price of the baseline fixture that is altered. DOE estimates a baseline empty fixture cost as well as incremental costs at ELs that require electronic ballasts. The cost adders to the fixtures are discussed later in this section.

DOE selected one to four representative fixture types for each rated wattage range based on the most common application(s) within that range. DOE determined the common application(s) by reviewing all fixtures in DOE's compliance certification database, identifying the type of fixture for each basic model, and then using a product count to determine the most popular fixture types in each equipment class. DOE selected representative fixture types separately for indoor and outdoor applications. The representative fixture types for each equipment class, are shown in Table IV.14 below. See chapter 5 of the NOPD TSD for further discussion.

TABLE IV.14—REPRESENTATIVE FIXTURE TYPES

Representative equipment class	Representative wattage	Representative fixture types	
		Indoor	Outdoor
≥50 W and ≤100 W	70 W	Downlight	Bollard, Flood, Post Top, Wallpack.
>100 W and <150 W *	150 W	Downlight	Area, Flood, Post Top, Wallpack.
≥150 W and ≤250 W **	250 W	High-Bay	Area, Flood, Post Top, Cobrahead.
>250 W and ≤500 W	400 W	High-Bay	Area, Flood, Post Top, Cobrahead.
>500 W and ≤1000 W	1000 W	High-Bay	Area, Flood, Sports.
>1000 W and ≤2000 W	1500 W	Sports	Sports.

* Includes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

** Excludes 150 W fixtures initially exempted by EISA 2007, which are fixtures rated only for 150 watt lamps; rated for use in wet locations, as specified by the NFPA 70–2002, section 410.4(A); and containing a ballast that is rated to operate at ambient air temperatures above 50 °C, as specified by UL 1029–2007.

[23] When viewed from the company-wide perspective, the sum of all material, labor, and overhead costs equals the company's sales cost, also referred to as the cost of goods sold.

The MPCs of empty fixtures were determined using teardowns. Teardowns were conducted for 31 fixtures that spanned the representative wattages and the applications identified for each representative wattage. The MPC of the empty fixture for each representative wattage was calculated by weighting the empty fixture cost for each application by the popularity of each application. DOE determined the weightings based on the number of fixtures for each application at each representative wattage in DOE's certification database. See chapter 5 of the NOPD TSD for further details.

While the empty fixture MPCs remain the same at each magnetic efficiency level, incremental costs are added when the fixture contains an electronic ballast. In the 2014 MHLF final rule DOE applied cost adders to fixtures that use electronic ballasts for (1) transient protection, (2) thermal management, and (3) 120 V auxiliary power functionality. 79 FR 7781. These costs varied based on whether the fixture application was indoor, indoor industrial, or outdoor.

Fixtures with electronic ballasts that are used in outdoor or indoor industrial applications must be able to withstand 10 kilovolt voltage transients. Therefore, in the 2014 MHLF final rule, DOE included the high-volume cost of a voltage transient protection device which it determined to be $10.31. 79 FR 7781. In this analysis, based on market research, DOE determined the price of voltage transient protection to be $9.03. DOE added $9.03 to the empty fixture MPC for outdoor and indoor industrial fixtures at efficiency levels requiring an electronic ballast.

Compared to magnetic ballasts, electronic ballasts are more vulnerable to high ambient temperatures, which can cause premature ballast failure. Hence, in the 2014 MHLF final rule, DOE included the cost of thermal management and determined it to be a 20 percent increase in MPC based on manufacturer feedback and teardown analysis. 79 FR 7782. In this analysis, DOE determined that the 20 percent increase in the empty fixture cost for thermal management in mental halide fixtures containing electronic ballasts remains valid. Therefore, DOE applied a 20 percent increase to the empty fixture MPC at efficiency levels requiring an electronic ballast.

As discussed in the 2014 MHLF final rule, indoor applications may require a 120 V auxiliary tap used to operate emergency lighting, which can be easily incorporated into a magnetic ballast but requires additional design for an electronic ballast. 79 FR 7782. In the 2014 MHLF final rule, DOE included the cost of an auxiliary tap, determining that auxiliary taps cost about $7.50 but because the tap is needed in only 10 percent of the ballasts in indoor fixtures DOE applied a cost of $0.75. *Id.* In this determination, DOE conducted market research and found the average market price of the 120 V auxiliary tap to be $7.38. Similarly, because the auxiliary tap is needed in only 10 percent of the ballasts in indoor fixtures, DOE added $0.74 to the indoor empty fixture MPC for efficiency levels requiring an electronic ballast.

The manufacturer markup converts MPC to MSP. For this analysis, DOE maintained the manufacturer markup developed in the 2014 MHLF final rule. In that rule, DOE determined the fixture manufacturer markup to be 1.58 based on financial information from manufacturers' SEC 10–K reports, as well as feedback from manufacturer interviews. 79 FR 7783. Hence, in this analysis, DOE applied the fixture manufacturer markup of 1.58 to the empty fixture MPC to determine the MSP of the fixture at each efficiency level.

b. Ballasts

To determine the MPCs of the metal halide ballasts identified in this analysis, DOE used data from the teardown analysis which included cost data for magnetic ballasts at the baseline in each equipment class. To determine the ballast MPC at the higher efficiency levels, DOE developed a ratio between the average retail price of ballasts at the efficiency level under consideration and ballasts at the baseline. DOE collected retail prices from electrical distributors (*e.g.,* Grainger, Graybar) as well as internet retailers to determine average retail prices for ballasts. For efficiency levels without retail prices available, DOE used a ratio between the same efficiency levels in a different wattage class or interpolated based on efficiency and ballast MPC.

The manufacturer markup converts MPC to MSP. For this analysis, DOE maintained the manufacturer markup developed in the 2014 MHLF final rule. In that rule, DOE determined the ballast manufacturer markup to be 1.47 based on financial information from manufacturers' SEC 10–K reports, as well as feedback from manufacturer interviews. 79 FR 7783. Hence, in this analysis, DOE applied the ballast manufacturer markup of 1.47 to the ballast MPC to determine the MSP of replacement ballasts at each efficiency level. If the ballast was sold within a new fixture, DOE applied the ballast manufacturer markup of 1.47 and the fixture manufacturer markup of 1.58 to the ballast MPC.

The total empty fixture MSPs, replacement ballast MSPs, and fixture with ballast MSPs are detailed the NOPD TSD. DOE requests comment on the methodology and resulting MSPs developed for all equipment classes.

D. Markups Analysis

The markups analysis develops appropriate markups (*e.g.,* retailer markups, distributor markups, contractor markups) in the distribution chain and sales taxes to convert the MSP estimates derived in the engineering analysis to customer prices, which are then used in the LCC and PBP analysis. At each step in the distribution channel, companies mark up the price of the product to cover business costs and profit margin. DOE used the same distribution channels and markups as in the 2014 MHLF final rule.

