This document, concerning Battery Chargers is an action issued by the Department of Energy. Though it is not intended or expected, should any discrepancy occur between the document posted here and the document published in the Federal Register, the Federal Register publication controls. This document is being made available through the Internet solely as a means to facilitate the public's access to this document.

[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 430

[EERE-2020-BT-STD-0013]

RIN 1904-AE50

Energy Conservation Program: Energy Conservation Standards for Battery Chargers

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

ACTION: Notice of proposed rulemaking and announcement of public meeting.

SUMMARY: The Energy Policy and Conservation Act, as amended ("EPCA"), prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including battery chargers. EPCA also requires the U.S. Department of Energy ("DOE" or "Department") to periodically determine whether more-stringent, standards would be technologically feasible and economically justified, and would result in significant energy savings. In this notice of proposed rulemaking ("NOPR"), DOE proposes amended energy conservation standards for battery chargers, and also announces a public meeting to receive comment on these proposed standards and associated analyses and results.

DATES: *Meeting*: DOE will hold a public meeting via webinar on Thursday, April 27, 2023, from 1:00 p.m. to 4:00 p.m. See section VII, "Public Participation," for webinar registration information, participant instructions, and information about the capabilities available to webinar participants.

Comments: DOE will accept comments, data, and information regarding this NOPR no later than [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***].

Comments regarding the likely competitive impact of the proposed standard should be sent to the Department of Justice contact listed in the **ADDRESSES** section on or before [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***].

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov,* under docket number EERE–2020–BT–STD-0013. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2020–BT–STD-0013, by any of the following methods:

Email: batterychargers2020STD0013@ee.doe.gov. Include the docket number EERE-2020-BT-STD-0013 in the subject line of the message.

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

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

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

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

The docket web page can be found at *www.regulations.gov/docket/EERE-2020-BT-STD-0013* . The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section VII of this document for information on how to submit comments through *www.regulations.gov*.

EPCA requires the Attorney General to provide DOE a written determination of whether the proposed standard is likely to lessen competition. The U.S. Department of Justice Antitrust Division invites input from market participants and other interested persons with views on the likely competitive impact of the proposed standard. Interested persons may contact the Division at *energy.standards@usdoj.gov* on or before the date specified in the **DATES** section. Please indicate in the "Subject" line of your email the title and Docket Number of this proposed rulemaking.

FOR FURTHER INFORMATION CONTACT:

Mr. Jeremy Dommu, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-2J, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Email: *ApplianceStandardsQuestions@ee.doe.gov*.

Ms. Melanie Lampton, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (240) 751-5157. Email: Melanie.Lampton@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 Rule

The Energy Policy and Conservation Act, Pub. L. 94-163, as amended ("EPCA"), [1] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles. (42 U.S.C. 6291-6309) These products include battery chargers, the subject of this rulemaking.

Pursuant to EPCA, any new or amended energy conservation standard must be designed to achieve the maximum improvement in energy efficiency that DOE determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) Furthermore, the new or amended standard must result in a significant conservation of energy. (42 U.S.C. 6295(o)(3)(B)) EPCA also provides that not later than 6 years after 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 notice of proposed rulemaking including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6295(m))

In accordance with these and other statutory provisions discussed in this document, DOE proposes new multi-metric energy conservation standards for battery chargers. The proposed standards, which are expressed in max active charge energy and max standby and off modes power values, are shown in Table I.1. These proposed standards, if adopted, would apply to all battery chargers listed in Table I.1 manufactured

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

in, or imported into, the United States starting on the date 2 years after the publication of the final rule for this rulemaking.

Table I.1 Proposed Energy Conservation Standards for Battery Chargers

<table>
<tr><th>Product Class</th><th>Battery Energy
E_{batt} (Wh)</th><th>Active Mode Energy
E_a (Wh)</th><th>Standby Mode Power
P_{sb}* (W)</th><th>Off Mode Power
P_{off} (W)</th></tr>
<tr><td>1a
Fixed-Location Wireless</td><td>≤100</td><td>1.718*Ebatt + 8.5</td><td>1.5</td><td>0</td></tr>
<tr><td>1b
Open-Placement Wireless</td><td>N/A</td><td>N/A</td><td>0.8 (P_{nb} only)</td><td>0</td></tr>
<tr><td>2a
Low-Energy</td><td>≤100</td><td>1.222*Ebatt + 4.980</td><td rowspan="3">0.00098*Ebatt + 0.4</td><td rowspan="3">0</td></tr>
<tr><td>2b
Medium-Energy</td><td>100–1000</td><td>1.367*Ebatt + -9.560</td></tr>
<tr><td>2c
High-Energy</td><td>>1000</td><td>1.323*Ebatt + 34.361</td></tr>
</table>

*Standby mode power is the sum of no-battery mode power and maintenance mode power, unless noted otherwise.

A. Benefits and Costs to Consumers

Table I.2 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of battery chargers, as measured by the average life-cycle cost ("LCC") savings and the simple payback period ("PBP").[2] The average LCC savings are positive or nearly zero for all product classes and the PBP is similar to or less than the average lifetime of battery chargers, which is estimated to range from 3.0 to 10.0 years (see section IV.F of this document).

[2] The average LCC savings refer to consumers that are affected by a standard and are measured relative to the efficiency distribution in the no-new-standards case, which depicts the market in the compliance year in the absence of new or amended standards (see section IV.F.6 of this document). The simple PBP, which is designed to compare specific efficiency levels, is measured relative to the baseline product (see section IV.C of this document).

Table I.2 Impacts of Proposed Energy Conservation Standards on Consumers of Battery Chargers

Battery Charger Product Class	Average LCC Savings *2021$*	Simple Payback Period *years*
Fixed-Location Wireless Chargers	-$0.03	3.8
Open-Placement Wireless Chargers	$0.12	4.1
Low-Energy Wired Chargers	$0.13	4.0
Medium-Energy Wired Chargers	$1.55	4.4
High-Energy Wired Chargers	$14.32	1.5

DOE's analysis of the impacts of the proposed standards on consumers is described in section IV.F of this document.

B. Impact on Manufacturers

The industry net present value ("INPV") is the sum of the discounted cash flows to the industry from the base year through the end of the analysis period (2023–2056). Using a real discount rate of 9.1 percent, DOE estimates that the INPV for manufacturers of battery charger applications in the case without amended standards is $78.9 billion in 2021$. Under the proposed standards, the change in INPV is estimated to range from 4.6 percent to -0.3 percent, which is approximately -$3,659 million to -$214 million. To bring products into compliance with amended standards, it is estimated that the industry would incur total conversion costs of $398.2 million.

DOE's analysis of the impacts of the proposed standards on manufacturers is described in section IV.J of this document. The analytic results of the manufacturer impact analysis ("MIA") are presented in section V.B.2.

C. National Benefits and Costs[3]

DOE's analyses indicate that the proposed energy conservation standards for battery chargers would save a significant amount of energy. Relative to the case without amended standards, the lifetime energy savings for battery chargers purchased in the 30-year period that begins in the anticipated year of compliance with the amended standards (2027-2056) amount to 1.2 quadrillion British thermal units ("Btu"), or quads.[4] This represents a savings of 17.6 percent relative to the energy use of these products in the case without amended standards (referred to as the "no-new-standards case").

The cumulative net present value ("NPV") of total consumer benefits of the proposed standards for battery chargers ranges from $3.7 billion (at a 7-percent discount rate) to $7.5 billion (at a 3-percent discount rate). This NPV expresses the estimated total value of future operating-cost savings minus the estimated increased product costs for battery chargers purchased in 2027-2056.

In addition, the proposed standards for battery chargers are projected to yield significant environmental benefits. DOE estimates that the proposed standards would result in cumulative emission reductions (over the same period as for energy savings) of 40 million metric tons ("Mt")[5] of carbon dioxide ("CO_2"), 272 thousand tons of methane

[3] All monetary values in this document are expressed in 2023 dollars.
[4] The quantity refers to full-fuel-cycle ("FFC") energy savings. FFC energy savings 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 efficiency standards. For more information on the FFC metric, see section IV.H.1 of this document.
[5] A metric ton is equivalent to 1.1 short tons. Results for emissions other than CO_2 are presented in short tons.

(“CH_4”), 0.42 thousand tons of nitrous oxide (“N_2O”), 18 thousand tons of sulfur dioxide (“SO_2”), 62 thousand tons of nitrogen oxides (“NO_X”), and 0.11 tons of mercury (“Hg”).[6]

DOE estimates the value of climate benefits from a reduction in greenhouse gases (GHG) using four different estimates of the social cost of CO_2 (“SC-CO_2”), the social cost of methane (“SC-CH_4”), and the social cost of nitrous oxide (“SC-N_2O”). Together these represent the social cost of GHG (SC-GHG). [7] DOE used interim SC-GHG values developed by an Interagency Working Group on the Social Cost of Greenhouse Gases (IWG).[8] The derivation of these values is discussed in section IV.L. of this document. For presentational purposes, the climate benefits associated with the average SC-GHG at a 3-percent discount rate are estimated to be $2.1 billion. DOE does not have a single central SC-GHG point estimate and it emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates.

---

[6] DOE calculated emissions reductions relative to the no-new-standards case, which reflects key assumptions in the *Annual Energy Outlook 2022* (“*AEO2022”*). *AEO2022* represents current federal and state legislation and final implementation of regulations as of the time of its preparation. See section IV.K of this document for further discussion of *AEO2022* assumptions that effect air pollutant emissions.

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

[8] See Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide. Interim Estimates Under Executive Order 13990, Washington, D.C., February 2021 (“February 2021 SC-GHG TSD”*). www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.*

DOE estimated the monetary health benefits of SO_2 and NO_X emissions reductions using benefit per ton estimates from the scientific literature, as discussed in section IV.L. of this document. DOE estimated the present value of the health benefits would be $1.8 billion using a 7-percent discount rate, and $3.8 billion using a 3-percent discount rate.[9] DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions.

Table I.3 summarizes the economic benefits and costs expected to result from the proposed standards for battery chargers. There are other important unquantified effects, including certain unquantified climate benefits, unquantified public health benefits from the reduction of toxic air pollutants and other emissions, unquantified energy security benefits, and distributional effects, among others.

[9] DOE estimates the economic value of these emissions reductions resulting from the considered TSLs for the purpose of complying with the requirements of Executive Order 12866.

Table I.3 Summary of Economic Benefits and Costs of Proposed Energy Conservation Standards for Battery Chargers (TSL 2)

	Billion $2021
3% discount rate	
Consumer Operating Cost Savings	9.0
Climate Benefits*	2.1
Health Benefits**	3.8
Total Benefits†	15.0
Consumer Incremental Product Costs	1.4
Net Benefits	13.5
7% discount rate	
Consumer Operating Cost Savings	4.6
Climate Benefits* (3% discount rate)	2.1
Health Benefits**	1.8
Total Benefits†	8.6
Consumer Incremental Product Costs	0.9
Net Benefits	7.7

Note: This table presents the costs and benefits associated with product name shipped in 2027-2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027-2056.
* Climate benefits are calculated using four different estimates of the social cost of carbon (SC-CO_2), methane (SC-CH_4), and nitrous oxide (SC-N_2O) (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate) (see section IV.L of this NOPR). Together these represent the global SC-GHG. For presentational purposes of this table, the climate benefits associated with the average SC-GHG at a 3 percent discount rate are shown, but DOE does not have a single central SC-GHG point estimate. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22-30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana v. Biden*, No. 21-cv-1074-JDC-KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from "adopting, employing, treating as binding, or relying upon" the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. As reflected in this proposed rule, DOE has reverted to its approach prior to the injunction and presents monetized benefits where appropriate and permissible under law.
** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. See section IV.L of this document for more details.
† Total and net benefits include those consumer, climate, and health benefits that can be quantified and monetized. For presentation purposes, total and net benefits for both the 3-percent and 7-percent cases are presented using the average SC-GHG with 3-percent discount rate, but DOE does not have a single central

SC-GHG point estimate. DOE emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates.

The benefits and costs of the proposed standards can also be expressed in terms of annualized values. The monetary values for the total annualized net benefits are (1) the reduced consumer operating costs, minus (2) the increase in product purchase prices and installation costs, plus (3) the value of climate and health benefits of emission reductions, all annualized.[10]

The national operating savings are domestic private U.S. consumer monetary savings that occur as a result of purchasing the covered products and are measured for the lifetime of battery chargers shipped in 2027-2056. The benefits associated with reduced emissions achieved as a result of the proposed standards are also calculated based on the lifetime of battery chargers shipped in 2027-2056. Total benefits for both the 3-percent and 7-percent cases are presented using the average GHG social costs with 3-percent discount rate. Estimates of SC-GHG values are presented for all four discount rates in section IV.L of this document.

Using a 7-percent discount rate for consumer benefits and costs and health benefits from reduced NOx and SO_2 emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated cost of the standards

[10] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2023, the year used for discounting the NPV of total consumer costs and savings. For the benefits, DOE calculated a present value associated with each year's shipments in the year in which the shipments occur (*e.g.*,2030), and then discounted the present value from each year to 2023. Using the present value, DOE then calculated the fixed annual payment over a 30-year period, starting in the compliance year, that yields the same present value.

proposed in this rule is $89 million per year in increased equipment costs, while the estimated annual benefits are $457 million in reduced equipment operating costs, $120 million in climate benefits, and $178 million in health benefits. In this case. The net benefit would amount to $665 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards is $81 million per year in increased equipment costs, while the estimated annual benefits are $500 million in reduced operating costs, $120 million in climate benefits, and $215 million in health benefits. In this case, the net benefit would amount to $754 million per year.

Table I.4 presents the total estimated monetized benefits and costs associated with the proposed standard, expressed in terms of annualized values. The results under the primary estimate are as follows.

Using a 7-percent discount rate for consumer benefits and costs and health benefits from reduced NOx and SO_2 emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated cost of the standards proposed in this rule is $89 million per year in increased equipment costs, while the estimated annual benefits are $457 million in reduced equipment operating costs, $120 million in climate benefits, and $178 million in health benefits. In this case. The net benefit would amount to $665 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards is $81 million per year in increased equipment costs, while the estimated annual benefits are $500 million in reduced operating costs, $120 million in climate benefits, and $215 million in health benefits. In this case, the net benefit would amount to $754 million per year.

Table I.4 Annualized Benefits and Costs of Proposed Energy Conservation Standards for Battery Chargers (TSL 2)

	Million 2021$/year		
	Primary Estimate	**Low-Net-Benefits Estimate**	**High-Net-Benefits Estimate**
3% discount rate			
Consumer Operating Cost Savings	500	487	516
Climate Benefits*	120	120	120
Health Benefits**	215	215	215
Total Benefits†	834	821	850
Consumer Incremental Product Costs	81	90	71
Net Benefits	754	731	779
7% discount rate			
Consumer Operating Cost Savings	457	447	469
Climate Benefits* (3% discount rate)	120	120	120
Health Benefits**	178	178	178
Total Benefits†	754	744	766
Consumer Incremental Product Costs	89	98	79
Net Benefits	665	646	687

Note: This table presents the costs and benefits associated with battery chargers shipped in 2027−2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027−2056. The Primary, Low Net Benefits, and High Net Benefits Estimates utilize projections of energy prices from the AEO2022 Reference case, Low Economic Growth case, and High Economic Growth case, respectively. In addition, incremental equipment costs reflect a medium decline rate in the Primary

Estimate, a low decline rate in the Low Net Benefits Estimate, and a high decline rate in the High Net Benefits Estimate. Note that the Benefits and Costs may not sum to the Net Benefits due to rounding.
* Climate benefits are calculated using four different estimates of the global SC-GHG (see section IV.L of this NOPR). For presentational purposes of this table, the climate benefits associated with the average SC-GHG at a 3 percent discount rate are shown, but the Department does not have a single central SC-GHG point estimate, and it emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22-30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana v. Biden*, No. 21-cv-1074-JDC-KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from "adopting, employing, treating as binding, or relying upon" the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. As reflected in this proposed rule, DOE has reverted to its approach prior to the injunction and presents monetized benefits where appropriate and permissible under law.
** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. See section IV.L of this document for more details.
† Total benefits for both the 3-percent and 7-percent cases are presented using the average SC-GHG with 3-percent discount rate, but the Department does not have a single central SC-GHG point estimate.

DOE's analysis of the national impacts of the proposed standards is described in sections IV.H, IV.K, and IV.L of this document.

D. Conclusion

DOE has tentatively concluded that the proposed standards represent the maximum improvement in energy efficiency that is technologically feasible and economically justified, and would result in the significant conservation of energy. Specifically, with regards to technological feasibility products achieving these standard levels are already commercially available for all product classes covered by this proposal. As for economic justification, DOE's analysis shows that the benefits of the proposed standard exceed, to a great extent, the burdens of the proposed standards.

Using a 7-percent discount rate for consumer benefits and costs and NOx and SO_2 reduction benefits, and a 3-percent discount rate case for GHG social costs, the estimated cost of the proposed standards for battery chargers is $89 million per year in increased battery charger costs, while the estimated annual benefits are $457 million in reduced battery charger operating costs, $120 million in climate benefits and $178 million in health benefits. The net benefit amounts to $665 million per year.