1. Distribution Channels

Before it could develop markups, DOE needed to identify distribution channels (*i.e.,* how the equipment is distributed from the manufacturer to the end-user) for the MHLF designs addressed in this rulemaking. 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 end-user. In a contractor distribution channel, DOE assumed the fixture manufacturer sells the fixture directly to a contractor, who sells it to the end-user. In a utility distribution channel, DOE assumed the fixture manufacturer sells the fixture directly to the end-user (*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.

2. Estimation of Markups

To estimate wholesaler and utility markups, DOE used financial data from 10–K reports of publicly owned electrical wholesalers and utilities. DOE's markup analysis developed both baseline and incremental markups to transform the fixture MSP into an end-user equipment price. DOE used the baseline markups to determine the price of baseline designs. Incremental markups are coefficients that relate the change in the MSP of higher-efficiency designs to the change in the wholesaler and utility sales prices, excluding sales tax. These markups refer to higher-efficiency designs sold under market conditions with new and amended energy conservation standards.

In the 2014 MHLF final rule, DOE 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 end-user. 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 end-user yielding an overall markup of 1.21 for this channel. 79 FR 7783. DOE used these same markups for this NOPD analysis.

The sales tax represents state and local sales taxes applied to the end-user equipment price. DOE obtained state and local tax data from the Sales Tax Clearinghouse.[24] These data represent weighted averages that include state, county, and city rates. DOE then calculated population-weighted average tax values for each census division and large state, and then derived U.S. average tax values using a population-weighted average of the census division and large state values. For this NOPD, this approach provided a national average tax rate of 7.2 percent.

3. Summary of Markups

Table IV.15 summarizes the markups at each stage in the distribution channels and the overall baseline and incremental markups, and sales taxes, for each of the three identified channels.

TABLE IV.15—SUMMARY OF FIXTURE DISTRIBUTION CHANNEL MARKUPS

	Wholesaler distribution		Utility distribution			
			Via wholesaler and contractor		Direct to end user	
	Baseline	Incremental	Baseline	Incremental	Baseline	Incremental
Electrical Wholesaler (Distributor)	1.23	1.05	N/A	N/A	N/A	N/A
Utility	N/A	N/A	1.00	1.00	1.00	1.00
Contractor or Installer	1.13	1.13	1.13	1.13	N/A	N/A
Sales Tax	1.07		1.07		1.07	
Overall	1.49	1.27	1.21	1.21	1.07	1.07

Using these markups, DOE generated fixture end-user prices for each EL it considered, assuming that each level represents a new minimum efficiency standard. Chapter 6 of the NOPD TSD provides details on DOE's development of markups for MHLFs. DOE welcomes any relevant data and comments on the markups analysis methodology.

E. Energy Use Analysis

The purpose of the energy use analysis is to determine the annual energy consumption of MHLFs at different efficiencies in the commercial, industrial, and outdoor stationary sectors, and to assess the energy savings potential of increased MHLF efficiency. The energy use analysis estimates the range of energy use of MHLFs in the field (*i.e.,* as they are actually used by customers). The energy use analysis provides the basis for other analyses DOE performed, particularly assessments of the energy savings and the savings in operating costs that could result from adoption of amended or new standards.

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'').[25] 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, consistent with the methodology from the 2014 MHLF final rule.[26]

All comments received in response to the July 2019 RFI regarding the methodology to develop annual operating hours and energy use from the 2014 MHLF final rule were supportive, and DOE has continued to use the same methodology in this NOPD (with updated inputs as appropriate). (NEMA, No. 3 at pp. 7–8) Chapter 7 of the NOPD TSD provides details on DOE's energy use analysis for MHLFs. DOE welcomes any relevant data and comments on the energy use analysis methodology.

F. Life-Cycle Cost and Payback Period Analysis

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

- The LCC is the total customer expense of equipment over the life of that equipment, consisting of total installed cost (manufacturer selling price, distribution chain markups, sales tax, and installation costs) plus operating costs (expenses for energy use, maintenance, and repair). To compute the operating costs, DOE discounts

[24] Sales Tax Clearinghouse, Inc. *The Sales Tax Clearinghouse.* (Last accessed December 5, 2019.) *https://thestc.com/STRates.stm.*

[25] Navigant Consulting, Inc. *2015 U.S. Lighting Market Characterization.* 2017. U.S. Department of Energy: Washington, DC Report No. DOE/EE–1719. (Last accessed December 5, 2019.) *https://energy.gov/eere/ssl/downloads/2015-us-lighting-market-characterization.*

[26] U.S. Department of Energy—Office of Energy Efficiency and Renewable Energy. Technical Support Document: Energy Conservation Program for Consumer Products and Certain Commercial and Industrial Equipment: Metal Halide Lamp Fixtures. January 2014. Washington, DC (Last accessed December 5, 2019.) *https://www.regulations.gov/document?D=EERE-2009-BT-STD-0018-0069.*

future operating costs to the time of purchase and sums them over the lifetime of the equipment.

• The PBP is the estimated amount of time (in years) it takes customers to recover the increased purchase cost (including installation) of a more-efficient equipment 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 measured the change in LCC relative to the LCC in the no-new-standards case, which reflects the estimated efficiency distribution of MHLFs 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 equipment.

For each considered efficiency level in each equipment class, DOE calculated the LCC and PBP for a nationally representative set of building types. As stated previously, DOE developed customer samples from the 2015 LMC. For each sample customer, DOE determined the energy consumption for the MHLF and the appropriate electricity price. By developing a representative sample of building types, the analysis captured the variability in energy consumption and energy prices associated with the use of MHLFs.

Inputs to the calculation of total installed cost include the cost of the equipment—which includes MPCs, manufacturer markups, retailer and distributor markups, and sales taxes—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy prices and price projections, repair and maintenance costs, equipment lifetimes, and discount rates. DOE created distributions of values for operating hours, equipment lifetime, discount rates, electricity prices, and sales taxes, with probabilities attached to each value, to account for their uncertainty and variability. For example, DOE created a probability distribution of annual energy consumption in its energy use analysis, based in part on a range of annual operating hours. The operating hour distributions capture variations across building types, lighting applications, and metal halide systems for three sectors (commercial, industrial, and outdoor stationary). In contrast, fixture MSPs were specific to the representative designs evaluated in DOE's engineering analysis, and price markups were based on limited, publicly available financial data. Consequently, DOE used discrete values instead of distributions for these inputs.

The computer model DOE uses to calculate the LCC and PBP, which incorporates Crystal Ball™ (a commercially available software program), 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 MHLF user samples. The model calculated the LCC and PBP for equipment at each efficiency level for 10,000 customers 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 and PBP calculation reveals that a consumer is not impacted by the standard level. By accounting for consumers who already purchase more-efficient products, DOE avoids overstating the potential benefits from increasing product efficiency.

DOE calculated the LCC and PBP for all customers of MHLFs as if each were to purchase new equipment in the expected year of required compliance with new or amended standards. Any amended standards would apply to MHLFs manufactured three years after the date on which any new or amended standard is published. (42 U.S.C. 6295(hh)(3)(B)) At this time, DOE estimates publication of a final rule in the latter half of 2021. Therefore, for purposes of its analysis, DOE used 2025 as the first year of compliance with any amended standards for MHLFs.

Table IV.16 summarizes the approach and data DOE used to derive inputs to the LCC and PBP calculations. The subsections that follow provide further discussion. Details of the spreadsheet model, and of all the inputs to the LCC and PBP analyses, are contained in chapter 8 of the NOPD TSD and its appendices.

TABLE IV.16—SUMMARY OF INPUTS AND METHODS FOR THE LCC AND PBP ANALYSIS*

Inputs	Source/method
Equipment Cost	Derived by multiplying MSPs by distribution channel markups (taken from the 2014 MHLF final rule) and sales tax.
Installation Costs	Used the same installation costs as in the 2014 MHLF final rule, but inflated to 2018$. The 2014 MHLF final rule costs were calculated using estimated labor times and applicable labor rates from "RS Means Electrical Cost Data" (2013), Sweets Electrical Cost Guide 2013, and the U.S. Bureau of Labor Statistics.
Annual Energy Use	The total annual energy use multiplied by the operating hours per year, which were determined separately for indoor and outdoor fixtures. Average number of hours based on the 2015 LMC.
Energy Prices	Electricity: Based on Edison Electric Institute data for 2018. Variability: Regional energy prices determined for 13 census divisions and large states.
Energy Price Trends	Based on *AEO 2019* price projections.
Replacement Costs	Used the same labor and material costs for lamp and ballast replacements as in the 2014 MHLF final rule, but inflated to 2018$.
Equipment Lifetime	Used the same lifetimes as in the 2014 MHLF final rule. Ballasts: Assumed an average of 50,000 hours for magnetic ballasts and 40,000 hours for electronic ballasts. Fixtures: Assumed an average of 20 years for indoor fixtures and 25 years for outdoor fixtures.
Discount Rates	Developed a distribution of discount rates for the commercial, industrial, and outdoor stationary sectors.
Compliance Date	2025.

* References for the data sources mentioned in this table are provided in the sections following the table or in chapter 8 of the NOPD TSD.

1. Equipment Cost

To calculate customer 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. See section IV.D for further details.

2. Installation Cost

Installation cost is the cost to install the fixture such as the labor, overhead, and any miscellaneous materials and parts needed. DOE used the installation costs from the 2014 MHLF final rule but inflated to 2018$.

3. Annual Energy Consumption

For each sampled customer, DOE determined the energy consumption for an MHLF at different efficiency levels using the approach described previously in section IV.E of this document. For this NOPD, DOE based the annual energy use inputs on sectoral operating hour distributions (commercial, industrial, and outdoor stationary sectors), with the exception of a discrete value (approximately 770 hours per year) for the 1,500 W equipment class that is primarily limited to sports lighting. DOE used operating hour (and, by extension, energy use) distributions to better characterize the potential range of operating conditions faced by MHLF customers.

4. Energy Prices

DOE derived average and marginal annual commercial and industrial electricity prices for 13 regions (9 Census Divisions and 4 large states) using 2018 data from Edison Electric Institute.[27]

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 2019 (AEO 2019).*[28] *AEO 2019* has an end year of 2050. To estimate price trends after 2050, DOE used the compound annual growth rate of change in prices between 2035 and 2050.

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. The costs are taken from the 2014 MHLF final rule but inflated to 2018$. 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.

6. Equipment Lifetime

DOE defined equipment lifetime as the age when a fixture, ballast, or lamp is retired from service. 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 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. All assumptions for estimating equipment lifetime are taken from the 2014 MHLF final rule. 79 FR 7787.

7. Discount Rates

The discount rate is the rate at which future expenditures are discounted to estimate their present value. In this NOPD, 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.[29] The average discount rates, weighted by the shares of each rate value in the sectoral distributions, are 8.3 percent for commercial end-users, 8.8 percent for industrial end-users, and 3.2 percent for outdoor stationary end-users. For more information regarding discount rates, see chapter 8 of the NOPD TSD.

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

DOE developed a no-new-standards case efficiency distribution using model count data from the compliance certification database collected on October 10, 2019. 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 on MHLF catalog data. The complete efficiency distribution for 2025 is shown in Table IV.17.

TABLE IV.17—MHLF EFFICIENCY DISTRIBUTION BY EQUIPMENT CLASS FOR 2025

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	83.1	88.1	73.6	87.6	99.5	56.0
1	0.3	6.0	18.9	0.3	0.5	44.0
2	9.2	0.0	7.5	12.2		
3	7.4	5.9				

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

[27] Edison Electric Institute. *Typical Bills and Average Rates Report.* Winter 2017, Summer 2017: Washington, DC.

[28] U.S. Energy Information Administration. *Annual Energy Outlook 2019 with Projections to 2050.* 2019. Washington, DC Report No. AEO2019. (Last accessed May 13, 2019.) *https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf.*

[29] 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.*

9. Payback Period Analysis

The payback period is the amount of time it takes the customer 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 customer 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 determined 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.

DOE welcomes any relevant data and comments on the life-cycle cost and payback period analysis methodology.

G. Shipments Analysis

DOE uses projections of annual equipment shipments to calculate the national impacts of potential amended or new energy conservation standards on energy use and NPV.[30] The shipments model takes an accounting approach, tracking market shares of each equipment class and the vintage of units in the stock. Stock accounting uses equipment shipments as inputs to estimate the age distribution of in-service equipment stocks for all years. The age distribution of in-service equipment 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.

The stock turnover model calculates demand for new MHLFs based on the expected demand for replacement MHLFs and the decrease in MHLF demand due to the adoption of out-of-scope LED alternatives. The model is initialized using a time series of historical shipments data compiled from the 2014 MHLF final rule and data from NEMA. The historical shipments for 2008 from the 2014 MHLF final rule were projected to 2018 using NEMA sales indices from 2008 to 2018. 79 FR 7788–7789.

NEMA commented in response to the July 2019 RFI that out-of-scope LED alternatives are now the preferred technology for traditional MHLF customers. (NEMA, No. 3 at pp. 2–3) DOE assumed an increasing fraction of the MHLF market will move to out-of-scope LED alternatives over the course of the shipments analysis period. DOE modelled the incursion of LED equipment in the form of a Bass diffusion curve.[31] The parameters for the Bass diffusion curve are based on fitting a Bass diffusion curve to market share data for general service LED lamps based on data published by NEMA. This same approach was used in the final determination for general service incandescent lamps; see chapter 9 of the final determination TSD.[32] 84 FR 71626, 71658 (December 27, 2019).

DOE apportioned the total shipments of MHLFs to each EL in the no-new-standards case using data downloaded from the compliance certification database[33] and data provided by NEMA in comments to the July 2019 RFI. (NEMA, No. 3 at pp.11–14). Equipment listed in the CCMS database were categorized by equipment class, efficiency level, and ballast type. The counts for each category were scaled based on ballast type by the NEMA market shares for magnetic and electronic ballasts reported in 2018.