The significance of energy savings is evaluated by DOE on a case-by-case basis considering the specific circumstances surrounding a specific rulemaking. The standards are projected to result in estimated national energy savings of 1.2 quad FFC. DOE has initially determined the energy savings that would result from the proposed standard levels are "significant" within the meaning of 42 U.S.C. 6295(o)(3)(B). A more detailed discussion of the basis for these tentative conclusions is contained in the remainder of this document and the accompanying TSD.

DOE also considered more-stringent energy efficiency levels as potential standards, and is still considering them in this rulemaking. However, DOE has tentatively concluded that the potential burdens of the more-stringent energy efficiency levels would outweigh the projected benefits.

Based on consideration of the public comments DOE receives in response to this document and related information collected and analyzed during the course of this rulemaking effort, DOE may adopt energy efficiency levels presented in this document that are either higher or lower than the proposed standards, or some combination of level(s) that incorporate the proposed standards in part.

II. Introduction

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

A. Authority

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. These products include battery chargers, the subject of this document. (42 U.S.C. 6291(32); 42 U.S.C. 6292(a)(20)) EPCA directed DOE to issue a final rule that prescribes energy conservation standards for battery chargers or classes of battery charges or to determine that no energy conservation standard is technically feasible or economically justified. 42 U.S.C. 6295(u)(1)(E)(i)(II) 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))

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

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297(a)-(c)) DOE may, however, grant waivers of Federal preemption 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. (42 U.S.C. 6295(o)(3)(A) and 42 U.S.C. 6295(r)) Manufacturers of covered products must use the prescribed DOE test procedure as the basis for certifying to DOE that their 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 42 U.S.C. 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 battery chargers appear at title 10 of the Code of Federal Regulations ("CFR") part 430, subpart B, appendix Y and appendix Y1.

DOE must follow specific statutory criteria for prescribing new or amended standards for covered products, including battery chargers. 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 42 U.S.C. 6295(o)(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 battery chargers, 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 imposition of the standard;

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

(4) Any lessening of the utility or the performance of the covered products likely to result from the imposition of 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 imposition of 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))

Finally, pursuant to the amendments contained in the Energy Independence and Security Act of 2007 ("EISA 2007"), Pub. L. 110-140, any final rule for new or amended energy conservation standards promulgated after July 1, 2010, is required to address standby mode and off mode energy use. (42 U.S.C. 6295(gg)(3)) Specifically, when DOE adopts a standard for a covered product after that date, it must, if justified by the criteria for adoption of standards under EPCA (42 U.S.C. 6295(o)), incorporate standby mode and off mode energy use into a single standard, or, if that is not feasible, adopt a separate standard for such energy use for that product. (42 U.S.C. 6295(gg)(3)(A)-(B)) DOE's current test procedures for battery chargers address standby mode and off mode energy use. In this rulemaking, DOE intends to incorporate such energy use into any amended energy conservation standards that it may adopt.

B. Background

1. Current Standards

In a final rule published on June 13, 2016 ("June 2016 Final Rule"), DOE prescribed the current energy conservation standards for battery chargers manufactured on and after June 13, 2018. 81 FR 38266. These standards are set forth in DOE's regulations at 10 CFR 430.32(z) and are summarized in Table II.1.

Table II.1 Current Federal Energy Conservation Standards for Battery Chargers

Product Class	**Battery Charger Classification**	**Maximum Unit of Energy Consumption (UEC)*** *(kWh/year)*
1	Low-energy inductive battery chargers to be used in wet environment with associated battery energy of less than or equal to 5 watt-hours (Wh).	3.04
2	Low-energy, low-voltage battery chargers with associated battery energy of less than 100Wh, and battery voltage of less than 4 volts (V).	$0.1440 * E_{batt} + 2.95$
3	Low-energy, medium-voltage battery chargers with associated battery energy of less than 100Wh, and battery voltage of 4V to 10V.	For $E_{batt} < 10Wh$, 1.42; For $E_{batt} \geq 10Wh$, $0.0255 * E_{batt} + 1.16$
4	Low-energy, high-voltage battery chargers with associated battery energy of less than 100Wh, and battery voltage of more than 10V.	$0.11 * E_{batt} + 3.18$

5	Medium-energy, low-voltage battery chargers with associated battery energy of 100Wh to 3000Wh, and battery voltage of less than 20V.	$0.0257*E_{batt} + 0.815$
6	Medium-energy, high-voltage battery chargers with associated battery energy of 100Wh to 3000Wh, and battery voltage of higher than or equal to 20V.	$0.0778*E_{batt} + 2.4$
7	High-energy battery chargers with associated battery energy of more than 3000Wh.	$0.0502*E_{batt} + 4.53$

*Maximum UEC is expressed as a function of representative battery energy (E_{batt}).

2. History of Standards Rulemaking for Battery Chargers

On September 16, 2020, DOE published notice that it was initiating an early assessment review to determine whether any new or amended standards would satisfy the relevant requirements of EPCA for a new or amended energy conservation standard for battery chargers and a request for information ("RFI"). 85 FR 57787 ("September 2020 Early Assessment Review RFI"). Specifically, through the published notice and request for information, DOE sought data and information that could enable the agency to determine whether DOE should propose a "no new standard" determination because a more stringent standard: (1) would not result in a significant savings of energy; (2) is not technologically feasible; (3) is not economically justified; or (4) any combination of foregoing. *Id.*

Subsequently, DOE published a preliminary analysis on March 3, 2022 ("March 2022 Preliminary Analysis") to respond to comments pertaining to the September 2020 Early Assessment Review RFI, and presented preliminary engineering analyses based on a multi-metric approach that independently measures active mode, standby mode, and off mode energy use metrics. 87 FR 11990. DOE conducted in-depth technical analyses in the following areas: (1) engineering; (2) markups to determine product price; (3) energy use; (4) LCC" and "PBP"; and (5) national impacts. The preliminary TSD that presents the methodology and results of each of these analyses is available at *https://www.regulations.gov/docket/EERE-2020-BT-STD-0013*.

DOE received comments in response to the March 2022 Preliminary Analysis from the interested parties listed in Table II.X.

Table II.2 March 2022 Preliminary Analysis Written Comments

Commenter(s)	Abbreviation	Comment No. in the Docket	Commenter Type
UL Solutions	UL	11	Efficiency Organization
Northwest Energy Efficiency Alliance	NEEA	16	Efficiency Organization
Association of Home Appliance Manufacturers; Consumer Technology Association; Information Technology Industry Council; National Electrical Manufacturers Association; Outdoor Power Equipment Institute; Power Tool Institute	Joint Trade Associations	17	Trade Association
Pacific Gas and Electric Company; San Diego Gas & Electric Company; Southern California Edison	CA IOUs	18	Utility Association
Appliance Standards Awareness Project; American Council for an Energy-Efficiency Economy; Consumer Federation of America; New York State Energy Research and Development Authority	Joint Efficiency Advocates	19	Efficiency Organization
Delta-Q Technologies	Delta-Q	20	Manufacturer

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[11] To the extent that interested parties have provided written comments that are substantively consistent with any oral comments provided during the April 2022 public meeting, DOE cites the written

[11] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop energy conservation standards for battery chargers. (Docket NO. EERE-2020-BT-STD-0013, which is maintained at *www.regulations.gov*). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

comments throughout this document. Any oral comments provided during the webinar that are not substantively addressed by written comments are summarized and cited separately throughout this document.

3. Deviation from Appendix A

In accordance with section 3(a) of 10 CFR part 430, subpart C, appendix A ("appendix A"), DOE notes that it is deviating from the provision in appendix A regarding the NOPR stages for an energy conservation standards rulemaking. Section 6(f)(2) of appendix A specifies that the length of the public comment period for a NOPR will not be less than 75 calendar days. For this NOPR, DOE has opted to instead provide a 60-day comment period. DOE requested comment in the March 2022 Preliminary Analysis on the technical and economic analyses and provided stakeholders with a 60-day comment period. 87 FR 11990. DOE has relied on many of the same analytical assumptions and approaches as used in the preliminary assessment and has determined that a 60-day comment period in conjunction with the prior comment periods provides sufficient time for interested parties to review the proposed rule and develop comments.

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. General Comments

This section summarizes general comments received from interested parties regarding rulemaking timing and process.

In response to the March 2022 Preliminary Analysis, Joint Trade Associations commented that DOE's process for this rulemaking undermines the value of early stakeholder engagement because: 1) DOE developed the preliminary analysis based on a proposed test procedure rather than a finalized one; and 2) DOE has provided a shortened comment period on the preliminary analysis that overlaps with the comment period for the external power supply ("EPS") preliminary analysis as well as a preliminary analysis on amended standards for electric motors, both of which impact many of the same manufacturers as the ones for battery chargers. (Joint Trade Associations, No. 17 at pp. 2-3) The Joint Trade Associations further commented that the proposed test procedure has drawn serious concerns from several commenters, and it would be flawed without addressing opposing comments. The Joint Trade Associations also suggested that amended standards would not be justified regardless of whether the standards were analyzed using either the current test procedure or the recently finalized new test procedure in appendix Y1 and that, as a result, DOE should issue a notice of proposed determination not to amend battery charger standards. (Joint Trade Associations, No. 17 at p. 4)

DOE reiterates that the preliminary analysis was intended to provide stakeholders with an opportunity to comment on the various methodologies DOE intended to use in the NOPR. DOE again notes that the preliminary analysis results should not be relied upon to assess whether amended standards for battery chargers are justified. In addition, by conducting the March 2022 Preliminary Analysis with the proposed test procedure, DOE gave stakeholders an early preview of what the new multi-metric standards may potentially look like, allowing stakeholders enough time to review and comment on potential issues with DOE's approach and results. DOE notes that there were concerns and potential test burdens associated with the original proposed test procedure; however, these issues have been addressed in the test procedure final rule published in September 2022 ("September 2022 Test Procedure Final Rule"). 87 FR 55090. As such, unless otherwise noted, test results used in support of this NOPR were measured using the multi-metric test procedure as finalized in the September 2022 Test Procedure Final Rule. DOE further notes that because the finalized test procedure adopts the multi-metric approach, the current integrated UEC standards would no longer be applicable to test results under the new test procedure. As such, even if DOE were to hold the multi-metric standards at the same level as the current UEC standards, DOE would still need to amend the current standards to translate them to the multi-metric one. DOE understands that the Joint Trade Associations are concerned that amended standards might not be justified, based on results from the preliminary analysis. However, DOE has expanded its analysis further in the NOPR stage and has more robust results that indicate amended standards can result in significant conservation of energy. These results are further discussed in section V of this NOPR document.

With regards to a shortened comment period, DOE believes the 60-day comment period was sufficient for reviewing the methodologies and results presented. However, DOE did not receive any comment period extension requests from any stakeholder during the preliminary analysis comment period.

NEEA stated its general support for several aspects of the preliminary TSD, including the general framework and approach to battery charger efficiency metrics and standards levels, active candidate standard levels (CSLs) that are continuous across product class boundaries, the approach to translate current compliance certification data (CCD) to active mode by subtracting 5 hours of battery maintenance power from the total charge and maintenance energy measurement, and the technology neutral definition of wireless charging. (NEEA, No. 16 at p. 5) DOE appreciates NEEA's general support on these aspects of DOE's battery charger rulemaking.

B. Scope of Coverage

This NOPR covers those consumer products that meet the definition of "battery chargers," which are devices that charge batteries for consumer products, including battery chargers embedded in other consumer products. 10 CFR 430.2. (*See also* 42 U.S.C. 6291(32)) A battery charger may be wholly embedded in another consumer product, partially embedded in another consumer product, or wholly separate from another consumer product. Currently under the test procedure at appendix Y, only consumer wired chargers and wet environment wireless inductive chargers designed for battery energies of no more than 5 watt-hours are covered battery charger product classes.

In the September 2022 Test Procedure Final Rule, DOE expanded the battery charger test procedure coverage to cover all fixed-location wireless chargers in all modes of operation, and open-placement wireless chargers in no-battery mode only. 87 FR 55090, 55095-55098. As such, in this NOPR, DOE is proposing to expand the scope of battery energy conservation standards to cover these fixed-location and open-placement wireless chargers in separate product classes.

See section IV.A.1 of this document for discussion of the product classes analyzed in this NOPR.

C. Test Procedure

EPCA sets forth generally applicable criteria and procedures for DOE's adoption and amendment of test procedures. (42 U.S.C. 6293) Manufacturers of covered products must use these test procedures to certify to DOE that their product complies with energy conservation standards and to quantify the efficiency of their product. As stated, currently, only consumer wired chargers and wet environment wireless inductive chargers designed for batteries with energies of no more than 5 watt-hours are covered under the test procedure scope at 10 CFR part 430, subpart B, appendix Y. However, on September 8, 2022, DOE published a test procedure final rule that expanded the battery charger test procedure coverage to cover all fixed-location and open-placement wireless chargers, and adopted the multi-metric test procedure approach, where each mode of operation is independently regulated, thus making usage profiles no longer required. 87 FR 55090, 55092-55093. This new test procedure is in the separate appendix Y1, and manufacturers will be required to use results of testing under the new test procedure to determine compliance with amended energy conservation standards.

D. 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 products or 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 products or in working prototypes to be technologically feasible. Sections 6(b)(3)(i) and 7(b)(1) of appendix A to 10 CFR part 430 subpart C ("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 product utility or availability; (3) adverse impacts on health or safety, and (4) unique-pathway proprietary technologies. Sections 6(b)(3)(ii)-(v) and 7(b)(2)-(5) of the Process Rule. Section IV.B of this document discusses the results of the screening analysis for battery chargers, particularly the designs DOE considered, those it screened out, and those that are the basis for the standards considered in this rulemaking. For further details on the screening analysis for this rulemaking, see chapter 4 of the NOPR technical support document ("TSD").

2. Maximum Technologically Feasible Levels

When DOE proposes to adopt an amended standard for a type or class of covered product, it must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for such product. (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 battery chargers, using the design parameters for the most efficient products available on the market or in working prototypes. The max-tech levels that DOE determined for this rulemaking are described in section IV.C of this proposed rule and in chapter 5 of the NOPR TSD.

E. Energy Savings

1. Determination of Savings

For each trial standard level ("TSL"), DOE projected energy savings from application of the TSL to battery chargers purchased in the 30-year period that begins in the year of compliance with the proposed standards (2027–2056).[12] The savings are measured over the entire lifetime of battery chargers 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 national impact analysis ("NIA") spreadsheet model to estimate national energy savings ("NES") from potential amended or new standards for battery chargers. 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 products at the locations where they are used. For electricity, DOE reports national energy savings in terms of primary energy savings, which is the savings in the energy that

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

is used to generate and transmit the site electricity. For natural gas, the primary energy savings are considered to be equal to the site energy savings. DOE also calculates NES in terms of 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.[13] 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.

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 significance of energy savings offered by a new or amended energy conservation standard cannot be determined without knowledge of the specific circumstances surrounding a given rulemaking.[14] For example, some covered products and equipment have most of their energy consumption occur during periods of peak energy demand. The impacts of these products on the energy infrastructure can be more pronounced than products with relatively constant demand. In evaluating the significance of energy savings, DOE considers differences in primary energy and FFC effects for

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

different covered products and equipment when determining whether energy savings are significant. Primary energy and FFC effects include the energy consumed in electricity production (depending on load shape), in distribution and transmission, and in extracting, processing, and transporting primary fuels (i.e., coal, natural gas, petroleum fuels), and thus present a more complete picture of the impacts of energy conservation standards.

Accordingly, DOE evaluates the significance of energy savings on a case-by-case basis, taking into account the significance of cumulative FFC national energy savings, the cumulative FFC emissions reductions, and the need to confront the global climate crisis, among other factors. DOE has initially determined the energy savings from the proposed standard levels at TSL 2 are "significant" within the meaning of 42 U.S.C. 6295(o)(3)(B).

F. 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 an MIA, as discussed in section IV.J of this document. 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) INPV, 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 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.

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.E, 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)) Based on data available to DOE, the standards proposed in this document would not reduce the utility or performance of the products under consideration in this rulemaking.

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)) DOE will transmit a copy of this proposed rule to the Attorney General with a request that the Department of Justice ("DOJ") provide its determination on this issue. DOE will publish and respond to the Attorney General's determination in the final rule. DOE invites comment from the public regarding the competitive impacts that are likely to result from this proposed rule. In addition, stakeholders may also provide comments separately to DOJ regarding these potential impacts. See the ADDRESSES section for information to send comments to DOJ.

f. Need for National Energy Conservation

DOE also considers the need for national energy and water conservation in determining whether a new or amended standard is economically justified. (42 U.S.C. 6295(o)(2)(B)(i)(VI)) The energy savings from the proposed standards are likely to provide improvements to the security and reliability of the Nation's energy system. Reductions in the demand for electricity also may result in reduced costs for maintaining the reliability of the Nation's electricity system. DOE conducts a utility impact analysis to estimate how standards may affect the Nation's needed power generation capacity, as discussed in section IV.M.