For the standards cases, DOE used a ''roll-up'' approach to estimate market share for each EL for the year that standards are assumed to become effective (2025). For each standards case, the market shares of ELs in the no-new-standards case that do not meet the standard under consideration ''roll up'' to meet the new standard level, and the market share of equipment above the standard remains unchanged.

For both the no-new-standards and standards cases, DOE assumed no efficiency trend over the analysis period. For a given case, market shares were held fixed to their 2025 distribution.

DOE typically includes the impact of price learning in its analysis. In a standard price learning model,[34] the price of a given technology is related to its cumulative production, as represented by total cumulative shipments. In response to the July 2019 RFI, NEMA indicated that MHLFs are a mature technology and are no longer a preferred technology. (NEMA, No. 3 at p. 2) DOE assumed MHLFs have reached a stable price point due to the high volume of total cumulative shipments and would not undergo price learning in this NOPD analysis. DOE welcomes any relevant data and comments on the shipments analysis methodology.

H. National Impact Analysis

The NIA assesses the NES and the NPV from a national perspective of total customer costs and savings that would be expected to result from new or amended standards at specific efficiency levels.[35] DOE calculates the NES and NPV for the potential standard levels considered based on projections of annual equipment shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses. For the present analysis, DOE projected the energy savings, operating cost savings, equipment costs, and NPV of customer benefits over the lifetime of MHLFs sold from 2025 through 2054.

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 customer 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 adopted new or amended standards at specific energy efficiency levels (*i.e.,* the TSLs or standards cases) for that class. For the standards cases, DOE considers

[30] 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.

[31] Bass, F.M. A New Product Growth Model for Consumer Durables. *Management Science.* 1969. 15(5): pp. 215–227.

[32] Chapter 9 of the GSIL final determination TSD is available at *https://www.regulations.gov/document?D=EERE-2019-BT-STD-0022-0116*

[33] See *https://www.regulations.doe.gov/certification-data/products.html* (Last accessed on January 21, 2020).

[34] Taylor, M. and S.K. Fujita. *Accounting for Technological Change in Regulatory Impact Analyses: The Learning Curve Technique.* 2013. Lawrence Berkeley National Laboratory: Berkeley, CA. Report No. LBNL–6195E. (Last accessed January 7, 2020.) *https://eta.lbl.gov/publications/accounting-technological-change.*

[35] The NIA accounts for impacts in the 50 states and U.S. territories.

how a given standard would likely affect the market shares of equipment with efficiencies greater than the standard.

DOE uses a spreadsheet model to calculate the energy savings and the national customer costs and savings from each TSL. 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.18 summarizes the inputs and methods DOE used for the NIA analysis for this NOPD. Discussion of these inputs and methods follows the table. See chapter 10 of the NOPD TSD for further details.

TABLE IV.18—SUMMARY OF INPUTS AND METHODS FOR THE NATIONAL IMPACT ANALYSIS

Inputs	Method
Shipments	Annual shipments from shipments model for each considered TSL.
First Full Year of Standard Compliance	2025.
No-new-standards Case Efficiency Trend	No trend assumed.
Standards Case Efficiency Trend	No trend assumed.
Annual Energy Consumption per Unit	Calculated for each efficiency level based on inputs from the energy use analysis.
Total Installed Cost per Unit	MHLF prices and installation costs from the LCC analysis.
Repair and Maintenance Cost per Unit	Cost to replace lamp and ballast over the lifetime of the fixture.
Residual Value per Unit	The monetary value of remaining lamp and ballast lifetime at the end of the fixture lifetime.
Electricity Prices	Estimated marginal electricity prices from the LCC analysis.
Electricity Price Trends	*AEO 2019* forecasts (to 2050) and extrapolation thereafter.
Energy Site-to-Primary and FFC Conversion	A time-series conversion factor based on *AEO 2019.*
Discount Rate	3 percent and 7 percent.
Present Year	2020.

1. National Energy Savings

The NES analysis involves a comparison of national energy consumption of the considered equipment between each potential TSL and the case with no new or amended energy conservation standards. DOE calculated the national energy consumption by multiplying the number of units (stock) of each equipment type (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 standard 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 2019.* Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

DOE generally accounts for the direct rebound effect in its NES analyses. Direct rebound reflects the idea that as appliances become more efficient, customers use more of their service because their operating cost is reduced. In the case of lighting, the rebound effect could be manifested in increased hours of use or in increased lighting density (lumens per square foot). In response to the July 2019 RFI, NEMA commented that a rebound rate of 0 is appropriate. (NEMA, No. 3 at p. 9) DOE assumed no rebound effect for MHLFs in this NOPD.

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 to the extent that emissions analyses are conducted. 76 FR 51281 (Aug. 18, 2011). After evaluating the approaches discussed in the August 18, 2011 proposal, DOE published a statement of amended policy in which DOE explained its determination that Energy Information Administration's (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 (Aug. 17, 2012). NEMS is a public domain, multi-sector, partial equilibrium model of the U.S. energy sector [36] 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 NOPD TSD.

2. Net Present Value Analysis

The inputs for determining the NPV of the total costs and benefits experienced by customers 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. 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 equipment shipped during the analysis period.

Energy cost savings, which are part of operating cost savings, 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 national marginal electricity prices by the forecast of annual national-average commercial or industrial electricity price changes in the Reference case from *AEO 2019,* which has an end year of 2050. To estimate price trends after 2050, DOE used the average annual rate of change in prices from 2041 to 2050.

DOE includes the cost of replacing failed lamps and ballasts over the course of the lifetime of the fixture. DOE assumed that lamps and ballasts were replaced at their rated lifetime. When replacing a ballast, DOE assumed the lamp was also replaced at the same time, independent of the timing of the previous lamp replacement. For more details see chapter 10 of the NOPD TSD.

DOE also estimates the residual monetary value remaining in the lamp and ballast at the end of the fixture lifetime and applies it as a credit to

[36] For more information on NEMS, refer to *The National Energy Modeling System: An Overview 2009,* DOE/EIA–0581(2009), October 2009. Available at *http://www.eia.gov/forecasts/aeo/index.cfm.*

operating costs (*i.e.,* the residual value is deducted from operating costs). See chapter 10 of the NOPD TSD for more details on DOE's calculation of the residual value.

In calculating the NPV, DOE multiplies the net savings in future years by a discount factor to determine their present value. For this NOPD, DOE estimated the NPV of customer 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.[37] 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 customer'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.

V. Analytical Results and Conclusions

The following section addresses the results from DOE's analyses with respect to the considered energy conservation standards for MHLFs. It addresses the ELs examined by DOE and the projected impacts of each of these levels. Additional details regarding DOE's analyses are contained in the NOPD TSD.

A. Trial Standard Levels

DOE analyzed the benefits and burdens of three TSLs for MHLFs. TSL 1 is composed of EL 1 for all equipment classes. TSL 2 is composed of the efficiency levels corresponding to the least efficient electronic ballast level for each equipment class, if any efficiency levels corresponding to an electronic ballast exist. TSL 3 is composed of the max-tech level for each equipment class. Table V.1 presents the TSLs and the corresponding efficiency levels that DOE has identified for potential amended energy conservation standards for MHLFs.

TABLE V.1—TRIAL STANDARD LEVELS FOR MHLFS

	≥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
TSL 0	0	0	0	0	0	0
TSL 1	1	1	1	1	1	1
TSL 2	2	2	2	2	1	1
TSL 3	3	3	2	2	1	1

B. Economic Impacts on Individual Customers

DOE analyzed the cost effectiveness (*i.e.,* any savings in operating costs compared to any increase in purchase price likely to result from the imposition of a standard) by considering the LCC and PBP. These analyses are discussed in the following sections.

1. Life-Cycle Cost and Payback Period

In general, higher efficiency equipment affects consumers in two ways: (1) Purchase price increases and (2) annual operating costs decrease.[38] 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, and replacement costs). The LCC calculation also uses product lifetime and a discount rate. Chapter 8 of the NOPD TSD provides detailed information on the LCC and PBP analyses.

Table V.2 through Table V.13 show the LCC and PBP results for the ELs and TSLs considered for each equipment class, with indoor and outdoor installations aggregated together using equipment shipments in the analysis period start year (2025). Results for each equipment class are shown in two tables. In the first table, the simple payback is measured relative to the baseline product. For ELs having a higher first year's operating cost than that of the baseline, the payback period is ''Never,'' because the additional installed cost relative to the baseline is not recouped. In the second table, impacts are measured relative to the efficiency distribution in the no-new-standards case in the compliance year (see section IV.F.8 of this document). Because some customers 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 TSL. The savings refer only to customers who are affected by a standard at a given TSL. Those who already purchase equipment with efficiency at or above a given TSL are not affected. Customers for whom the LCC increases at a given TSL experience a net cost.

TABLE V.2—AVERAGE LCC AND PBP RESULTS FOR THE ≥50 W AND ≤100 W EQUIPMENT CLASS

Efficiency level	Average costs (2018$)				Simple payback (years)	Average fixture lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	835.94	123.58	1,534.59	2,370.53	....	24.1
1	848.48	123.51	1,532.13	2,380.61	182.0	24.1
2	878.81	124.20	1,549.40	2,428.21	Never	24.1

[37] United States Office of Management and Budget. *Circular A–4: Regulatory Analysis.* September 17, 2003. Section E. Available at *http://www.whitehouse.gov/omb/memoranda/m03-21.html.*

[38] While it is generally true that higher-efficiency equipment has lower operating costs, MHLF operating costs in this analysis also incorporate the costs of lamp and ballast replacements. Due to these replacement costs, higher operating costs can be experienced at efficiency levels above the baseline.

TABLE V.2—AVERAGE LCC AND PBP RESULTS FOR THE ≥50 W AND ≤100 W EQUIPMENT CLASS—Continued

Efficiency level	Average costs (2018$)				Simple payback (years)	Average fixture lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
3	895.39	123.51	1,538.46	2,433.85	893.2	24.1

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

TABLE V.3—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR THE ≥50 W AND ≤100 W EQUIPMENT CLASS

TSL	Efficiency level	Life-cycle cost savings	
		Average LCC savings* (2018$)	Percent of consumers that experience net cost
1	1	(10.09)	83.2
2	2	(57.39)	62.7
3	3	(57.38)	72.1

* The savings represent the average LCC for affected consumers.

TABLE V.4—AVERAGE LCC AND PBP RESULTS FOR THE >100 W AND <150 W EQUIPMENT CLASS

Efficiency level	Average costs (2018$)				Simple payback (years)	Average fixture lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	803.46	146.31	1,702.74	2,506.20		23.5
1	817.04	145.35	1,690.07	2,507.11	14.2	23.5
2	853.41	143.65	1,678.31	2,531.72	18.8	23.5
3	970.98	147.00	1,706.26	2,677.25	Never	23.5

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

TABLE V.5—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR THE >100 W AND <150 W EQUIPMENT CLASS

TSL	Efficiency level	Life-cycle cost savings	
		Average LCC savings* (2018$)	Percent of consumers that experience net cost
1	1	(0.87)	57.4
2	2	(25.22)	50.4
3	3	(170.66)	90.7

* The savings represent the average LCC for affected consumers.

TABLE V.6—AVERAGE LCC AND PBP RESULTS FOR THE ≥150 W AND ≤250 W EQUIPMENT CLASS

Efficiency level	Average costs (2018$)				Simple payback (years)	Average fixture lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	963.46	181.07	2,089.02	3,052.48		23.5
1	988.66	180.75	2,082.57	3,071.23	79.4	23.5
2	1,149.72	184.26	2,123.00	3,272.71	Never	23.5

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

TABLE V.7—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR THE ≥150 W AND ≤250 W EQUIPMENT CLASS

TSL	Efficiency level	Life-cycle cost savings	
		Average LCC savings* (2018$)	Percent of consumers that experience net cost
1	1	(18.70)	73.4
2	2	(216.24)	90.9
3	2	(216.24)	90.9

*The savings represent the average LCC for affected consumers.

TABLE V.8—AVERAGE LCC AND PBP RESULTS FOR THE >250 W AND ≤500 W EQUIPMENT CLASS

Efficiency level	Average costs (2018$)				Simple payback (years)	Average fixture lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	1,098.78	237.28	2,713.41	3,812.19		23.5
1	1,122.58	237.08	2,708.49	3,831.07	121.8	23.5
2	1,376.47	245.60	2,800.48	4,176.95	Never	23.5

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

TABLE V.9—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR THE >250 W AND ≤500 W EQUIPMENT CLASS

TSL	Efficiency level	Life-cycle cost savings	
		Average LCC savings* (2018$)	Percent of consumers that experience net cost
1	1	(18.87)	86.9
2	2	(364.30)	87.2
3	2	(364.30)	87.2

*The savings represent the average LCC for affected consumers.

TABLE V.10—AVERAGE LCC AND PBP RESULTS FOR THE >500 W AND ≤1000 W EQUIPMENT CLASS

Efficiency level	Average costs (2018$)				Simple payback (years)	Average fixture lifetime (years)
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	1,305.39	555.06	6,526.50	7,831.89		23.7
1	1,336.23	554.15	6,512.29	7,848.52	33.6	23.7

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

TABLE V.11—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR THE >500 W AND ≤1000 W EQUIPMENT CLASS

TSL	Efficiency level	Life-cycle cost savings	
		Average LCC savings* (2018$)	Percent of consumers that experience net cost
1	1	(16.64)	93.3
2	1	(16.64)	93.3
3	1	(16.64)	93.3

*The savings represent the average LCC for affected consumers.