DOE maintains that environmental and public health benefits associated with the more efficient use of energy are important to take into account when considering the need for national energy conservation. The proposed standards are likely to result in environmental benefits in the form of reduced emissions of air pollutants and GHGs associated with energy production and use. DOE conducts an emissions analysis to estimate how potential standards may affect these emissions, as discussed in section IV.K; the estimated emissions impacts are reported in section IV.L of this document.

DOE also estimates the economic value of emissions reductions resulting from the considered TSLs, as discussed in section IV.L.

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)) To the extent DOE identifies any relevant information regarding economic justification that does not fit into the other categories described previously, DOE could consider such information under "other factors."

2. Rebuttable Presumption

As set forth in 42 U.S.C. 6295(o)(2)(B)(iii), 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. 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 of this proposed rule.

IV. Methodology and Discussion of Related Comments

This section addresses the analyses DOE has performed for this rulemaking with regard to battery chargers. 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. DOE uses the third spreadsheet tool, the Government Regulatory Impact Model ("GRIM"), to assess manufacturer impacts of potential standards. These three spreadsheet tools are available on the DOE website for this rulemaking: *www.regulations.gov/document/EERE-Mar-BT-STD-0013*. Additionally, DOE used output from the latest version of the Energy Information Administration's ("EIA's") *Annual Energy Outlook* ("*AEO*"), a widely known energy projection for the United States, for the emissions and utility impact analyses.

A. Market and Technology Assessment

DOE develops information in the market and technology assessment that provides an overall picture of the market for the products concerned, including the purpose of the products, the industry structure, manufacturers, market characteristics, and technologies used in the products. This activity includes both quantitative and qualitative assessments, based primarily on publicly-available information. The subjects addressed in the market and technology assessment for this rulemaking include (1) a determination of the scope of the rulemaking and product classes, (2) manufacturers and industry structure, (3) existing efficiency programs, (4) shipments information, (5) market and industry trends; and (6) technologies or design options that could improve the energy efficiency of battery chargers. The key findings of DOE's market assessment are summarized in the following sections. See chapter 3 of the NOPR TSD for further discussion of the market and technology assessment.

1. Product Classes

When evaluating and establishing energy conservation standards, DOE may establish separate standards for a group of covered products (*i.e.*, establish a separate product class) if DOE determines that separate standards are justified based on the type of energy used, or if DOE determines that a product's capacity or other performance-related feature justifies a different standard. (42 U.S.C. 6295(q)) In making a determination whether a performance-related feature justifies a different standard, DOE must consider such factors as the utility of the feature to the consumer and other factors DOE determines are appropriate. (*Id.*)

DOE currently defines separate energy conservation standards for the following battery charger product classes (10 CFR 430.32(z)(1)):

Table IV.1 Current Battery Charger Product Classes

Product Class	Battery Charger Classification	Maximum UEC* (kWh/year)
1	Low-energy inductive battery chargers to be used in wet environment with associated battery energy of less than or equal to 5 watt-hours (Wh).	3.04
2	Low-energy, low-voltage battery chargers with associated battery energy of less than 100Wh, and battery voltage of less than 4 volts (V).	$0.1440*E_{batt} + 2.95$
3	Low-energy, medium-voltage battery chargers with associated battery energy of less than 100Wh, and battery voltage of 4V to 10V.	For $E_{batt} < 10Wh$, 1.42; For $E_{batt} \geq 10Wh$, $0.0255*E_{batt} + 1.16$
4	Low-energy, high-voltage battery chargers with associated battery energy of less than 100Wh, and battery voltage of more than 10V.	$0.11*E_{batt} + 3.18$
5	Medium-energy, low-voltage battery chargers with associated battery energy of 100Wh to 3000Wh, and battery voltage of less than 20V.	$0.0257*E_{batt} + 0.815$
6	Medium-energy, high-voltage battery chargers with associated battery energy of 100Wh to 3000Wh, and battery voltage of higher than or equal to 20V.	$0.0778*E_{batt} + 2.4$
7	High-energy battery chargers with associated battery energy of more than 3000Wh.	$0.0502*E_{batt} + 4.53$

*Maximum UEC is expressed as a function of representative battery energy (E_{batt}).

Battery chargers are devices that charge batteries for consumer products, including battery chargers embedded in other consumer products. 10 CFR 430.2. (*See also* 42 U.S.C. 6291(32)) A battery charger may be wholly embedded in another consumer product, partially embedded in another consumer product, or wholly separate from another consumer product. Under appendix Y, only consumer wired chargers and wet environment wireless inductive chargers designed for battery energies of no more than 5 watt-hours are covered battery charger product classes.

In the September 2022 Test Procedure Final Rule, DOE adopted the proposal to expand the battery charger test procedure scope to cover all both fixed-location wireless chargers and open-placement wireless chargers. 87 FR 55090, 55095-55098. DOE also adopted the proposal to establish new multi-metric test procedure for battery chargers. 87 FR 55090, 55100-55108.

DOE notes that in transitioning to the multi-metric approach where each mode of operation is independently regulated, usage profiles are no longer required. Currently established product classes help identify the particular set of usage profiles that must be applied to the UEC equation for a given battery charger model's UEC to be calculated. Without the need for usage profiles, however, the need to maintain currently established product classes is also greatly diminished. In light of this situation, along with the additional wireless battery charger test procedure coverage, DOE is proposing to remove the existing product classes and establish new ones as follows:

Table IV.2 Proposed Battery Charger Product Class Description

Product Class Number	**Product Class Description**	**Rated Battery Energy (Ebatt)**
1a	Fixed-Location Wireless Battery Chargers	≤100Wh
1b	Open-Placement Wireless Battery Chargers	All Battery Energies
2a	Low-energy Wired Battery Charger	0-100Wh
2b	Medium-energy Wired Battery Charger	100-1000Wh
2c	High-energy Wired Battery Charger	>1000Wh

As shown in Table IV.2, wired battery chargers are further divided into three sub-product classes representing chargers with associated battery energies that are either low-energy (0-100Wh), medium-energy (100-1000Wh), or high-energy (>1000Wh) such that equations representing potential standards for each of these sub-classes can be independently adjusted to accommodate the unique characteristics of chargers at each of these ranges and to achieve a desired pass rate. Similarly, wireless chargers are divided into fixed-location wireless charger and open-placement wireless charger because of the expanded test procedure scope.

The Joint Efficiency Advocates stated support for DOE's evaluation of both fixed-location and open-placement wireless chargers in the NOPR stage analysis because of the significant energy savings that could be achieved. The Joint Efficiency Advocates reiterated that wireless chargers are significantly less efficient than wired chargers, as stated from their response to the standards RFI published on September 16, 2020.[15] (Joint Efficiency Advocates, No. 19 at p. 2)

The CA IOUs and NEEA both supported DOE's development of standards for wireless chargers. (CA IOUs, No. 18 at pp.2-3; NEEA No. 16 at pp. 3-4) NEEA further commented that considering active mode and standby mode CSLs are appropriate for fixed-location wireless chargers and no battery mode only standards for open-placement wireless chargers are also appropriate at this time. (*Id.*) Both the CA IOUs and NEEA also encouraged DOE to further analyze the standards for wireless chargers with the CA

[15] The Joint Efficiency Advocates' response to the September 2020 RFI can be found at *https://www.regulations.gov/comment/EERE-2020-BT-STD-0013-0005*.

IOUs urging DOE to work with the industry to cover the active mode operation of open-placement wireless chargers as well.

DOE notes that DOE's battery charger standards are developed with the test procedure in mind. Although DOE adopted both active and standby modes test procedure for fixed-location wireless chargers, because of the intrinsic testing repeatability and representativeness issues, DOE did not prescribe an active mode test procedure for open-placement wireless chargers in the September 2022 Test Procedure Final Rule. As a result, DOE is also not considering active mode energy conservation standards for open-placement wireless chargers in this rulemaking.

An engineer from UL commented that a cross-class standard for multi-port and/or multi-voltage battery chargers should be developed because one of the battery charger products that they are testing cannot be classified with the current battery charger product classes, and the compliance certification management system (CCMS) reporting template also does not address such issue. (UL, No. 11 at pp. 1-2)

DOE notes that for multi-port and/or multi-voltage battery chargers, DOE's battery selection criteria in Table 3.2.1 from appendix Y and appendix Y1 clearly notes that all ports and battery or configuration of batteries with the highest individual voltage should be used for testing, and if multiple batteries meet the criteria, then the battery or configuration of batteries with the highest total nameplate charge capacity at the highest individual voltage should be used for testing. As such, the battery charger product class for such multi-port/multi-voltage battery would be based on the highest individual battery voltage, and the highest total battery charge capacity.

The CA IOUs stated that DOE should reconsider its decision not to include DC fast chargers (DCFCs) used to charge light-duty EVs and PHEVs in DOE's battery charger standards. The CA IOUs stated that the original decision to not regulate these products under battery charger rulemaking scope was because DOE stated that it lacks the authority to regulate automobiles as consumer products. However, the CA IOUs considered that DCFCs fall within the definition of covered products in that "a battery charger must charge batteries for consumer products," and that such DCFCs are consumer products used to charge other consumer products. The CA IOUs further commented that when EPCA passed in 1975, it could not have foreseen how excluding automobiles from consumer products could bar DOE from regulating DCFCs. Therefore, the CA IOUs recommended DOE to reconsider if DCFCs should fall within the scope of DOE's standards. (CA IOUs, No. 18 at pp. 3-5)

DOE reiterates that DOE's authority to regulate battery chargers is limited to battery chargers that charge batteries for consumer products. (42 U.S.C. 6291(32)) As defined by EPCA, "consumer products" explicitly excludes automobiles as that term is defined in 49 U.S.C. 32901(a)(3). (42 U.S.C 6291(1)) DOE has limited information on whether DCFCs are used to charge any consumer products other than automobiles. As such, DOE is not proposing standards for DCFCs at this time. However, considering the current trend towards electrification in many industries, DOE is interested in whether

DCFCs are used to charge other consumer products, including electric vehicles other than automobiles, such as electric motorcycles. Technology Options

For technology assessment, DOE identifies technology options that appear to be a feasible means of improving product efficiency. This assessment provides the technical background and structure on which DOE bases its screening and engineering analyses. The following discussion provides an overview of the salient aspects of the technology assessment, including issues on which DOE seeks public comment. Chapter 3 of the NOPR TSD provides detailed descriptions of the basic construction and operation of battery chargers, followed by a discussion of technology options to improve their efficiency and power consumption in various modes. These technology options are also listed in the table as follows:

Table IV.3 Battery Charger Design Options

Technology Option		Description
Slow Charger	Improved Cores	Use transformer cores with low losses.
	Termination	Limit power provided to fully-charged batteries.
	Elimination/Limitation of Maintenance Current	Limit power provided to fully-charged batteries.
	Elimination of No-Battery Current	Limit power provided drawn when no battery is present.
	Switched-Mode Power Supply	Use switched-mode power supplies instead of linear power supplies.
Fast Charger	Low-Power Integrated Circuits	Use integrated circuit controllers with minimal power consumption.
	Elimination/Limitation of Maintenance Current	Limit power provided to fully-charged batteries.
	Schottky Diodes and Synchronous Rectification	Use rectifiers with low losses.
	Elimination of No-Battery Current	Limit power provided drawn when no battery is present.
	Phase Control to Limit Input Power	Limit input power in lower-power modes.

	Wide-Band Gap Semiconductors	Use semiconductors such as Gallium Nitride and Silicon Carbide to achieve higher charging efficiency.

B. 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 commercially viable, existing prototypes will not be considered further.

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

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

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

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

In summary, 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. The reasons for eliminating any technology are discussed in the following sections.

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

1. Screened-Out Technologies

Battery charger manufacturers often use various combinations of the DOE identified technology option, and because these options are relatively common with little barrier to implement, DOE did not screen out any technology option. DOE did not receive comments on its screening analysis.

2. Remaining Technologies

DOE tentatively concludes that all of the identified technologies listed in section IV.A.2 met all five screening criteria to be examined further as design options in DOE's NOPR analysis. In summary, DOE did not screen out the following technology options:

Table IV.4 Remaining Battery Charger Design Options

<table>
<tr><th colspan="2">Technology Option</th><th>Description</th></tr>
<tr><td rowspan="5">Slow Charger</td><td>Improved Cores</td><td>Use transformer cores with low losses.</td></tr>
<tr><td>Termination</td><td>Limit power provided to fully-charged batteries.</td></tr>
<tr><td>Elimination/Limitation of Maintenance Current</td><td>Limit power provided to fully-charged batteries.</td></tr>
<tr><td>Elimination of No-Battery Current</td><td>Limit power provided drawn when no battery is present.</td></tr>
<tr><td>Switched-Mode Power Supply</td><td>Use switched-mode power supplies instead of linear power supplies.</td></tr>
<tr><td rowspan="6">Fast Charger</td><td>Low-Power Integrated Circuits</td><td>Use integrated circuit controllers with minimal power consumption.</td></tr>
<tr><td>Elimination/Limitation of Maintenance Current</td><td>Limit power provided to fully-charged batteries.</td></tr>
<tr><td>Schottky Diodes and Synchronous Rectification</td><td>Use rectifiers with low losses.</td></tr>
<tr><td>Elimination of No-Battery Current</td><td>Limit power provided drawn when no battery is present.</td></tr>
<tr><td>Phase Control to Limit Input Power</td><td>Limit input power in lower-power modes.</td></tr>
<tr><td>Wide-Band Gap Semiconductors</td><td>Use semiconductors such as Gallium Nitride and Silicon Carbide to achieve higher charging efficiency.</td></tr>
</table>

DOE has initially determined that these technology options are technologically feasible because they are being used in commercially-available products or working prototypes. DOE also finds that all of the remaining technology options meet the other screening criteria (*i.e.*, practicable to manufacture, install, and service and do not result in adverse impacts on consumer utility, product availability, health, or safety, unique-pathway proprietary technologies). While DOE does not anticipate any material impact on fit, function, and utility of the battery chargers, we request comment on potential impacts from the proposed standard. For additional details on the analysis, see chapter 4 of the NOPR TSD.

C. Engineering Analysis

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

1. Efficiency Analysis

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

To analyze the battery charger efficiency levels under the new multi-metric approach, DOE established efficiency levels for active charge energy and standby power separately. For off mode power consumption, DOE notes that for chargers that offer an off mode, the power draw is usually negligible; therefore, DOE estimated the off mode power to be zero across all efficiency levels and did not analyze the off mode performance for battery chargers in this NOPR.

In developing CSLs, DOE used data available in the CCD as a representation of the wired battery charger market. The CCD currently provides values for metrics based on the DOE test procedure at 10 CFR, part 430, subpart B, appendix Y, which includes UEC, 24-hour charge and maintenance mode energy ("E_{24}"), maintenance mode power ("P_m"), standby mode power ("P_{nb}"), and off mode power ("P_{off}"). However, in order to develop CSLs for wired chargers in consideration of the metrics in the newly adopted appendix Y1, DOE needed to further disaggregate the current E_{24} rated value to estimate the active charge energy ("E_a") component. DOE achieved this by subtracting maintenance mode energy, which equals the time in hours spent in maintenance mode multiplied by P_m, from E_{24}. However, the time spent in maintenance mode for each battery charger basic model can vary significantly depending on intended application, and DOE does not have sufficient information to derive these times on a case-by-case basis. As such, for this NOPR, DOE continues to estimate that every charger spends five hours in maintenance mode out of the 24-hour charge and maintenance mode test period, as determined by section 3.3.2 of the current test procedure. As a result, DOE calculated E_a as E_{24} minus five hours times P_m. DOE used the resultant data to define CSLs. DOE also slightly adjusted the intercept of the resultant CSL equation for each analyzed battery energy group as necessary so that each CSL would be a continuous function across battery energy groups.

For fixed-location wireless battery chargers, DOE also relied on the CCD data to estimate the relationship between the CCD derived E_a and CCD reported E_{batt} for their active mode CSLs. However, for the standby mode power (the sum of maintenance mode power and no-battery mode power), or P_{sb}, because the newly covered fixed-location wireless chargers can have higher maintenance mode power consumption because of different inductive power transmitting standards, DOE developed the standby power CSLs based on its own testing data. The multi-metric CSL results for fixed-location wireless chargers are further discussed in sections 0 and IV.C.1.b below.

For open-placement wireless battery chargers, similarly, because these are chargers covered under the expanded scope, DOE relied on its own testing data to develop the no-battery mode only CSLs for these chargers, with further discussion in sections IV.C.1.a and IV.C.1.b below

The Joint Efficiency Advocates commented that DOE could consider uncoupling active mode and standby mode efficiency levels rather than increasing both active mode and standby mode efficiency together at each CSL so that alternate combinations could be analyzed to explore the potential for additional cost-effective savings. (Joint Efficiency Advocates, No. 19 at p. 2)

DOE notes that the electronics related to these modes of operations are typically highly integrated and in performing teardowns, DOE was unable to accurately establish technology options and cost that would solely improve the energy performance in one mode of operation without affecting another. While not universal, DOE noticed from its teardowns that battery charger designs with improved efficiency in one more of operation will typically also be more efficient in other modes. Lacking accurate cost information associated with improving the performance in each mode of operation separately, DOE chose not to decouple active mode and standby mode efficiency levels for wired and fixed-location wireless battery chargers in this NOPR. In taking this approach, DOE however ensured that teardown units representing successive efficiency levels ("ELs") achieved both the required active mode as well as standby performance for that EL. This ensures that the teardown cost of representative units accurately capture the cost of attaining both the active mode and standby performance required by each EL. The results of these TSLs are also further discussed in chapter 5 of the TSD.

The CA IOUs also supported DOE in updating the standards for battery chargers and expand the engineering analysis to higher-capacity battery chargers because of advances in technology and the increasing availability of higher-powered lithium-ion battery consumer devices on the market. (CA IOUs, No. 18 at pp. 1-2) The CA IOUs recommended DOE to reevaluate the bins for battery chargers as proposed in the preliminary analysis because the CSLs allow higher active mode energy for battery chargers with higher battery capacities within a product class. The CA IOUs recommended DOE to develop more granular battery capacity bins or redesign the standard algorithms to flatten the curve of allowable maximum active mode energy, making CSLs equally stringent across battery chargers of all battery capacities. (CA IOUs, No. 18 at p. 5)

DOE notes that DOE's active mode charge energy measures the raw energy input into the battery charger; therefore, as battery energy increases within each product class, the corresponding raw active energy would increase as well. As such, "flattening" the active charge energy curve within each product class would increase relative stringency for those battery chargers designed to charge higher-energy batteries from the same product class.

The Joint Trade Associations stated that several joint commenters opposed DOE's test procedure proposal to rely on separate metrics, and urged retention of the UEC metric in response to the test procedure NOPR published in November 2021. The commenters also opposed DOE's proposed approach for determining active, standby, and battery maintenance mode energy, as well as DOE's proposal to specify that, for chargers not shipped with adapters and where one is not recommended, the test can be done with any EPS that is minimally compliant with DOE's energy conservation standards. (Joint Trade Associations, No. 17 at pp. 3-4)

DOE notes that these comments pertain to the test procedure rulemaking, and DOE has already addressed these stakeholder concerns in the September 2022 Test Procedure Final Rule by adopting the alternate method for measuring the active mode energy consumption of a battery charger, ensuring that the test method for the new multiple metrics remain largely the same as that of DOE's previous test procedure for the UEC metric. 87 FR 55090, 55100-55108. DOE also notes that it adopted the additional requirement to test battery chargers with an EPS because it ensures test procedure representativeness and test result comparability. 87 FR 55090, 55098-55099.

Delta-Q commented that DOE's efficiency level analysis of product class 2c contains incorrect assumptions, because the test procedure measures the energy consumption of the battery charge system as a whole, which fails to take into account energy losses in the battery itself and these losses vary depending on battery type and battery chemistry. Attempting to reduce the amount of charge delivered, particularly for lead acid batteries, would result in precipitous reductions in battery life. (Delta-Q, No. 20 at p. 1) Delta-Q provided an example that for a golf cart with a flooded lead acid battery of 80% round-trip efficiency, a charger around 90% efficiency, and a total system efficiency that meets the current DOE standard of around 70% total efficiency; however, DOE's proposed CSL for product class 2c would require battery charge system efficiency to be substantially increased. In the extreme case of CSL 3, lead-acid batteries would be effectively banned because they cannot meet the standard, even though lead-acid batteries dominate some parts of the market. Delta-Q further noted that the cost to replace these batteries can be ten to fifteen times the charger cost, with the total system replacement cost increasing in hundreds of dollars. (Delta-Q, No. 20 at p. 2) As such, Delta-Q commented that DOE's proposed CSL efficiencies appear to be flawed because product class 2c contains products with a variety of battery chemistries and system efficiencies, and while most lithium ion batteries would have system efficiencies passing at CSL 2, flooded lead-acid batteries would struggle to pass CSL 1; in effect, 100% of lead-acid battery charge systems would fail. (*Id.*)

DOE notes that the battery charger test procedure was designed to measure the overall system efficiency. As a result, the energy losses in the batteries would also be accounted for as wasted energy or "non-useful energy". DOE understands that for some manufacturers, they do not have direct control over the type of battery consumers use with their chargers; however, for each battery charger product class and each comparable battery energy range, these chargers would still be regulated along with other similar types of chargers with comparable battery characteristics. DOE's standards have been, and will be, developed based on the representative units from a variety of end use product types and battery energy ranges. As such, DOE's battery charger standards do account for the battery energy losses and do not negatively impact battery charger manufacturers. DOE further notes that CSL 0 for active mode and standby mode were developed to be an approximate translation of the current DOE battery charger UEC standard, with higher CSLs developed based on CCD reported battery charger performance trends and/or DOE's own testing results. Currently presented CSLs are only for standards development process; any standard DOE decides to adopt later in the final rule stage will be verified to be cost effective while having meaningful energy savings without undue burden. To account for Delta-Q's concern, DOE has slightly relaxed high-energy chargers' higher CSL levels in this NOPR, and from DOE's internal testing and modeling, DOE was able to confirm that even CSL 3 was attainable by some lead-acid battery chargers.

Delta-Q commented that the present single, unified metric of UEC would provide more flexibility in reducing overall energy consumption while still delivering on customer features and cost targets, and that separate standards for separate metrics will reduce design flexibility and raise the cost of compliance. (Delta-Q, No. 20 at p. 2) Delta-Q further commented that the proposed baseline standby mode power requirements are already restrictive, resulting in targets that are very challenging to meet, which can limit the maximum charge speed or the minimum battery size. This is particularly challenging for generic and standalone battery chargers such as those manufactured by Delta-Q and used by many OEMs. (Delta-Q, No. 20 at pp. 2-3) Delta-Q commented that standby mode power provides a variety of customer-required functions, such as status display, signal communication, or maintain state of charge, and therefore does not necessarily represent wasted energy. Delta-Q further stated that if efficiency regulations precluded drawing from AC mains in maintenance mode power, battery chargers would require power draw from the DC battery, reducing battery readiness and runtime. (*Id.*)

DOE recognizes that the current UEC metric may provide design flexibility for manufacturers; however, it risks being increasingly unrepresentative without frequent and continuous updates to the usage profiles. If DOE were to constantly update the usage profiles, manufacturers would also need to repeatedly recalculate the representative UEC and recertify their products, which would add undue burden for manufacturers. Although DOE's adopted multi-metric testing approach does not provide the same level of freedom for battery charger design in all modes of operation when compared to the current integrated UEC approach, it would still provide design flexibility in standby mode operation by allowing manufacturers to prioritize either maintenance power or no-battery power, which accounts for the majority of battery charger operation time. DOE reiterates that the CSLs presented in the preliminary analysis were only for DOE to present the general approach for developing the standards, and for stakeholders to get an early chance at contributing to DOE's standards rulemaking process. As such, the CSLs presented in the preliminary analysis are not final results. Any standard adopted by DOE in the final rule must be economically justifiable and technologically feasible, and will be required to demonstrate that they are verified to be cost effective while having meaningful energy savings without undue burden. In response to Delta-Q's comment that the baseline standard levels presented in the preliminary analysis are already restrictive, DOE notes that these were either translated from the current UEC standard, or developed from DOE's own testing data representing some of the most energy consumptive products in the market; demonstrating that the technology required to achieve the currently prescribed standards at the baseline level are readily available and not restrictive.

a. Baseline Energy Use

For each product class, DOE generally selects a baseline model as a reference point for each class, and measures changes resulting from potential energy conservation standards against the baseline. The baseline model in each product class represents the characteristics of a product typical of that class (e.g., capacity, physical size). Generally, a baseline model is one that just meets current energy conservation standards, or, if no standards are in place, the baseline is typically the most common or least efficient unit on the market.

Consistent with the baseline efficiency levels analyzed from the preliminary analysis, for this NOPR, DOE's baseline multi-metric efficiency levels for wired battery chargers are approximated from the current UEC standards along with reference to the original California Energy Commission's ("CEC") battery charger multi-metric standard. Because the current UEC standard was adopted based on approximated CEC standards for most of the original product classes except product classes 5 and 6, which were more efficient than CEC's, DOE's current standard can be approximately "translated" back to the CEC's standard, especially on the lower end of the battery energy spectrum (for battery chargers with battery energy less than 100Wh). DOE further assumed that most chargers on the CCD are only single port chargers and applied the CEC active charge energy standard to the current CCD battery energy levels to get the maximum charge and maintenance energy, and then subtracted five hours of maintenance mode power to approximate the active charge energy for every single wired battery charger entry. DOE did not receive any opposing comments to this approach.

DOE further notes that the September 2022 Test Procedure Final Rule adopted the requirement that for all battery chargers that would need an external power supply for operation, they would need to be tested with a minimally compliant EPS. 87 FR 55090, 55098-55099. DOE anticipated that a proposed standard would also be affected by this change. As such, DOE analyzed the CCD reported battery charger basic models and manually removed entries with negligible power draw in no-battery mode so that the remaining entries would likely be tested with an EPS or with input power measured directly at the wall. Although this may unintentionally remove some entries with very efficient no-battery mode design, it would ensure that all the remaining models are indeed tested with an appropriate power supply or have the conversion losses captured. DOE then applied a linear regression to the remaining CCD entries to establish a relationship between battery energy and the approximated CEC standard described in the previous paragraph. DOE repeated the same steps for standby mode power and battery energy to establish the standby mode baseline efficiency level for wired battery chargers. Each CSL would contain both the independent active mode efficiency level, and the independent standby mode efficiency level.

For fixed-location wireless chargers in active mode, DOE also repeated similar steps to establish the active energy CSL based off of CCD data, but assumed that the slopes across CSL 0 to CSL 3 are the same, which equal to the slope of the active charge energy vs. battery energy from the wet-environment wireless charger CCD data. DOE then adjusted the intercept so that all currently reported wet-environment wireless chargers pass the baseline standard level.

For the baseline efficiency level for standby mode power of fixed-location wireless chargers, DOE relied on the worst average 30% standby mode power of the fixed-location wireless chargers that passed DOE's internal testing. Similarly for open-placement wireless chargers' baseline no-battery mode power level, DOE also relied on the worst no-battery mode power of the wireless chargers that passed DOE's internal testing.

Table IV.5 below shows the baseline efficiency level for all wired and wireless battery chargers.

Table IV.5 Baseline Efficiency Level or CSL 0 for Battery Chargers

<table>
<tr><th colspan="5">CSL 0: Approximated Current Standards</th></tr>
<tr><th>Product Class</th><th>Battery Energy (E_{batt})</th><th>Active Mode Energy (E_a)</th><th>Standby Mode Power ($P_{sb} = P_m + P_{nb}$)</th><th>Off Mode Power (P_{off})</th></tr>
<tr><td>1a</td><td>≤100Wh</td><td>1.718*Ebatt + 17.3</td><td>1.7</td><td>0</td></tr>
<tr><td>1b</td><td>N/A</td><td>N/A</td><td>1.4 (P_{nb} only)</td><td>0</td></tr>
<tr><td>2a</td><td>≤100Wh</td><td>1.656*Ebatt + 10.5</td><td rowspan="2">0.0021*Ebatt + 1</td><td rowspan="2">0</td></tr>
<tr><td>2b</td><td>100–1000</td><td>1.564*Ebatt + 19.661</td></tr>
</table>

2c	>1000	1.549*Ebatt + 34.361		

b. Higher Efficiency Levels

As part of DOE's analysis, the maximum available efficiency level is the highest efficiency unit currently available on the market. DOE also defines a "max-tech" efficiency level to represent the maximum possible efficiency for a given product.

Again, DOE applied linear regression models to different portions of the CCD to characterize three different performance levels of the reported wired battery charger basic models. For active mode energy of high-energy battery chargers in product class 2c, DOE held the intercept constant but adjusted the slope to allow slightly relaxed higher CSLs when compared to the preliminary analysis and to retain the continuous CSL for each level.

For active mode energy of fixed-location wireless chargers, DOE held the slopes the same across efficiency levels but adjusted the intercepts to achieve similar pass rates when compared to the wired battery charger pass rates at each corresponding CSLs. DOE further finetuned the intercepts by aligning them with DOE's internal testing results.

Similar to how DOE developed the baseline standard levels for standby mode power of fixed-location wireless chargers and no-battery mode power for open-placement wireless chargers, DOE relied on its own testing data to develop the higher efficiency levels as well. For P_{sb} of fixed-location wireless chargers, CSL 2 represents the approximated average value of DOE's tested samples, whereas CSL 3 represents the most efficient 25-30% of the samples. CSL 1 P_{sb} of fixed-location wireless chargers was set to approximately be the average of CSL 0 and CSL 2 levels. For open-placement wireless charger no-battery mode CSLs, DOE approximated CSL 2 to be the average no-battery mode power of all the units tested by DOE. DOE then set CSL 1 to be the average of the bottom third of tested units and CSL 3 to represent open-placement wireless chargers that do not consume any power in no-battery mode from their wireless charging components, but with all power draw coming from the power supply just meeting DOE's multi-voltage EPS maximum no-load power of 0.3W, as prescribed in 10 CFR 430.32(w)(1)(ii).

DOE analyzed these three higher battery charger efficiency levels, identified design options, and obtained incremental cost data at each of these levels. Table IV.6 below shows the efficiency levels analyzed for this NOPR analysis.

Table IV.6 Higher Efficiency Levels for Battery Chargers

Product Class	Battery Energy (E_{batt})	Active Mode Energy E_a	Standby Mode Power ($P_{sb} = P_m + P_{nb}$)	Off Mode Power P_{off}
CSL 1: Intermediate (~70% Pass Rate)				
1a	≤100Wh	1.718*Ebatt + 8.5	1.5	0
1b	N/A	N/A	0.8 (P_{nb} only)	0
2a	≤100Wh	1.390*Ebatt + 7.5	0.00154*Ebatt + 0.65	0
2b	100–1000	1.418*Ebatt + 4.692		
2c	>1000	1.388*Ebatt + 34.361		
CSL 2: Above Intermediate (~40% Pass Rate)				
1a	≤100Wh	1.718*Ebatt + 5.54	1.25	0
1b	N/A	N/A	0.5 (P_{nb} only)	0
2a	≤100Wh	1.222*Ebatt + 4.980	0.00098*Ebatt + 0.4	0

2b	100–1000	1.367*Ebatt + -9.560		
2c	>1000	1.323*Ebatt + 34.361		
CSL 3: Max-Tech (~10% Pass Rate)				
1a	≤100Wh	1.718*Ebatt + 2	0.65	0
1b	N/A	N/A	0.3 (P_{nb} only)	0
2a	≤100Wh	1.053*Ebatt + 4.980	0.0005*Ebatt + 0.25	0
2b	100–1000	1.316*Ebatt + -21.292		
2c	>1000	1.260*Ebatt + 34.361		

For wired battery chargers, the three analyzed higher efficiency levels (i.e., ELs) correspond to the top 70%, 40%, and 10% of battery chargers in the market in terms of their active mode energy and standby mode power consumption. For ease of reference, DOE refers to the efficiency level that represents the top 70% of the market as "Intermediate", the top 40% of the market as "Above Intermediate" and those that represent the top 10% of the market as "Max-Tech," which typically also represents the lowest active mode energy and standby mode power consumption commercially attainable using current technology. Fixed-location wireless chargers share similar market distribution as wired chargers for these higher CSLs from DOE's estimates. However, for open-placement wireless chargers, DOE's internal testing data shows higher pass rates for higher efficiency levels, especially at Max-Tech. DOE notes that although DOE tried to test a wide variety of the wireless chargers covered under the expanded scope, there are still hundreds of wireless charger models in the market that have various no-battery mode efficiency. As such, the actual market efficiency distribution for open-placement wireless chargers in higher CSLs can be different than DOE's current estimates; additionally, because the CSL differences of the no-battery mode power draw is relatively small, the overall energy use analysis based on these market distribution estimates should still yield meaningful and reliable results.

DOE requests feedback on DOE's approach of establishing these higher efficiency CSLs and welcomes stakeholders to submit any data on the actual market distribution of these higher efficiency CSLs.

2. Cost Analysis

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

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

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

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

In the present case, DOE conducted the analysis using all three methods (physical teardowns, catalog teardowns, and price surveys) of analysis to determine manufacturing cost as it relates to the efficiency of a battery charger. Units for teardown were selected from the CCD based on reported energy values. Several units were selected as representative units for each CSL. In addition to units from the CCD, DOE purchased various open-placement and fixed-location wireless chargers to study their design, cost, and performance. DOE received additional cost data from manufacturer interviews and stakeholder feedback, which was incorporated in the cost model generation.

After testing, physical teardowns of CCD units were performed using internal tools. Price survey data was collected in manufacturer interviews and in some stakeholder feedback for units at each CSL.

To generate the cost model, cost data from teardowns were combined with price survey data to generate cost/efficiency relationships at each battery energy group of interest. Equations for cost as a function of relative active mode energy and standby mode power were then created using an exponential fit to the data at each battery energy level. The resulting manufacturer production costs (MPCs) were then generated for each efficiency level using the fit equations.