TABLE V.12—AVERAGE LCC AND PBP RESULTS FOR THE >1000 W AND ≤2000 W EQUIPMENT CLASS

Efficiency level	Average costs (2018$)				Simple payback years	Average fixture lifetime years
	Installed cost	First year's operating cost	Lifetime operating cost	LCC		
0	1,392.61	179.13	2,145.92	3,538.52	0.0	23.7
1	1,423.31	177.41	2,124.97	3,548.28	17.9	23.7

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

TABLE V.13—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR THE >1000 W AND ≤2000 W EQUIPMENT CLASS

TSL	Efficiency level	Life-cycle cost savings	
		Average LCC savings* (2018$)	Percent of consumers that experience net cost
1	1	(9.80)	48.0
2	1	(9.80)	48.0
3	1	(9.80)	48.0

*The savings represent the average LCC for affected consumers.

2. Rebuttable Presumption Payback

As discussed in section IV.F.9 of this document, EPCA establishes a rebuttable presumption that an energy conservation standard is economically justified if the increased purchase cost for equipment that meets the standard is less than three times the value of the first-year energy savings resulting from the standard. In calculating a rebuttable presumption payback period for each of the considered ELs, DOE used discrete values, and, as required by EPCA, based the energy use calculation on the DOE test procedure for MHLFs. In contrast, the PBPs presented in section V.B.1 of this document were calculated using distributions that reflect the range of energy use in the field. See chapter 8 of the NOPD TSD for more information on the rebuttable presumption payback analysis.

C. National Impact Analysis

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

1. Significance of Energy Savings

To estimate the energy savings attributable to potential amended standards for MHLFs, DOE compared the energy consumption under the no-new-standards case to the anticipated energy consumption under each TSL. The savings are measured over the entire lifetime of equipment purchased in the 30-year period that begins in the year of anticipated compliance with amended standards (2025–2054). Table V.14 presents DOE's projections of the national energy savings for each TSL considered for MHLFs. The savings were calculated using the approach described in section IV.H.1 of this document.

TABLE V.14—CUMULATIVE NATIONAL ENERGY SAVINGS FOR MHLFS; 30 YEARS OF SHIPMENTS

[2025–2054]

	Equipment class	Trial standard level		
		1	2	3
Site Energy Savings (quads)	≥50 W and ≤100 W	0.000006	0.00004	0.00006
	>100 W and <150 W	0.000005	0.00002	0.00003
	≥150 W and ≤250 W	0.00001	0.00007	0.00007
	>250 W and ≤500 W	0.00001	0.0001	0.0001
	>500 W and ≤1000 W	0.00001	0.00001	0.00001
	>1000 W and ≤2000 W	0.0000003	0.0000003	0.0000003
	Total*	0.00005	0.0002	0.0003
Primary Energy Savings (quads)	≥50 W and ≤100 W	0.00002	0.0001	0.0002
	>100 W and <150 W	0.00001	0.00007	0.00008
	≥150 W and ≤250 W	0.00003	0.0002	0.0002
	>250 W and ≤500 W	0.00004	0.0003	0.0003
	>500 W and ≤1000 W	0.00003	0.00003	0.00003
	>1000 W and ≤2000 W	0.0000007	0.0000007	0.0000007
	Total*	0.0001	0.0007	0.0007
FFC Energy Savings (quads)	≥50 W and ≤100 W	0.00002	0.0001	0.0002
	>100 W and <150 W	0.00001	0.00007	0.00009
	≥150 W and ≤250 W	0.00003	0.0002	0.0002

TABLE V.14—CUMULATIVE NATIONAL ENERGY SAVINGS FOR MHLFS; 30 YEARS OF SHIPMENTS—Continued
[2025–2054]

	Equipment class	Trial standard level		
		1	2	3
	>250 W and ≤500 W	0.00004	0.0003	0.0003
	>500 W and ≤1000 W	0.00003	0.00003	0.00003
	>1000 W and ≤2000 W	0.0000008	0.0000008	0.0000008
	Total *	0.0001	0.0007	0.0008

* Total may not equal sum due to rounding.

OMB Circular A–4 [39] 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 rulemaking, DOE undertook a sensitivity analysis using 9 years, rather than 30 years, of equipment shipments. The choice of a 9-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.[40] The review timeframe established in EPCA is generally not synchronized with the equipment lifetime, equipment manufacturing cycles, or other factors specific to MHLFs. 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 9-year analytical period are presented in Table V.15 of this document. The impacts are counted over the lifetime of MHLFs purchased in 2025–2033.

TABLE V.15—CUMULATIVE NATIONAL ENERGY SAVINGS FOR MHLFS; 9 YEARS OF SHIPMENTS
[2025–2033]

	Equipment class	Trial standard level		
		1	2	3
Site Energy Savings (quads)	≥50 W and ≤100 W	0.000006	0.00004	0.00006
	>100 W and <150 W	0.000005	0.00002	0.00003
	≥150 W and ≤250 W	0.00001	0.00007	0.00007
	>250 W and ≤500 W	0.00001	0.0001	0.0001
	>500 W and ≤1000 W	0.00001	0.00001	0.00001
	>1000 W and ≤2000 W	0.0000003	0.0000003	0.0000003
	Total *	0.00005	0.0002	0.0003
Primary Energy Savings (quads)	≥50 W and ≤100 W	0.00002	0.0001	0.0002
	>100 W and <150 W	0.00001	0.00007	0.00008
	≥150 W and ≤250 W	0.00003	0.0002	0.0002
	>250 W and ≤500 W	0.00004	0.0003	0.0003
	>500 W and ≤1000 W	0.00003	0.00003	0.00003
	>1000 W and ≤2000 W	0.0000007	0.0000007	0.0000007
	Total *	0.0001	0.0007	0.0007
FFC Energy Savings (quads)	≥50 W and ≤100 W	0.00002	0.0001	0.0002
	>100 W and <150 W	0.00001	0.00007	0.00009
	≥150 W and ≤250 W	0.00003	0.0002	0.0002
	>250 W and ≤500 W	0.00004	0.0003	0.0003
	>500 W and ≤1000 W	0.00003	0.00003	0.00003
	>1000 W and ≤2000 W	0.0000008	0.0000008	0.0000008
	Total *	0.0001	0.0007	0.0008

* Total may not equal sum due to rounding.

The NES results for the 30-years and 9-years of shipments presented in Table V.15 and Table V.16, respectively, are nearly identical due to the significant shift to out-of-scope LED equipment that occurs over the course of the analysis period. DOE projects that MHLF shipments drop by more than 99 percent in 2030 relative to shipments in 2019 due to the incursion of out-of-scope LED equipment.

[39] U.S. Office of Management and Budget. *Circular A–4: Regulatory Analysis.* September 17, 2003. *http://www.whitehouse.gov/omb/circulars_a004_a-4/.*

[40] Section 325(m) of EPCA requires DOE to review its standards at least once every 6 years, and requires, for certain products, a 3-year period after any new standard is promulgated before compliance is required, except that in no case may any new standards be required within 6 years of the compliance date of the previous standards. While adding a 6-year review to the 3-year compliance period adds up to 9 years, DOE notes that it may undertake reviews at any time within the 6 year period and that the 3-year compliance date may yield to the 6-year backstop. A 9-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 5 years rather than 3 years.