The Joint Efficiency Advocates expressed concerned that only four units representing CSL 0 and CSL 3 at two battery energy levels were used in the preliminary engineering analysis to estimate costs for all other wired charger CSLs and battery energy combinations. The Joint Efficiency Advocates commented that better accuracy would be obtained through additional testing and teardowns for all product classes, or through a design option approach for estimating costs for all wired chargers, or a combination of both. (Joint Efficiency Advocates, No. 19 at p. 2)

The CA IOUs further suggested DOE conduct additional teardowns of larger battery chargers in product classes 2a, 2b, and 2c for common product types (e.g., notebooks, cordless vacuums, power tools, landscaping equipment, ride-on electric vehicles, electric scooters, and golf carts) because larger battery chargers for such devices may have different efficiency profiles than smaller ones due to higher quality components or the incorporation of high-efficiency technologies, such as wide-band-gap semiconductors. The CA IOUs stated their expectation that larger battery chargers may not show a linear trend between active energy and battery energy. (CA IOUs, No. 18 at p. 2)

Similarly, NEEA commented that DOE's methodology of conducting teardowns of four chargers in product class 2a representing only the lowest (baseline) and highest

(CSL 3) of the four CSLs resulted in insufficient reliable data for class 2a CSL 1 and 2. NEEA's own research suggested that design options to enable CSL 1 and CSL 2 efficiencies are likely quite different than those used to achieve the highest efficiency level (CSL 3), creating inaccuracies in DOE's current estimates of the incremental cost for these middle levels. NEEA further commented that the reliance on four charger teardowns with battery energies less than 20 Wh (product class 2a) to 35 different battery charger applications with battery energies up to two orders of magnitude higher (2000 Wh) has yielded insufficient data to develop incremental cost information for product classes 2b and 2c because these higher power battery chargers likely use different semiconductor chipsets and/or can be impacted by production volume-related cost effects from other similar power electronics applications. (NEEA, No. 16 at pp. 1-2) NEEA commented that incremental battery charger costs presented for product class 2b ($2.59 to $8.73) are high relative to DOE EPS cost analysis, indicating that battery charger incremental costs are likely to be overestimated for these middle CSLs (CSLs 1 and 2). (NEEA, No. 16 at p. 2) NEEA stated that DOE should make three changes to more accurately measure the energy consumption of battery chargers: 1) add an alternative approach such as design option approach to teardown data already collected for class 2a CSL 1 and CSL 2; 2) conduct teardowns and/or utilize design option approaches to determine costs for product classes 2b and 2c; and 3) consider costs that maintain charge rate (slow or fast), given that slower chargers can be less costly due to a lower power output level. NEEA commented that if an expanded engineering analysis reveals that current CSL levels are not cost-effective in wired charges, NEEA recommends that DOE consider alternative combinations and standby and active mode that are more likely to be cost-effective, and adding an additional CSL level between CSL 0 and CSL 1. (NEEA, No. 16 at pp. 2-3)

DOE acknowledges that better representativeness can be achieved through additional testing and teardowns. Therefore, for the NOPR analysis, DOE has expanded the representative unit size significantly to cover more battery energy ranges and different end product types. DOE has also conducted various manufacturer interviews to get more direct design and cost information from stakeholders to calibrate DOE's internal teardown results, which improves the accuracy and representativeness of DOE's battery charger cost-efficiency relationship. Details of how DOE updated its cost analysis can be found in chapter 5 of the NOPR TSD.

To account for manufacturers' non-production costs and profit margin, DOE applies a multiplier (the manufacturer markup) to the MPC. The resulting manufacturer selling price ("MSP") is the price at which the manufacturer distributes a unit into commerce. DOE, throughout this NOPR analysis, is using the average manufacturer markup presented in the June 2016 final rule. This markup was determined based on information collected during the manufacturer interviews preceding that rulemaking. More detail on the manufacturer markup is given in section IV.D of this document.

3. Cost-Efficiency Results

The results of the engineering analysis are presented as cost-efficiency data for each product class by efficiency levels. The cost-efficiency curves are described by the efficiency levels DOE analyzed and the increase in MPC required to improve a baseline-efficiency product to each of the considered efficiency levels. DOE recognizes that costs of battery chargers vary according to the energy of the battery it is intended to charge. DOE analyzed costs at various battery energies from different battery energy groups for each CSL as shown below. These representative battery energies were selected based on areas of significant market density, as indicated by entries in the CCD. They also span a wide range of battery energy groups for which the CSL equations were defined. For battery energy groups for which DOE lacks direct teardown costs, DOE extrapolated these costs from representative units that DOE has physically torn down and calibrated DOE's extrapolation with price information DOE acquired from manufacturer interviews.

Tables and plots with MPC results, as well as extrapolation methods used both within and across each product class, are presented below as well as in greater detail in chapter 5 of the NOPR TSD.

DOE requests stakeholder feedbacks on these analyzed incremental costs as well as any topic covered in chapter 5 of the NOPR TSD. DOE also welcomes stakeholders to submit their own cost-efficiency results, should there be any.

Product Class	Product Class Name	Battery Energy (Wh)	Incremental MPC ($)			
			Base	CSL 1	CSL 2	CSL 3
1a	Fixed-Location Wireless Charger	12	0.00	0.67	1.51	3.52
1b	Open-Placement Wireless Charger	N/A	0.00	0.53	1.49	2.14
2a	Low-Energy Wired Battery Charger (≤100Wh)	5	0.00	0.23	0.63	0.75
		12	0.00	0.40	0.77	1.59

		25	0.00	0.55	1.00	1.85
		75	0.00	0.93	1.60	2.67
2b	Medium-Energy Wired Battery Charger (100-1000Wh)	200	0.00	1.58	2.45	3.24
		420	0.00	3.35	5.20	6.86
2c	High-Energy Wired Battery Charger (>1000Wh)	2000	0.00	3.35	5.20	6.86

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 consumer prices, which are then used in the LCC and PBP analysis and in the manufacturer impact analysis. At each step in the distribution channel, companies mark up the price of the product to cover business costs and profit margin.

For battery chargers, the main parties in the distribution chain are battery charger manufacturers, end-use product original equipment manufacturers, consumer product retailers, and consumers. DOE developed baseline and incremental markups for each actor in the distribution chain. Baseline markups are applied to the price of products with baseline efficiency, while incremental markups are applied to the difference in price between baseline and higher-efficiency models (the incremental cost increase). The incremental markup is typically less than the baseline markup and is designed to maintain similar per-unit operating profit before and after new or amended standards.[16]

In the March 2022 Preliminary Analysis, DOE used the same baseline and incremental markups that were used in the June 2016 Final Rule.[17] DOE did not receive any comments regarding the markups or distribution channels in the March 2022 Preliminary Analysis, therefore DOE used the same markups in this NOPR.

Chapter 6 of the NOPR TSD provides details on DOE's development of markups for battery chargers.

DOE requests comment on the estimated increased manufacturer markups and incremental MSPs that result from the analyzed energy conservation standards from the NOPR engineering analysis.

E. Energy Use Analysis

The purpose of the energy use analysis is to determine the annual energy consumption of battery chargers at different efficiencies in representative U.S. single-family homes, multi-family residences, and commercial buildings, and to assess the

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

[17] See Chapter 6 of the 2016 Final Rule Technical Support Document for Battery Chargers. (Available at: *www.regulations.gov/document/EERE-2008-BT-STD-0005-0257*) (last accessed Sept. 12, 2022). See also Chapter 6 of the 2022 Preliminary Analysis Technical Support Document for Battery Chargers. (Available at: *www.regulations.gov/document/EERE-2020-BT-STD-0013-0009*) (last accessed Sept. 12, 2022).

energy savings potential of increased battery charger efficiency. The energy use analysis estimates the range of energy use of battery chargers in the field (*i.e.*, as they are actually used by consumers). The energy use analysis provides the basis for other analyses DOE performs, particularly assessments of the energy savings and the savings in consumer operating costs that could result from adoption of amended or new standards.

In the March 2022 Preliminary Analysis, DOE used usage profiles that were developed in the June 2016 Final Rule, along with efficiency data at different load conditions, to calculate the UECs for battery chargers for a variety of applications.[18] Usage profiles are estimates of the average time a device spends in each mode of operation. In the February 2023 NOPR for external power supplies, DOE updated some of the usage profiles for certain applications based on stakeholder comments. 88 FR 7284. For this analysis, DOE aligned the battery charger usage profiles for these applications with the EPS usage profiles for consistency.

Chapter 7 of the NOPR TSD provides details on DOE's energy use analysis for battery chargers.

F. Life-Cycle Cost and Payback Period Analysis

DOE conducted LCC and PBP analyses to evaluate the economic impacts on individual consumers of potential energy conservation standards for battery chargers.

[18] See appendix 7A of the 2016 Final Rule Technical Support Document for Battery Chargers. (Available at: *www.regulations.gov/document/EERE-2008-BT-STD-0005-0257*) (last accessed Sept. 12, 2022). See also appendix 7A of the 2022 Preliminary Analysis Technical Support Document for Battery Chargers. (Available at: *www.regulations.gov/document/EERE-2020-BT-STD-0013-0009*) (last accessed Sept. 12, 2022).

The effect of new or amended energy conservation standards on individual consumers usually involves a reduction in operating cost and an increase in purchase cost. DOE used the following two metrics to measure consumer impacts:

- The LCC is the total consumer expense of an appliance or product over the life of that product, 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 future operating costs to the time of purchase and sums them over the lifetime of the product.

- 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 at higher efficiency levels by the change in annual operating cost for the year that amended or new standards are assumed to take effect.

For any given efficiency level, DOE measures the change in LCC relative to the LCC in the no-new-standards case, which reflects the estimated efficiency distribution of battery chargers in the absence of new or amended energy conservation standards. In contrast, the PBP for a given efficiency level is measured relative to the baseline product.

For each considered efficiency level in each product class, DOE calculated the LCC and PBP for a nationally representative set of housing units and commercial buildings. DOE developed household samples from the 2015 Residential Energy Consumption Survey[19] (RECS 2015) and the 2018 Commercial Building Energy Consumption Survey[20] (CBECS 2018). For each sample household, DOE determined the energy consumption for the battery chargers and the appropriate energy price. By developing a representative sample of households, the analysis captured the variability in energy consumption and energy prices associated with the use of battery chargers.

Inputs to the calculation of total installed cost include the cost of the product—which includes MPCs, manufacturer markups, retailer and distributor markups, and sales taxes—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy prices and price projections, repair and maintenance costs, product lifetimes, and discount rates. DOE created distributions of values for product lifetime, discount rates, and sales taxes, with probabilities attached to each value, to account for their uncertainty and variability.

The computer model DOE uses to calculate the LCC relies on a Monte Carlo simulation to incorporate uncertainty and variability into the analysis. The Monte Carlo simulations randomly sample input values from the probability distributions and battery chargers' user samples. For this rulemaking, the Monte Carlo approach is implemented in MS Excel. The model calculated the LCC for products at each efficiency level for 10,000 housing units and commercial buildings per simulation run. The analytical results

[19] *www.eia.gov/consumption/residential/data/2015/* (last accessed Sept. 12, 2022). EIA is currently working on RECS 2020, and the entire RECS 2020 microdata are expected to be fully released in early 2023. Until that time, RECS 2015 remains the most recent full data release. For future analyses, DOE plans to consider using the complete RECS 2020 microdata when available.
[20] *www.eia.gov/consumption/commercial/* (last accessed Sept. 12, 2022).

include a distribution of 10,000 data points showing the range of LCC savings for a given efficiency level relative to the no-new-standards case efficiency distribution. In performing an iteration of the Monte Carlo simulation for a given consumer, product efficiency is chosen based on its probability. If the chosen product efficiency is greater than or equal to the efficiency of the standard level under consideration, the LCC calculation reveals that a consumer is not impacted by the standard level. By accounting for consumers who already purchase more-efficient products, DOE avoids overstating the potential benefits from increasing product efficiency.

DOE calculated the LCC and PBP for all consumers of battery chargers as if each were to purchase a new product in the expected year of required compliance with new or amended standards. New and amended standards would apply to battery chargers manufactured 2 years after the date on which any new or amended standard is published. (42 U.S.C. 6295(u)) At this time, DOE estimates publication of a final rule in late 2024, therefore, for purposes of this analysis, DOE used 2027 as the first year of compliance with any amended standards for EPSs.

Table IV.7 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 NOPR TSD and its appendices.

Table IV.7 Summary of Inputs and Methods for the LCC and PBP Analysis*

Inputs	Source/Method
Product Cost	Derived by multiplying MPCs by battery charger manufacturer and appliance manufacturer markups and sales tax, as appropriate. Used historical Product Price Index (PPI) data for semiconductors to derive a price scaling index to project product costs.
Installation Costs	No installation costs.
Annual Energy Use	The total annual energy use calculated using product efficiency and operating hours. Variability: Based on the 2015 RECS and 2018 CBECS
Energy Prices	Electricity: EIA data – 2021. Variability: Census Division.
Energy Price Trends	Based on *AEO2022* price projections.
Repair and Maintenance Costs	No repair or maintenance costs were considered.
Product Lifetime	Average: 3 to 10 years
Discount Rates	Approach involves identifying all possible debt or asset classes that might be used to purchase the considered appliances, or might be affected indirectly. Primary data source was the Federal Reserve Board's Survey of Consumer Finances.
Compliance Date	2027

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

1. Product Cost

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

In the March 2022 Preliminary Analysis, DOE did not use any price trend.[21] In response, the CA IOUs commented that based on American Council for an Energy-Efficient Economy information and price comparisons, DOE has historically

[21] See Chapters 8 and 10 of the 2022 Preliminary Analysis Technical Support Document for Battery Chargers. (Available at: *www.regulations.gov/document/EERE-2020-BT-STD-0013-0009*) (last accessed Sept. 12, 2022)

overestimated its forecasts of the incremental cost for products subject to standards due to energy conservation policies that may accelerate the decline of appliance costs due to increased production and innovation. (CA IOUs, No. 18 at pp. 5-6) The CA IOUs further commented that battery chargers are increasingly employing gallium nitride (GaN) semiconductors as a primary cost component, and GaN semiconductor costs are expected to decrease substantially; in addition, GaN topologies require fewer components and heat dissipation needs, causing system-level costs to decrease. For these reasons, DOE should include price learning in its analysis of battery chargers and develop criteria for applying price learning in all cases involving products with rapidly expanding sales volumes or based on components or materials that are likely to experience declining costs. (CA IOUs, No. 18 at pp. 6-7)

The Joint Efficiency Advocates stated that with price learning not addressed in the preliminary analysis, costs to achieve higher efficiency levels over the analysis period could be overestimated; learning rates associated with semiconductors are especially important because improved semiconductors are a key technology option for reaching higher efficiency levels. (Joint Efficiency Advocates, No. 19 at p. 2)

NEEA also commented that DOE should incorporate manufacturer price learning and leverage general semiconductor price data into its analysis of life-cycle cost and payback period for battery chargers. (NEEA, No. 16 at p. 3)

DOE agrees with the commenters that costs for electronic components are likely to change during the analysis period. In this NOPR, DOE has incorporated a price trend based on the PPI for semiconductors,[22] with an estimated annual deflated price decline of approximately 6 percent per year from 1967 through 2021. DOE applied this price trend to the proportion of battery charger costs attributable to semiconductors, which is estimated at 90 percent of incremental costs.

2. Annual Energy Consumption

For each sampled household or commercial business, DOE determined the energy consumption for a battery charger at different efficiency levels using the approach described previously in section IV.E of this document.

3. Energy Prices

Because marginal electricity price more accurately captures the incremental savings associated with a change in energy use from higher efficiency, it provides a better representation of incremental change in consumer costs than average electricity prices. Therefore, DOE applied average electricity prices for the energy use of the product purchased in the no-new-standards case, and marginal electricity prices for the incremental change in energy use associated with the other efficiency levels considered.

For the NOPR, DOE derived average monthly residential and commercial marginal electricity prices for the various regions using 2021 data from EIA.[23]

---

[22] Producer Price Index: Semiconductors and Related Manufacturing. Series ID: PCU334413334413. (Available at: *beta.bls.gov/dataViewer/view/timeseries/PCU334413334413*) (last accessed Sept. 12, 2022)
[23] U.S. Department of Energy-Energy Information Administration, Form EIA-861M (formerly EIA-826) Database Monthly Electric Utility Sales and Revenue Data (1990-2020). (Available at: *www.eia.gov/electricity/data/eia861m/*) (last accessed Sept. 12, 2022).

To estimate energy prices in future years, DOE multiplied the 2021 energy prices by the projection of annual average price changes for each of the nine census divisions from the Reference case in *AEO2022*, which has an end year of 2050.[24] To estimate price trends after 2050, DOE used the average annual rate of change in prices from 2023 through 2050.

See chapter 8 of the NOPR TSD for details.

4. Product Lifetime

In the March 2022 Preliminary Analysis, DOE based the battery charger lifetime on the lifetime of the application for which it is associated.[25] In the February 2023 NOPR for external power supplies, DOE increased the lifetime for several applications based on stakeholder comments. 88 FR 7284. For this analysis, DOE aligned the application lifetimes (and thus battery charger lifetimes) for these applications with the EPS lifetime estimates for consistency.

5. Discount Rates

In the calculation of LCC, DOE applies discount rates appropriate to households and commercial buildings to estimate the present value of future operating cost savings.

[24] EIA. *Annual Energy Outlook 2022 with Projections to 2050*. Washington, DC. (Available at *www.eia.gov/forecasts/aeo/*) (last accessed Sept. 12, 2022).
[25] See Chapter 8 of the 2022 Preliminary Analysis Technical Support Document for Battery Chargers. (Available at: *www.regulations.gov/document/EERE-2020-BT-STD-0013-0009*) (last accessed Sept. 12, 2022)

DOE estimated a distribution of discount rates for battery chargers based on the opportunity cost of consumer funds.

For residential households, DOE applies weighted average discount rates calculated from consumer debt and asset data, rather than marginal or implicit discount rates.[26] The LCC analysis estimates net present value over the lifetime of the product, so the appropriate discount rate will reflect the general opportunity cost of household funds, taking this time scale into account. Given the long time horizon modeled in the LCC analysis, the application of a marginal interest rate associated with an initial source of funds is inaccurate. Regardless of the method of purchase, consumers are expected to continue to rebalance their debt and asset holdings over the LCC analysis period, based on the restrictions consumers face in their debt payment requirements and the relative size of the interest rates available on debts and assets. DOE estimates the aggregate impact of this rebalancing using the historical distribution of debts and assets.

To establish residential discount rates for the LCC analysis, DOE identified all relevant household debt or asset classes in order to approximate a consumer's opportunity cost of funds related to appliance energy cost savings. It estimated the average percentage shares of the various types of debt and equity by household income group

[26] The implicit discount rate is inferred from a consumer purchase decision between two otherwise identical goods with different first cost and operating cost. It is the interest rate that equates the increment of first cost to the difference in net present value of lifetime operating cost, incorporating the influence of several factors: transaction costs; risk premiums and response to uncertainty; time preferences; interest rates at which a consumer is able to borrow or lend. The implicit discount rate is not appropriate for the LCC analysis because it reflects a range of factors that influence consumer purchase decisions, rather than the opportunity cost of the funds that are used in purchases.

using data from the Federal Reserve Board's Survey of Consumer Finances[27] ("SCF") for 1995, 1998, 2001, 2004, 2007, 2010, and 2013. Using the SCF and other sources, DOE developed a distribution of rates for each type of debt and asset by income group to represent the rates that may apply in the year in which amended standards would take effect. DOE assigned each sample household a specific discount rate drawn from one of the distributions. The average rate across all types of household debt and equity and income groups, weighted by the shares of each type, is 4.1% percent.

For commercial buildings, DOE derived the discount rates for the LCC analysis by estimating the cost of capital for companies or public entities that purchase EPSs. For private firms, the weighted average cost of capital ("WACC") is commonly used to estimate the present value of cash flows to be derived from a typical company project or investment. Most companies use both debt and equity capital to fund investments, so their cost of capital is the weighted average of the cost to the firm of equity and debt financing, as estimated from financial data for publicly traded firms across all commercial sectors. The average commercial cost of capital is 6.7%.

See chapter 8 of the NOPR TSD for further details on the development of consumer discount rates.

[27] Board of Governors of the Federal Reserve System. *Survey of Consumer Finances*. 1995, 1998, 2001, 2004, 2007, 2010, and 2013. (Available at: *www.federalreserve.gov/econres/scfindex.htm*) (last accessed Sept. 12, 2022).

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

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

In the March 2022 Preliminary Analysis, DOE used the CCD[28] to estimate the energy efficiency distribution of battery chargers for 2027.[29] DOE updated these distributions based on the latest data in CCD. For wireless chargers, DOE estimated the efficiency distributions based on the models tested and used for the engineering analysis. The estimated market shares for the no-new-standards case for battery chargers are shown in Table IV.8. See chapter 8 of the NOPR TSD for further information on the derivation of the efficiency distributions.

Table IV.8 Estimated Market Shares of Battery Chargers in the No-New-Standards Case

Representative Unit (battery energy)	Baseline	Intermediate	Above Intermediate	Max-Tech
10Wh	9.8%	48.9%	19.4%	21.9%
10-50Wh (RPU 12.7Wh)	26.1%	53.0%	18.1%	2.8%
10-50Wh (RPU 25Wh)	26.1%	53.0%	18.1%	2.8%
50-100Wh (RPU 75Wh)	20.6%	51.5%	27.8%	0.1%
100-400Wh (RPU 200Wh)	19.7%	27.5%	37.6%	15.2%

[28] https://www.regulations.doe.gov/ccms

[29] See Chapter 8 of the 2022 Preliminary Analysis Technical Support Document for Battery Chargers. (Available at: *www.regulations.gov/document/EERE-2020-BT-STD-0013-0009*) (last accessed Sept. 12, 2022)

400-1000Wh (RPU 420Wh)	19.7%	27.5%	37.6%	15.2%
>1000Wh (RPU 2000Wh)	38.5%	36.1%	13.6%	11.8%
Fixed-Location wireless charger	8.3%	25.0%	58.3%	8.3%
Open-Placement wireless charger	6.7%	20.0%	20.0%	53.3%

7. Payback Period Analysis

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

The inputs to the PBP calculation for each efficiency level are the change in total installed cost of the product and the change in the first-year annual operating expenditures relative to the baseline. DOE refers to this as a “simple PBP” because it does not consider changes over time in operating cost savings. The PBP calculation uses the same inputs as the LCC analysis when deriving first-year operating costs.

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

The Joint Trade Associations and Delta-Q commented that amended standards for battery chargers are not economically justified because the payback periods are far longer than the average useful life of the product; therefore, most consumers will experience a net cost through amended standards. The Joint Trade Associations further recommended that DOE focus on other rulemakings for potential significant energy savings. (Joint Trade Associations, No. 17 at p. 1; Delta-Q, No. 20 at p. 1)

DOE notes that the preliminary analysis did not propose any specific standard level. For this NOPR, DOE's evaluation of the economic justification of potential standard levels, including the consideration of payback periods, is provided in section V.C.

G. Shipments Analysis

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

[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.

stocks is a key input to calculations of both the national energy savings ("NES") and NPV, because operating costs for any year depend on the age distribution of the stock.

In the March 2022 Preliminary Analysis, DOE developed shipments estimates based on actual shipments from 2019 and a population growth rate based on U.S. Census population projections through 2050.[31] DOE did not receive any comments on the shipments analysis and therefore used this same approach in the NOPR.

See Chapter 9 of the NOPR TSD for more detail on the shipments analysis.

DOE requests comment on its methodology for estimating shipments. DOE also requests comment on its approach to estimate the market share for EPSs of all product classes.

H. National Impact Analysis

The NIA assesses the NES and the NPV from a national perspective of total consumer costs and savings that would be expected to result from new or amended standards at specific efficiency levels.[32] ("Consumer" in this context refers to consumers of the product being regulated.) DOE calculates the NES and NPV for the potential standard levels considered based on projections of annual product shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC

[31] See Chapter 9 of the 2022 Preliminary Analysis Technical Support Document for Battery Chargers. (Available at: *www.regulations.gov/document/EERE-2020-BT-STD-0013-0009*) (last accessed Sept. 12, 2022)
[32] The NIA accounts for impacts in the 50 states and U.S. territories.

analyses. For the present analysis, DOE projected the energy savings, operating cost savings, product costs, and NPV of consumer benefits over the lifetime of battery chargers sold from 2027 through 2056.

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

DOE uses a spreadsheet model to calculate the energy savings and the national consumer costs and savings from each 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.9 summarizes the inputs and methods DOE used for the NIA analysis for the NOPR. Discussion of these inputs and methods follows the table. See chapter 10 of the NOPR TSD for further details.

Table IV.9 Summary of Inputs and Methods for the National Impact Analysis

Inputs	Method
Shipments	Annual shipments from shipments model.
Compliance Date of Standard	2027
Efficiency Trends	No-new-standards case: Varies by application.
Annual Energy Consumption per Unit	Annual weighted-average values are a function of energy use at each TSL.
Total Installed Cost per Unit	Annual weighted-average values are a function of cost at each TSL. Incorporates projection of future product prices based on historical data.
Annual Energy Cost per Unit	Annual weighted-average values as a function of the annual energy consumption per unit and energy prices.
Repair and Maintenance Cost per Unit	Annual values do not change with efficiency level.
Energy Price Trends	*AEO2022* projections (to 2050) and extrapolation thereafter based on the growth rate from 2023-2050.
Energy Site-to-Primary and FFC Conversion	A time-series conversion factor based on *AEO2022*.
Discount Rate	3 percent and 7 percent
Present Year	2022

1. Product Efficiency Trends

A key component of the NIA is the trend in energy efficiency projected for the no-new-standards case and each of the standards cases. Section IV.F.6 of this document describes how DOE developed an energy efficiency distribution for the no-new-standards case (which yields a shipment-weighted average efficiency) for each of the considered product classes for the first full year of anticipated compliance with an amended or new standard. To project the trend in efficiency absent amended standards for battery chargers over the entire shipments projection period, DOE assumed a constant efficiency trend. The approach is further described in chapter 10 of the NOPR TSD.

For the standards cases, DOE used a "roll-up" scenario to establish the shipment-weighted efficiency for the year that standards are assumed to become effective (2027). In this scenario, the market shares of products in the no-new-standards case that do not meet the standard under consideration would "roll up" to meet the new standard level, and the market share of products above the standard would remain unchanged.

To develop standards case efficiency trends after 2027, DOE used a constant efficiency trend, keeping the distribution equal to the compliance year.

2. National Energy Savings

The national energy savings analysis involves a comparison of national energy consumption of the considered products between each potential standards case ("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 product (by vintage or age) by the unit energy consumption (also by vintage). DOE calculated annual NES based on the difference in national energy consumption for the no-new standards case and for each higher efficiency 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 *AEO2022*. Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

Use of higher-efficiency products is occasionally associated with a direct rebound effect, which refers to an increase in utilization of the product due to the increase in efficiency. DOE did not consider a rebound effect in this analysis, because the price differences by EL and energy use are so small that any rebound effect would be close to zero.

In 2011, in response to the recommendations of a committee on "Point-of-Use and Full-Fuel-Cycle Measurement Approaches to Energy Efficiency Standards" appointed by the National Academy of Sciences, DOE announced its intention to use FFC measures of energy use and greenhouse gas and other emissions in the national impact analyses and emissions analyses included in future energy conservation standards rulemakings. 76 FR 51281 (Aug. 18, 2011). After evaluating the approaches discussed in the August 18, 2011 notice, DOE published a statement of amended policy in which DOE explained its determination that EIA's National Energy Modeling System ("NEMS") is the most appropriate tool for its FFC analysis and its intention to use NEMS for that purpose. 77 FR 49701 (Aug. 17, 2012). NEMS is a public domain, multi-sector, partial equilibrium model of the U.S. energy sector[33] 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 NOPR TSD.

3. Net Present Value Analysis

The inputs for determining the NPV of the total costs and benefits experienced by consumers are (1) total annual installed cost, (2) total annual operating costs (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

[33] For more information on NEMS, refer to *The National Energy Modeling System: An Overview 2009*, DOE/EIA-0581(2009), October 2009. Available at *www.eia.gov/forecasts/aeo/index.cfm* (last accessed December 2, 2022).

between the no-new-standards case and each standards case in terms of total savings in operating costs versus total increases in installed costs. DOE calculates operating cost savings over the lifetime of each product shipped during the projection period.

As discussed in section IV.F.1 of this document, DOE developed battery charger price trends based on historical PPI data for the semiconductor industry. DOE applied the same trends to project prices for each product class at each considered efficiency level. By 2056, which is the end date of the projection period, the average battery charger price is projected to drop 90 percent relative to 2021. DOE's projection of product prices is described in chapter 8 of the NOPR TSD.

The operating cost savings are energy cost savings, which are calculated using the estimated energy savings in each year and the projected price of the appropriate form of energy. To estimate energy prices in future years, DOE multiplied the average regional energy prices by the projection of annual national-average residential and commercial energy price changes in the Reference case from *AEO2022*, which has an end year of 2050. To estimate price trends after 2050, DOE used the average annual rate of change in prices from 2020 through 2050.

In calculating the NPV, DOE multiplies the net savings in future years by a discount factor to determine their present value. For this NOPR, DOE estimated the NPV of consumer benefits using both a 3-percent and a 7-percent real discount rate. DOE uses these discount rates in accordance with guidance provided by the Office of Management and Budget ("OMB") to Federal agencies on the development of regulatory analysis.[34] The discount rates for the determination of NPV are in contrast to the discount rates used in the LCC analysis, which are designed to reflect a consumer's perspective. The 7-percent real value is an estimate of the average before-tax rate of return to private capital in the U.S. economy. The 3-percent real value represents the "social rate of time preference," which is the rate at which society discounts future consumption flows to their present value.

I. Consumer Subgroup Analysis

In analyzing the potential impact of new or amended energy conservation standards on consumers, DOE evaluates the impact on identifiable subgroups of consumers that may be disproportionately affected by a new or amended national standard. The purpose of a subgroup analysis is to determine the extent of any such disproportional impacts. DOE evaluates impacts on particular subgroups of consumers by analyzing the LCC impacts and PBP for those particular consumers from alternative standard levels. For this NOPR, DOE analyzed the impacts of the considered standard levels on one subgroup: low-income households. The analysis used subsets of the RECS 2015 and CBECS 2018 sample composed of households that meet the criteria for the two subgroups. DOE used the LCC and PBP spreadsheet model to estimate the impacts of

[34] United States Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. Section E. Available at *georgewbush-whitehouse.archives.gov/omb/memoranda/m03-21.html* (last accessed December 2, 2022).

the considered efficiency levels on these subgroups. Chapter 11 in the NOPR TSD describes the consumer subgroup analysis.

J. Manufacturer Impact Analysis

1. Overview

DOE performed an MIA to estimate the financial impacts of amended energy conservation standards on manufacturers of battery chargers and to estimate the potential impacts of such standards on employment and manufacturing capacity. The MIA has both quantitative and qualitative aspects and includes analyses of projected industry cash flows, the INPV, investments in research and development ("R&D") and manufacturing capital, and domestic manufacturing employment. Additionally, the MIA seeks to determine how amended energy conservation standards might affect manufacturing employment, capacity, and competition, as well as how standards contribute to overall regulatory burden. Finally, the MIA serves to identify any disproportionate impacts on manufacturer subgroups, including small business manufacturers.

The quantitative part of the MIA primarily relies on the Government Regulatory Impact Model ("GRIM"), an industry cash flow model with inputs specific to this rulemaking. The key GRIM inputs include data on the industry cost structure, unit production costs, product shipments, manufacturer markups, and investments in R&D and manufacturing capital required to produce compliant products. The key GRIM outputs are the INPV, which is the sum of industry annual cash flows over the analysis period, discounted using the industry-weighted average cost of capital, and the impact to domestic manufacturing employment. The model uses standard accounting principles to estimate the impacts of more-stringent energy conservation standards on a given industry by comparing changes in INPV and domestic manufacturing employment between a no-new-standards case and the various standards cases ("TSLs"). To capture the uncertainty relating to manufacturer pricing strategies following amended standards, the GRIM estimates a range of possible impacts under different markup scenarios.

The qualitative part of the MIA addresses manufacturer characteristics and market trends. Specifically, the MIA considers such factors as a potential standard's impact on manufacturing capacity, competition within the industry, the cumulative impact of other DOE and non-DOE regulations, as well as impacts on manufacturer subgroups. The complete MIA is outlined in chapter 12 of the NOPR TSD.

DOE conducted the MIA for this rulemaking in three phases. In Phase 1 of the MIA, DOE prepared a profile of the battery charger manufacturing industry based on the market and technology assessment, manufacturer interviews, and publicly-available information. This included a top-down analysis of battery charger manufacturers that DOE used to derive preliminary financial inputs for the GRIM (*e.g.*, revenues; materials, labor, overhead, and depreciation expenses; selling, general, and administrative expenses ("SG&A"); and R&D expenses). DOE also used public sources of information to further calibrate its initial characterization of the battery charger manufacturing industry, including company filings of form 10-K from the U.S. Securities and Exchange

Commission ("SEC"),[35] corporate annual reports, the U.S. Census Bureau's *Economic Census*,[36] and reports from D&B Hoovers.[37]

In Phase 2 of the MIA, DOE prepared a framework industry cash-flow analysis to quantify the potential impacts of amended energy conservation standards. The GRIM uses several factors to determine a series of annual cash flows starting with the announcement of the standard and extending over a 30-year period following the compliance date of the standard. These factors include annual expected revenues, costs of sales, SG&A and R&D expenses, taxes, and capital expenditures. In general, energy conservation standards can affect manufacturer cash flow in three distinct ways: (1) creating a need for increased investment, (2) raising production costs per unit, and (3) altering revenue due to higher per-unit prices and changes in sales volumes.