2. Net Present Value of Customer Costs and Benefits

DOE estimated the cumulative NPV of the total costs and savings for customers that would result from the TSLs considered for MHLFs. In accordance with OMB's guidelines on regulatory analysis,[41] DOE calculated NPV using both a 7-percent and a 3-percent real discount rate. Table V.16 shows the customer NPV results with impacts counted over the lifetime of equipment purchased in 2025–2054.

TABLE V.16—CUMULATIVE NET PRESENT VALUE OF CUSTOMER BENEFITS FOR MHLFS; 30 YEARS OF SHIPMENTS

[2025–2054]

	Equipment class	Trial standard level		
		1	2	3
3 percent (millions 2018$)	≥50 W and ≤100 W	−0.13	−2.08	−2.11
	>100 W and <150 W	0.012	−0.49	−1.19
	≥150 W and ≤250 W	−0.19	−4.57	−4.57
	>250 W and ≤500 W	−0.29	−3.33	−3.33
	>500 W and ≤1000 W	−0.077	−0.077	−0.077
	>1000 W and ≤2000 W	0.00026	0.00026	0.00026
	Total*	−0.68	−10.54	−11.29
7 percent (millions 2018$)	≥50 W and ≤100 W	−0.10	−1.14	−1.20
	>100 W and <150 W	−0.0022	−0.28	−0.76
	≥150 W and ≤250 W	−0.15	−2.83	−2.83
	>250 W and ≤500 W	−0.22	−2.83	−2.83
	>500 W and ≤1000 W	−0.071	−0.071	−0.071
	>1000 W and ≤2000 W	−0.0010	−0.0010	−0.0010
	Total*	−0.54	−7.16	−7.70

*Total may not equal sum due to rounding.

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.17 of this document. The impacts are counted over the lifetime of equipment purchased in 2025–2033. 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.17—CUMULATIVE NET PRESENT VALUE OF CUSTOMER BENEFITS FOR MHLFS; 9 YEARS OF SHIPMENTS

[2025–2033]

	Equipment class	Trial standard level		
		1	2	3
3 percent (millions 2018$)	≥50 W and ≤100 W	−0.13	−2.07	−2.11
	>100 W and <150 W	0.012	−0.48	−1.19
	≥150 W and ≤250 W	−0.19	−4.56	−4.56
	>250 W and ≤500 W	−0.29	−3.32	−3.32
	>500 W and ≤1000 W	−0.077	−0.077	−0.077
	>1000 W and ≤2000 W	0.00026	0.00026	0.00026
	Total*	−0.68	−10.52	−11.26
7 percent (millions 2018$)	≥50 W and ≤100 W	−0.10	−1.14	−1.20
	>100 W and <150 W	0.00	−0.28	−0.76
	≥150 W and ≤250 W	−0.15	−2.83	−2.83
	>250 W and ≤500 W	−0.22	−2.83	−2.83
	>500 W and ≤1000 W	−0.071	−0.071	−0.071
	>1000 W and ≤2000 W	−0.00095	−0.00095	−0.00095
	Total*	−0.54	−7.15	−7.68

*Total may not equal sum due to rounding.

The NPV results for the 30-years and 9-years of shipments presented in Table V.16 and Table V.17, respectively, are nearly identical due to the significant shift to out-of-scope LED equipment that occurs over the course of the analysis period. The previous results reflect DOE's assumption of no price trend over the analysis period (see section IV.G).

D. Proposed Determination

When considering amended energy conservation standards, the standards that DOE adopts for any type (or class) of covered equipment must be designed to achieve the maximum improvement in energy efficiency that the Secretary determines is technologically feasible and economically justified. (42 U.S.C.

[41] U.S. Office of Management and Budget. *Circular A–4: Regulatory Analysis.* September 17, 2003. *http://www.whitehouse.gov/omb/circulars_a004_a-4/.*

6295(o)(2)(A)) In determining whether a standard is economically justified, the Secretary must determine whether the benefits of the standard exceed its burdens by, to the greatest extent practicable, considering the seven statutory factors discussed previously. (42 U.S.C. 6295(o)(2)(B)(i)) The new or amended standard must also result in significant conservation of energy. (42 U.S.C. 6295(o)(3)(B))

For this NOPD, DOE considered the impacts of amended standards for MHLFs at analyzed TSLs, beginning with the maximum technologically feasible level, to determine whether that level would result in a significant conservation of energy. DOE also considered whether that level was economically justified. Where the max-tech level was not economically justified, DOE then considered the next most efficient level and undertook the same evaluation.

Because an analysis of potential energy savings and economic justification first requires an evaluation of the relevant technology, in the following sections DOE first discusses the technological feasibility of amended standards. DOE then addresses the energy savings and economic justification associated with potential amended standards.

1. Technological Feasibility

EPCA mandates that DOE consider whether amended energy conservation standards for MHLFs would be technologically feasible. (42 U.S.C. 6295(o)(2)(A) and (3)(B)) DOE has tentatively determined that there are technology options that would improve the efficiency of ballasts contained within MHLFs. These technology options are being used in commercially available MHLFs and therefore are technologically feasible. (See section IV.B.4 for further information.) Hence, DOE has tentatively determined that amended energy conservation standards for MHLFs are technologically feasible.

2. Significant Conservation of Energy

EPCA also mandates that DOE consider whether amended energy conservation standards for MHLF would result in significant energy savings. (42 U.S.C. 6295(o)(3)(B)) On February 14, 2020 DOE issued a final rule that defined a significant energy savings threshold (''Process Rule''). 85 FR 8626. The Process Rule establishes a two-step process for determining the significance of energy savings using an absolute and percentage threshold. Section 6 of the Process Rule. DOE first evaluates whether standards at the max-tech level would result in a minimum site-energy savings of 0.3 quads over a 30-year period. Section 6(b)(2) of the Process Rule. If the 0.3 quad threshold is not met, DOE then evaluates whether energy savings at the max-tech level represent at least 10 percent of the total energy usage of the covered equipment over a 30-year period. Section 6(b)(3) of the Process Rule. If the percentage threshold is not met, DOE proposes to determine that no significant energy savings would likely result from setting amended standards. Section 6(b)(4) of the Process Rule.

In this analysis, DOE estimates that amended standards for MHLFs would result in site energy savings of 0.0003 quads at max-tech levels over a 30-year analysis period (2025–2054). (See results in Table V.14.) Because the site energy savings do not meet the 0.3 quads threshold set forth in Section 6(b)(2) of the Process Rule, DOE compared the max-tech savings to the total energy usage to calculate a percentage reduction in energy usage. This comparison yielded a reduction in site energy use of 3.6 percent over a 30-year period. Because the reduction in site energy use is less than 10 percent as set forth in Section 6(b)(3) and (4) of the Process Rule, DOE determined that amended standards for metal halide lamp fixtures would not result in significant energy savings.