In Phase 3 of the MIA, DOE also evaluated subgroups of manufacturers that may be disproportionately impacted by amended standards or that may not be accurately represented by the average cost assumptions used to develop the industry cash flow analysis. Such manufacturer subgroups may include small business manufacturers, low-volume manufacturers ("LVMs"), niche players, and/or manufacturers exhibiting a cost structure that largely differs from the industry average. DOE identified subgroups for separate impact analysis: the small appliance application industry segment, the consumer electronics application industry segment, the power tools application industry segment,

---

[35] *See www.sec.gov/edgar.shtml.*
[36] *See www.census.gov/programs-surveys/asm/data.html.*
[37] *See app.dnbhoovers.com.*

and the high energy application industry segment, as well as small business manufacturers. The small business subgroup is discussed in section VI.B of this document, "Review under the Regulatory Flexibility Act", and in chapter 12 of the NOPR TSD.

2. Government Regulatory Impact Model and Key Inputs

DOE uses the GRIM to quantify the changes in cash flow due to amended standards that result in a higher or lower industry value. The GRIM uses a standard, annual discounted cash-flow analysis that incorporates manufacturer costs, markups, shipments, and industry financial information as inputs. The GRIM models change in costs, distribution of shipments, investments, and manufacturer margins that could result from an amended energy conservation standard. The GRIM uses the inputs to arrive at a series of annual cash flows, beginning in 2023 (the reference year) and continuing to 2056. DOE calculated INPVs by summing the stream of annual discounted cash flows during this period. For manufacturers of battery charger applications, DOE used a real discount rate of 9.1 percent, which was the same value used in the August 2016 Final Rule.

The GRIM calculates cash flows using standard accounting principles and compares changes in INPV between the no-new-standards case and each standards case. The difference in INPV between the no-new-standards case and a standards case represents the financial impact of the amended energy conservation standard on manufacturers. As discussed previously, DOE developed critical GRIM inputs using a number of sources, including publicly available data, results of the engineering analysis, and information gathered from industry stakeholders. The GRIM results are presented in section V.B.2 of this document. Additional details about the GRIM, the discount rate, and other financial parameters can be found in chapter 12 of the NOPR TSD.

a. Manufacturer Production Costs

Manufacturing more efficient products is typically more expensive than manufacturing baseline products due to the use of more complex components, which are typically more costly than baseline components. The changes in the MPCs of covered products can affect the revenues, gross margins, and cash flow of the industry. Throughout its analysis of manufacturers, DOE adjusted the MPC value of battery chargers but did not adjust the value of battery charger applications—focusing on the changes to the overall product package caused by possible amended standards on battery chargers. An overview of the methodology used to generate MPCs of battery chargers is in the engineering analysis (see section IV.C.2), and a complete discussion of the MPCs can be found in chapter 5 of the NOPR TSD.

b. Shipments Projections

The GRIM estimates manufacturer revenues based on total unit shipment projections and the distribution of those shipments by efficiency level. Changes in sales volumes and efficiency mix over time can significantly affect manufacturer finances. For this analysis, the GRIM uses the NIA's annual shipment projections derived from the shipments analysis from 2023 (the reference year) to 2056 (the end year of the analysis period). A complete discussion of shipments can be found in chapter 9 of the NOPR.

c. Product and Capital Conversion Costs

Amended energy conservation standards could cause manufacturers to incur conversion costs to bring their production facilities and product designs into compliance. DOE evaluated the level of conversion-related expenditures that would be needed to comply with each considered efficiency level in each product class. For the MIA, DOE classified these conversion costs into two major groups: (1) product conversion costs; and (2) capital conversion costs. Product conversion costs are investments in research, development, testing, marketing, and other non-capitalized costs necessary to make product designs comply with amended energy conservation standards. Capital conversion costs are investments in property, plant, and equipment necessary to adapt or change existing production facilities such that new compliant product designs can be fabricated and assembled.

DOE anticipates that, while amended standards would not fundamentally alter the manufacturing process for battery chargers, battery charger application manufacturers would incur capital conversion costs as a result of amended standards. These costs would take the form of updated tooling, new or altered plastic molds, and additional or new testing equipment. DOE developed estimates of the conversion costs using estimated revenues related to battery charger applications, the capital expenditure factor of revenue used in the August 2016 Final Rule for each industry segment, and research related to the engineering analysis. These capital conversion cost estimates can be found in section V.B.2.a of this document. DOE assumes that all capital conversion costs would occur between the date of the final rule publication and the compliance date.

DOE does also expect that manufacturers would incur product redesign costs due to amended standards. Manufacturers may need to redesign models outside of their normal product redesign cycles and would need to design around a higher minimum efficiency constraint. To evaluate the level of product conversion costs manufacturers would likely incur to comply with amended energy conservation standards, DOE developed estimates of product conversion costs for each product class at each efficiency level using estimated revenues related to battery charger applications, the R&D factor of revenue used in the August 2016 Final Rule for each industry segment, and research related to the engineering analysis. The product conversion cost estimates used in the GRIM can be found in section V.B.2.a of this document. DOE assumes that all product conversion costs would occur between the date of the final rule publication and the compliance date.

For additional information on the estimated conversion costs and the related methodology, see chapter 12 of the NOPR TSD.

d. Markup Scenarios

MSPs include direct manufacturing production costs (*i.e.*, labor, materials, and overhead estimated in DOE's MPCs) and all non-production costs (*i.e.*, SG&A, R&D, and interest), along with profit. To calculate the MSPs in the GRIM, DOE applied non-production cost markups to the MPCs estimated in the engineering analysis for each product class and efficiency level. Modifying these markups in the standards case yields different sets of impacts on manufacturers. For the MIA, DOE modeled two standards-case markup scenarios to represent uncertainty regarding the potential impacts on prices and profitability for manufacturers following the implementation of amended energy conservation standards: (1) a preservation of gross margin scenario; and (2) a constant price scenario. These scenarios lead to different margins that, when applied to the MPCs, result in varying revenue and cash flow impacts.

Under the preservation of gross margin scenario, DOE applied a single uniform gross margin across all efficiency levels, which assumes that manufacturers would be able to maintain the same amount of profit as a percentage of revenues at all efficiency levels within a product class. This scenario represents the upper bound of INPV impacts modeled by DOE in this analysis.

Under the constant price markup scenario, DOE modeled a situation in which manufacturers do not adjust their prices in response to increased MPCs of battery chargers. This scenario represents the lower bound of INPV impacts modeled by DOE in this analysis.

A comparison of industry financial impacts under the two markup scenarios is presented in section V.B.2.a of this document.

3. Manufacturer Interviews

DOE interviewed battery charger manufacturers, battery charger application manufacturers, and industry stakeholders in order to develop its analysis.

In interviews, DOE asked manufacturers to describe their major concerns regarding this rulemaking. The following section highlights manufacturer concerns, related to the MIA, that helped inform the projected potential impacts of an amended standard on the industry. Manufacturer interviews are conducted under non-disclosure agreements ("NDAs"), so DOE does not document these discussions in the same way that it does public comments in the comment summaries and DOE's responses throughout the rest of this document.

Manufacturers communicated concerns generally over the potential costs imposed by amended energy conservation standards. Product redesign related costs were noted as the most substantial likely costs, but also that capital conversion costs would be imposed on both application and battery charger manufacturers and could be quite substantial depending on the extent of possible changes.

Manufacturers additionally noted concerns around engineering manpower related to potential product redesigns as a major concern. Several manufacturers described limited qualified staff and difficulty retaining and hiring staff in recent times. As such, it may be difficult to hire and possibly train additional staff on relatively short notice. Further, while manufacturers may have the capacity to engage in substantial product redesigns in order to comply with amended efficiency standards, standards would also impose an opportunity cost since those engineers would have to be redirected from projects intended to reduce production costs or improve non-efficiency-related product features.

Manufacturers also expressed concerns over tariffs, which cause manufacturers to avoid vendors from China or relocate manufacturing operations elsewhere abroad—such as Mexico—in order to avoid additional cost. This issue restricts the competitive set of potential vendors and diminishes manufacturer's ability to negotiate optimal prices.

K. Emissions Analysis

The emissions analysis consists of two components. The first component estimates the effect of potential energy conservation standards on power sector and site (where applicable) combustion emissions of CO_2, NO_X, SO_2, and Hg. The second component estimates the impacts of potential standards on emissions of two additional greenhouse gases, CH_4 and N_2O, as well as the reductions to emissions of other gases due to "upstream" activities in the fuel production chain. These upstream activities comprise extraction, processing, and transporting fuels to the site of combustion.

The analysis of electric power sector emissions of CO_2, NO_X, SO_2, and Hg uses emissions factors intended to represent the marginal impacts of the change in electricity consumption associated with amended or new standards. The methodology is based on results published for the *AEO*, including a set of side cases that implement a variety of efficiency-related policies. The methodology is described in appendix 13A in the NOPR TSD. The analysis presented in this NOPR uses projections from *AEO2022*. Power sector emissions of CH_4 and N_2O from fuel combustion are estimated using Emission

Factors for Greenhouse Gas Inventories published by the Environmental Protection Agency (EPA).[38]

FFC upstream emissions, which include emissions from fuel combustion during extraction, processing, and transportation of fuels, and "fugitive" emissions (direct leakage to the atmosphere) of CH_4 and CO_2, are estimated based on the methodology described in chapter 15 of the NOPR TSD.

The emissions intensity factors are expressed in terms of physical units per MWh or MMBtu of site energy savings. For power sector emissions, specific emissions intensity factors are calculated by sector and end use. Total emissions reductions are estimated using the energy savings calculated in the national impact analysis.

1. Air Quality Regulations Incorporated in DOE's Analysis

DOE's no-new-standards case for the electric power sector reflects the *AEO*, which incorporates the projected impacts of existing air quality regulations on emissions. *AEO2022* generally represents current legislation and environmental regulations, including recent government actions, that were in place at the time of preparation of *AEO2022*, including the emissions control programs discussed in the following paragraphs.[39]

[38] Available at www.epa.gov/sites/production/files/2021-04/documents/emission-factors_apr2021.pdf (last accessed July 12, 2021).

[39] For further information, see the Assumptions to *AEO2022* report that sets forth the major assumptions used to generate the projections in the Annual Energy Outlook. Available at *www.eia.gov/outlooks/aeo/assumptions/* (last accessed Oct. 12, 2022).

SO_2 emissions from affected electric generating units ("EGUs") are subject to nationwide and regional emissions cap-and-trade programs. Title IV of the Clean Air Act sets an annual emissions cap on SO_2 for affected EGUs in the 48 contiguous States and the District of Columbia (D.C.). (42 U.S.C. 7651 *et seq.*) SO_2 emissions from numerous States in the eastern half of the United States are also limited under the Cross-State Air Pollution Rule ("CSAPR"). 76 FR 48208 (Aug. 8, 2011). CSAPR requires these States to reduce certain emissions, including annual SO_2 emissions, and went into effect as of January 1, 2015.[40] *AEO2022* incorporates implementation of CSAPR, including the update to the CSAPR ozone season program emission budgets and target dates issued in 2016. 81 FR 74504 (Oct. 26, 2016). Compliance with CSAPR is flexible among EGUs and is enforced through the use of tradable emissions allowances. Under existing EPA regulations, any excess SO_2 emissions allowances resulting from the lower electricity demand caused by the adoption of an efficiency standard could be used to permit offsetting increases in SO_2 emissions by another regulated EGU.

However, beginning in 2016, SO_2 emissions began to fall as a result of the Mercury and Air Toxics Standards ("MATS") for power plants. 77 FR 9304 (Feb. 16, 2012). The final rule establishes power plant emission standards for mercury, acid gases, and non-mercury metallic toxic pollutants. In order to continue operating, coal power

[40] CSAPR requires states to address annual emissions of SO_2 and NO_X, precursors to the formation of fine particulate matter ($PM_{2.5}$) pollution, in order to address the interstate transport of pollution with respect to the 1997 and 2006 $PM_{2.5}$ National Ambient Air Quality Standards ("NAAQS"). CSAPR also requires certain states to address the ozone season (May-September) emissions of NO_X, a precursor to the formation of ozone pollution, in order to address the interstate transport of ozone pollution with respect to the 1997 ozone NAAQS. 76 FR 48208 (Aug. 8, 2011). EPA subsequently issued a supplemental rule that included an additional five states in the CSAPR ozone season program. 76 FR 80760 (Dec. 27, 2011) (Supplemental Rule).

plants must have either flue gas desulfurization or dry sorbent injection systems installed. Both technologies, which are used to reduce acid gas emissions, also reduce SO_2 emissions. Because of the emissions reductions under the MATS, it is unlikely that excess SO_2 emissions allowances resulting from the lower electricity demand would be needed or used to permit offsetting increases in SO_2 emissions by another regulated EGU. Therefore, energy conservation standards that decrease electricity generation would generally reduce SO_2 emissions. DOE estimated SO_2 emissions reduction using emissions factors based on *AEO2022*.

CSAPR also established limits on NO_X emissions for numerous States in the eastern half of the United States. Energy conservation standards would have little effect on NO_X emissions in those States covered by CSAPR emissions limits if excess NO_X emissions allowances resulting from the lower electricity demand could be used to permit offsetting increases in NO_X emissions from other EGUs. In such case, NO_X emissions would remain near the limit even if electricity generation goes down. A different case could possibly result, depending on the configuration of the power sector in the different regions and the need for allowances, such that NO_X emissions might not remain at the limit in the case of lower electricity demand. In this case, energy conservation standards might reduce NOx emissions in covered States. Despite this possibility, DOE has chosen to be conservative in its analysis and has maintained the assumption that standards will not reduce NO_X emissions in States covered by CSAPR. Energy conservation standards would be expected to reduce NO_X emissions in the States not covered by CSAPR. DOE used *AEO2022* data to derive NO_X emissions factors for the group of States not covered by CSAPR.

The MATS limit mercury emissions from power plants, but they do not include emissions caps and, as such, DOE's energy conservation standards would be expected to slightly reduce Hg emissions. DOE estimated mercury emissions reduction using emissions factors based on *AEO2022*, which incorporates the MATS.

L. Monetizing Emissions Impacts

As part of the development of this proposed rule, for the purpose of complying with the requirements of Executive Order 12866, DOE considered the estimated monetary benefits from the reduced emissions of CO_2, CH_4, N_2O, NO_X, and SO_2 that are expected to result from each of the TSLs considered. In order to make this calculation analogous to the calculation of the NPV of consumer benefit, DOE considered the reduced emissions expected to result over the lifetime of products shipped in the projection period for each TSL. This section summarizes the basis for the values used for monetizing the emissions benefits and presents the values considered in this NOPR.

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

1. Monetization of Greenhouse Gas Emissions

DOE estimates the monetized benefits of the reductions in emissions of CO_2, CH_4, and N_2O by using a measure of the social cost of each pollutant (*e.g.*, SC-CO_2). These estimates represent the monetary value of the net harm to society associated with a marginal increase in emissions of these pollutants in a given year, or the benefit of avoiding that increase. These estimates are intended to include (but are not limited to) climate-change-related changes in net agricultural productivity, human health, property damages from increased flood risk, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services.

DOE exercises its own judgment in presenting monetized climate benefits as recommended by applicable Executive orders, and DOE would reach the same conclusion presented in this proposed rulemaking in the absence of the social cost of greenhouse gases, including the February 2021 Interim Estimates presented by the Interagency Working Group on the Social Cost of Greenhouse Gases.

DOE estimated the global social benefits of CO_2, CH_4, and N_2O reductions (i.e., SC-GHGs) using the estimates presented in the Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order

13990, published in February 2021 by the IWG ("February 2021 SC-GHG TSD"). The SC-GHGs is the monetary value of the net harm to society associated with a marginal increase in emissions in a given year, or the benefit of avoiding that increase. In principle, SC-GHGs includes the value of all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk and natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. The SC-GHGs therefore, reflects the societal value of reducing emissions of the gas in question by one metric ton. The SC-GHGs is the theoretically appropriate value to use in conducting benefit-cost analyses of policies that affect CO_2, N_2O and CH_4 emissions.

As a member of the IWG involved in the development of the February 2021 SC-GHG TSD, DOE agrees that the interim SC-GHG estimates represent the most appropriate estimate of the SC-GHG until revised estimates have been developed reflecting the latest, peer-reviewed science.

The SC-GHGs estimates presented here were developed over many years, using transparent process, peer-reviewed methodologies, the best science available at the time of that process, and with input from the public. Specifically, in 2009, the IWG, which included the DOE and other executive branch agencies and offices, was established to ensure that agencies were using the best available science and to promote consistency in the social cost of carbon ("SC-CO_2") values used across agencies. The IWG published SC-CO_2 estimates in 2010 that were developed from an ensemble of three widely cited integrated assessment models ("IAMs") that estimate global climate damages using highly aggregated representations of climate processes and the global economy combined into a single modeling framework. The three IAMs were run using a common set of input assumptions in each model for future population, economic, and CO_2 emissions growth, as well as equilibrium climate sensitivity – a measure of the globally averaged temperature response to increased atmospheric CO_2 concentrations. These estimates were updated in 2013 based on new versions of each IAM. In August 2016 the IWG published estimates of the social cost of methane ("SC-CH_4") and nitrous oxide ("SC-N_2O") using methodologies that are consistent with the methodology underlying the SC-CO_2 estimates. The modeling approach that extends the IWG SC-CO_2 methodology to non-CO_2 GHGs has undergone multiple stages of peer review. The SC-CH_4 and SC-N_2O estimates were developed by Marten *et al.*[41] and underwent a standard double-blind peer review process prior to journal publication.