3. Economic Justification

In determining whether a standard is economically justified, the Secretary must determine whether the benefits of the standard exceed its burdens, considering to the greatest extent practicable the seven statutory factors discussed previously. (42 U.S.C. 6295(o)(2)(B)(i)) One of those seven factors is the savings in operating costs throughout the estimated average life of the covered equipment in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses for the covered equipment that are likely to result from the standard. This factor is assessed using the life cycle cost and payback period analysis, discussed in section IV.F, and the national net present value, discussed in section IV.H.2 of this document.

At TSL 3, TSL 2, and TSL 1 the average LCC savings are negative for all equipment classes (see section V.B.1 of this document). The NPV benefits at these TSLs are also negative for all equipment classes at the 3-percent and 7-percent discount rates except for the >1000 W and ≤2000 W equipment class which has positive NPV of $0.00026 million at the 3-percent discount rate (see section V.C.2 of this document). Additionally, the simple payback periods are much higher than the average fixture lifetime with the exception of the >100 W and <150 W equipment class at EL 1 and EL 2 and for the >1000 W and ≤2000 W equipment class at EL 1.

Based on these negative LCC and predominantly negative NPV (*i.e.,* the second EPCA factor of savings in operating costs), DOE has tentatively determined that any potential positive impact of the other statutory factors would not outweigh the increased costs to consumers. Hence DOE has tentatively determined that amended standards at the TSLs under consideration are not economically justified.

4. Summary

In this proposed determination, DOE has tentatively determined that amended standards for MHLF would not result in significant conservation of energy or be economically justified. Hence, DOE's initial determination is to not amend standards for MHLFs. DOE requests comments on its initial determination that energy conservation standards should not be amended for MHLFs.

VI. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

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

B. Review Under Executive Orders 13771 and 13777

On January 30, 2017, the President issued E.O. 13771, ''Reducing Regulation and Controlling Regulatory Costs.'' 82 FR 9339 (Feb. 3, 2017). E.O. 13771 stated the policy of the executive branch is to be prudent and financially responsible in the expenditure of funds, from both public and private sources. E.O. 13771 stated it is essential to manage the costs associated with the governmental imposition of private expenditures required to comply with Federal regulations.

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

(i) Eliminate jobs, or inhibit job creation;

(ii) Are outdated, unnecessary, or ineffective;

(iii) Impose costs that exceed benefits;

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

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

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

DOE initially concludes that this proposed determination is consistent with the directives set forth in these executive orders.

As discussed in this document, DOE is proposing to not amend energy conservation standards for MHLFs. Therefore, if finalized as proposed, this determination is expected to be an E.O. 13771 other action.

C. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis (''IRFA'') 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 (Aug. 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website (*http://energy.gov/gc/office-general-counsel*).

DOE reviewed this proposed determination under the provisions of the Regulatory Flexibility Act and the policies and procedures published on February 19, 2003. Because DOE is not proposing to amend standards for MHLFs, if finalized, the determination would not amend any energy conservation standards. On the basis of the foregoing, DOE certifies that the proposed determination, if finalized, would have no significant economic impact on a substantial number of small entities. Accordingly, DOE has not prepared an IRFA for this proposed determination. DOE will transmit this certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

D. Review Under the National Environmental Policy Act

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

E. Review Under Executive Order 13132

E.O. 13132, ''Federalism,'' 64 FR 43255 (Aug. 10, 1999), imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE has examined this proposed determination and has tentatively 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 proposed rule. 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,'' imposes on Federal agencies the general duty to adhere to the following requirements: (1) Eliminate drafting errors and ambiguity, (2) write regulations to minimize litigation, (3) provide a clear legal standard for affected conduct rather than a general standard, and (4) promote simplification and burden reduction. 61 FR 4729 (Feb. 7, 1996). Regarding the review required by section 3(a), section 3(b) of 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 Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this proposed determination meets the relevant standards of 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 proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a 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 *http://energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf.*

This proposed determination does not contain a Federal intergovernmental mandate, nor is it expected to require expenditures of $100 million or more in any one year by the private sector. As a result, the analytical requirements of UMRA do not apply.

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 rule that may affect family well-being. This proposed determination would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

Pursuant to E.O. 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 53 FR 8859 (Mar. 15, 1988), DOE has determined that this proposed determination would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

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). DOE has reviewed this NOPD 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 Executive Order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy, or (3) is designated by the Administrator of OIRA as a significant energy action. For any proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

Because this proposed determination does not propose amended energy conservation standards for MHLFs, it is not a significant energy action, nor has it been designated as such by the Administrator at OIRA. Accordingly, DOE has not prepared a Statement of Energy Effects.

L. Information Quality

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 report describing that peer review.[42] 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. DOE has determined that the peer-reviewed analytical process continues to reflect current practice, and the Department followed that process for developing energy conservation standards in the case of the present action.

VII. Public Participation

A. Participation in the Webinar

The time and date of the webinar are listed in the **DATES** section at the beginning of this document. If no participants register for the webinar then it will be cancelled. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website: *https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=14.* Participants are responsible for ensuring their systems are compatible with the webinar software.

Additionally, you may request an in-person meeting to be held prior to the close of the request period provided in the **DATES** section of this document. Requests for an in-person meeting may be made by contacting Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *Appliance_Standards_Public_Meetings@ee.doe.gov.*

B. Submission of Comments

DOE will accept comments, data, and information regarding this proposed determination no later than the date provided in the **DATES** section at the

[42] ''Energy Conservation Standards Rulemaking Peer Review Report.'' 2007. Available at *http://energy.gov/eere/buildings/downloads/energy-conservation-standards-rulemaking-peer-review-report-0.*

beginning of this proposed determination. Interested parties may submit comments, data, and other information using any of the methods described in the **ADDRESSES** section at the beginning of this document.

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

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

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

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

Submitting comments via email, hand delivery/courier, or postal mail. Comments and documents submitted via email, hand delivery/courier, or postal mail also will be posted to *http://www.regulations.gov.* If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. With this instruction followed, 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, that are written in English, and that are free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

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

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

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

C. Issues on Which DOE Seeks Comment

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

(1) DOE requests comment on the ELs under consideration for the equipment classes, including the max-tech levels. See section IV.C.4 and IV.C.6 of this document.

(2) DOE requests comment on the methodology and resulting MSPs developed for all equipment classes. See section IV.C.7 of this document.

(3) DOE welcomes any relevant data and comments on the markups analysis methodology. See section IV.D.3 of this document.

(4) DOE welcomes any relevant data and comments on the life-cycle cost and payback period analysis methodology. See section IV.F of this document.

(5) DOE welcomes any relevant data and comments on the shipments analysis methodology. See section IV.G of this document.

(6) DOE requests comments on its initial determination that energy conservation standards should not be adopted for MHLFs. See section V.D.4 of this document.

VIII. Approval of the Office of the Secretary

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

Signing Authority

This document of the Department of Energy was signed on June 30, 2020, by Daniel R Simmons, Assistant Secretary, Office 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 July 1, 2020.

Treena V. Garrett,

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

[FR Doc. 2020–14540 Filed 8–4–20; 8:45 am]

BILLING CODE 6450–01–P