In 2015, as part of the response to public comments received to a 2013 solicitation for comments on the SC-CO_2 estimates, the IWG announced a National Academies of Sciences, Engineering, and Medicine review of the SC-CO_2 estimates to offer advice on how to approach future updates to ensure that the estimates continue to reflect the best available science and methodologies. In January 2017, the National Academies released their final report, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide, and recommended specific criteria for future updates to the SC-CO_2 estimates, a modeling framework to satisfy the specified criteria, and both near-term

---

[41] Marten, A. L., E. A. Kopits, C. W. Griffiths, S. C. Newbold, and A. Wolverton. Incremental CH4 and N2O mitigation benefits consistent with the US Government's SC-CO2 estimates. *Climate Policy*. 2015. 15(2): pp. 272–298.

updates and longer-term research needs pertaining to various components of the estimation process (National Academies, 2017).[42] Shortly thereafter, in March 2017, President Trump issued Executive Order 13783, which disbanded the IWG, withdrew the previous TSDs, and directed agencies to ensure SC-CO_2 estimates used in regulatory analyses are consistent with the guidance contained in OMB's Circular A-4, "including with respect to the consideration of domestic versus international impacts and the consideration of appropriate discount rates" (EO 13783, Section 5(c)). Benefit-cost analyses following E.O. 13783 used SC-GHG estimates that attempted to focus on the U.S.-specific share of climate change damages as estimated by the models and were calculated using two discount rates recommended by Circular A-4, 3 percent and 7 percent. All other methodological decisions and model versions used in SC-GHG calculations remained the same as those used by the IWG in 2010 and 2013, respectively.

On January 20, 2021, President Biden issued Executive Order 13990, which re-established the IWG and directed it to ensure that the U.S. Government's estimates of the social cost of carbon and other greenhouse gases reflect the best available science and the recommendations of the National Academies (2017). The IWG was tasked with first reviewing the SC-GHG estimates currently used in Federal analyses and publishing interim estimates within 30 days of the E.O. that reflect the full impact of GHG emissions, including by taking global damages into account. The interim SC-GHG estimates published in February 2021 are used here to estimate the climate benefits for this proposed rulemaking. The E.O. instructs the IWG to undertake a fuller update of the

[42] National Academies of Sciences, Engineering, and Medicine. *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide*. 2017. The National Academies Press: Washington, DC.

SC-GHG estimates by January 2022 that takes into consideration the advice of the National Academies (2017) and other recent scientific literature. The February 2021 SC-GHG TSD provides a complete discussion of the IWG's initial review conducted under E.O.13990. In particular, the IWG found that the SC-GHG estimates used under E.O. 13783 fail to reflect the full impact of GHG emissions in multiple ways.

First, the IWG found that the SC-GHG estimates used under E.O. 13783 fail to fully capture many climate impacts that affect the welfare of U.S. citizens and residents, and those impacts are better reflected by global measures of the SC-GHG. Examples of omitted effects from the E.O. 13783 estimates include direct effects on U.S. citizens, assets, and investments located abroad, supply chains, U.S. military assets and interests abroad, tourism, and spillover pathways such as economic and political destabilization and global migration that can lead to adverse impacts on U.S. national security, public health, and humanitarian concerns. In addition, assessing the benefits of U.S. GHG mitigation activities requires consideration of how those actions may affect mitigation activities by other countries, as those international mitigation actions will provide a benefit to U.S. citizens and residents by mitigating climate impacts that affect U.S. citizens and residents. A wide range of scientific and economic experts have emphasized the issue of reciprocity as support for considering global damages of GHG emissions. If the United States does not consider impacts on other countries, it is difficult to convince other countries to consider the impacts of their emissions on the United States. The only way to achieve an efficient allocation of resources for emissions reduction on a global basis—and so benefit the U.S. and its citizens—is for all countries to base their policies on global estimates of damages. As a member of the IWG involved in the development of the February 2021 SC-GHG TSD, DOE agrees with this assessment and, therefore, in this proposed rule DOE centers attention on a global measure of SC-GHG. This approach is the same as that taken in DOE regulatory analyses from 2012 through 2016. A robust estimate of climate damages that accrue only to U.S. citizens and residents does not currently exist in the literature. As explained in the February 2021 SC-GHG TSD, existing estimates are both incomplete and an underestimate of total damages that accrue to the citizens and residents of the U.S. because they do not fully capture the regional interactions and spillovers discussed above, nor do they include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature. As noted in the February 2021 SC–GHG TSD, the IWG will continue to review developments in the literature, including more robust methodologies for estimating a U.S.-specific SC–GHG value, and explore ways to better inform the public of the full range of carbon impacts. As a member of the IWG, DOE will continue to follow developments in the literature pertaining to this issue.

Second, the IWG found that the use of the social rate of return on capital (7 percent under current OMB Circular A-4 guidance) to discount the future benefits of reducing GHG emissions inappropriately underestimates the impacts of climate change for the purposes of estimating the SC-GHG. Consistent with the findings of the National Academies (2017) and the economic literature, the IWG continued to conclude that the consumption rate of interest is the theoretically appropriate discount rate in an intergenerational context,[43] and recommended that discount rate uncertainty and relevant aspects of intergenerational ethical considerations be accounted for in selecting future discount rates.

Furthermore, the damage estimates developed for use in the SC-GHG are estimated in consumption-equivalent terms, and so an application of OMB Circular A-4's guidance for regulatory analysis would then use the consumption discount rate to calculate the SC-GHG. DOE agrees with this assessment and will continue to follow developments in the literature pertaining to this issue. DOE also notes that while OMB Circular A-4, as published in 2003, recommends using 3 percent and 7 percent discount rates as "default" values, Circular A-4 also reminds agencies that "different regulations may call for different emphases in the analysis, depending on the nature and complexity of the regulatory issues and the sensitivity of the benefit and cost estimates to the key assumptions." On discounting, Circular A-4 recognizes that "special ethical considerations arise when comparing benefits and costs across generations," and Circular A-4 acknowledges that analyses may appropriately "discount future costs and

[43] Interagency Working Group on Social Cost of Carbon. *Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866*. 2010. United States Government. (Last accessed April 15, 2022.) www.epa.gov/sites/default/files/2016-12/documents/scc_tsd_2010.pdf; Interagency Working Group on Social Cost of Carbon. *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. 2013. (Last accessed April 15, 2022.) *www.federalregister.gov/documents/2013/11/26/2013-28242/technical-support-document-technical-update-of-the-social-cost-of-carbon-for-regulatory-impact*; Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. Technical Support Document: Technical Update on the Social Cost of Carbon for Regulatory Impact Analysis-Under Executive Order 12866. August 2016. (Last accessed January 18, 2022.) *www.epa.gov/sites/default/files/2016-12/documents/sc_co2_tsd_august_2016.pdf*; Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide. August 2016. (Last accessed January 18, 2022.) *www.epa.gov/sites/default/files/2016-12/documents/addendum_to_sc-ghg_tsd_august_2016.pdf.*

consumption benefits…at a lower rate than for intragenerational analysis." In the 2015 Response to Comments on the Social Cost of Carbon for Regulatory Impact Analysis, OMB, DOE, and the other IWG members recognized that "Circular A-4 is a living document" and "the use of 7 percent is not considered appropriate for intergenerational discounting. There is wide support for this view in the academic literature, and it is recognized in Circular A-4 itself." Thus, DOE concludes that a 7 percent discount rate is not appropriate to apply to value the social cost of greenhouse gases in the analysis presented in this analysis.

To calculate the present and annualized values of climate benefits, DOE uses the same discount rate as the rate used to discount the value of damages from future GHG emissions, for internal consistency. That approach to discounting follows the same approach that the February 2021 TSD recommends "to ensure internal consistency—i.e., future damages from climate change using the SC-GHG at 2.5 percent should be discounted to the base year of the analysis using the same 2.5 percent rate." DOE has also consulted the National Academies' 2017 recommendations on how SC-GHG estimates can "be combined in RIAs with other cost and benefits estimates that may use different discount rates." The National Academies reviewed several options, including "presenting all discount rate combinations of other costs and benefits with SC-GHG estimates."

As a member of the IWG involved in the development of the February 2021 SC-GHG TSD, DOE agrees with the above assessment and will continue to follow developments in the literature pertaining to this issue. While the IWG works to assess how best to incorporate the latest, peer reviewed science to develop an updated set of SC-

GHG estimates, it set the interim estimates to be the most recent estimates developed by the IWG prior to the group being disbanded in 2017. The estimates rely on the same models and harmonized inputs and are calculated using a range of discount rates. As explained in the February 2021 SC-GHG TSD, the IWG has recommended that agencies revert to the same set of four values drawn from the SC-GHG distributions based on three discount rates as were used in regulatory analyses between 2010 and 2016 and were subject to public comment. For each discount rate, the IWG combined the distributions across models and socioeconomic emissions scenarios (applying equal weight to each) and then selected a set of four values recommended for use in benefit-cost analyses: an average value resulting from the model runs for each of three discount rates (2.5 percent, 3 percent, and 5 percent), plus a fourth value, selected as the 95th percentile of estimates based on a 3 percent discount rate. The fourth value was included to provide information on potentially higher-than-expected economic impacts from climate change. As explained in the February 2021 SC-GHG TSD, and DOE agrees, this update reflects the immediate need to have an operational SC-GHG for use in regulatory benefit-cost analyses and other applications that was developed using a transparent process, peer-reviewed methodologies, and the science available at the time of that process. Those estimates were subject to public comment in the context of dozens of proposed rulemakings as well as in a dedicated public comment period in 2013.

There are a number of limitations and uncertainties associated with the SC-GHG estimates. First, the current scientific and economic understanding of discounting approaches suggests discount rates appropriate for intergenerational analysis in the context of climate change are likely to be less than 3 percent, near 2 percent or lower.[44] Second, the IAMs used to produce these interim estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature and the science underlying their "damage functions" – i.e., the core parts of the IAMs that map global mean temperature changes and other physical impacts of climate change into economic (both market and nonmarket) damages – lags behind the most recent research. For example, limitations include the incomplete treatment of catastrophic and non-catastrophic impacts in the integrated assessment models, their incomplete treatment of adaptation and technological change, the incomplete way in which inter-regional and intersectoral linkages are modeled, uncertainty in the extrapolation of damages to high temperatures, and inadequate representation of the relationship between the discount rate and uncertainty in economic growth over long time horizons. Likewise, the socioeconomic and emissions scenarios used as inputs to the models do not reflect new information from the last decade of scenario generation or the full range of projections. The modeling limitations do not all work in the same direction in terms of their influence on the SC-CO_2 estimates. However, as discussed in the February 2021 TSD, the IWG has recommended that, taken together, the limitations suggest that the interim SC-GHG estimates used in this proposed rule likely underestimate the damages from GHG emissions. DOE concurs with this assessment.

[44] Interagency Working Group on Social Cost of Greenhouse Gases (IWG). 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990. February. United States Government. Available at: *www.whitehouse.gov/briefing-room/blog/2021/02/26/a-return-to-science-evidence-based-estimates-of-the-benefits-of-reducing-climate-pollution/*.

DOE's derivations of the $SC\text{-}CO_2$, $SC\text{-}N_2O$, and $SC\text{-}CH_4$ values used for this NOPR are discussed in the following sections, and the results of DOE's analyses estimating the benefits of the reductions in emissions of these GHGs are presented in section V.B.6 of this document.

a. Social Cost of Carbon

The $SC\text{-}CO_2$ values used for this NOPR were based on the values presented for the IWG's February 2021 TSD. Table IV.10 shows the updated sets of $SC\text{-}CO_2$ estimates from the IWG's TSD in 5-year increments from 2020 to 2050. The full set of annual values that DOE used is presented in appendix 14A of the NOPR TSD. For purposes of capturing the uncertainties involved in regulatory impact analysis, DOE has determined it is appropriate to include all four sets of $SC\text{-}CO_2$ values, as recommended by the IWG.[45]

Table IV.10 Annual $SC\text{-}CO_2$ Values from 2021 Interagency Update, 2020–2050 (2020$ per Metric Ton CO_2)

Year	Discount Rate and Statistic			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
2020	14	51	76	152
2025	17	56	83	169
2030	19	62	89	187
2035	22	67	96	206
2040	25	73	103	225
2045	28	79	110	242
2050	32	85	116	260

[45] For example, the February 2021 TSD discusses how the understanding of discounting approaches suggests that discount rates appropriate for intergenerational analysis in the context of climate change may be lower than 3 percent.

For 2051 to 2070, DOE used SC-CO_2 estimates published by EPA, adjusted to 2021$.[46] These estimates are based on methods, assumptions, and parameters identical to the 2020-2050 estimates published by the IWG.

DOE multiplied the CO_2 emissions reduction estimated for each year by the SC-CO_2 value for that year in each of the four cases. DOE adjusted the values to 2021$ using the implicit price deflator for gross domestic product ("GDP") from the Bureau of Economic Analysis. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the four cases using the specific discount rate that had been used to obtain the SC-CO_2 values in each case.

b. Social Cost of Methane and Nitrous Oxide

The SC-CH_4 and SC-N_2O values used for this NOPR were based on the values developed for the February 2021 TSD. Table IV.11 shows the updated sets of SC-CH_4 and SC- N_2O estimates from the latest interagency update in 5-year increments from 2020 to 2050. The full set of annual values used is presented in appendix 14A of the NOPR TSD. To capture the uncertainties involved in regulatory impact analysis, DOE has determined it is appropriate to include all four sets of SC-CH_4 and SC- N_2O values, as recommended by the IWG. DOE derived values after 2050 using the approach described above for the SC-CO_2.

[46] See EPA, *Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards: Regulatory Impact Analysis*, Washington, D.C., December 2021. Available at: *www.epa.gov/system/files/documents/2021-12/420r21028.pdf* (last accessed January 13, 2022).

Table IV.11 Annual SC-CH_4 and SC-N_2O Values from 2021 Interagency Update, 2020–2050 (2020$ per Metric Ton)

Year	SC-CH_4				SC-N_2O			
	Discount Rate and Statistic				Discount Rate and Statistic			
	5%	3%	2.5%	3%	5%	3%	2.5 %	3%
	Average	Average	Average	95th percentile	Average	Average	Average	95th percentile
2020	670	1500	2000	3900	5800	18000	27000	48000
2025	800	1700	2200	4500	6800	21000	30000	54000
2030	940	2000	2500	5200	7800	23000	33000	60000
2035	1100	2200	2800	6000	9000	25000	36000	67000
2040	1300	2500	3100	6700	10000	28000	39000	74000
2045	1500	2800	3500	7500	12000	30000	42000	81000
2050	1700	3100	3800	8200	13000	33000	45000	88000

DOE multiplied the CH_4 and N_2O emissions reduction estimated for each year by the SC-CH_4 and SC-N_2O estimates for that year in each of the cases. DOE adjusted the values to 2021$ using the implicit price deflator for gross domestic product ("GDP") from the Bureau of Economic Analysis. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the cases using the specific discount rate that had been used to obtain the SC-CH_4 and SC-N_2O estimates in each case.

2. Monetization of Other Emissions Impacts

For the NOPR, DOE estimated the monetized value of NO_X and SO_2 emissions reductions from electricity generation using the latest benefit per ton estimates for that sector from the EPA's Benefits Mapping and Analysis Program.[47] DOE used EPA's values for PM2.5-related benefits associated with NO_X and SO_2 and for ozone-related benefits associated with NO_X for 2025 2030, and 2040, calculated with discount rates of

[47] *Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 21 Sectors*. www.epa.gov/benmap/estimating-benefit-ton-reducing-pm25-precursors-21-sectors

3 percent and 7 percent. DOE used linear interpolation to define values for the years not given in the 2025 to 2040 period; for years beyond 2040 the values are held constant. DOE derived values specific to the sector for battery chargers using a method described in appendix 14B of the NOPR TSD.

M. Utility Impact Analysis

The utility impact analysis estimates several effects on the electric power generation industry that would result from the adoption of new or amended energy conservation standards. The utility impact analysis estimates the changes in installed electrical capacity and generation that would result for each TSL. The analysis is based on published output from the NEMS associated with *AEO2022*. NEMS produces the *AEO* Reference case, as well as a number of side cases that estimate the economy-wide impacts of changes to energy supply and demand. For the current analysis, impacts are quantified by comparing the levels of electricity sector generation, installed capacity, fuel consumption and emissions in the *AEO2022* Reference case and various side cases. Details of the methodology are provided in the appendices to chapters 13 and 15 of the NOPR TSD.

The output of this analysis is a set of time-dependent coefficients that capture the change in electricity generation, primary fuel consumption, installed capacity and power sector emissions due to a unit reduction in demand for a given end use. These coefficients are multiplied by the stream of electricity savings calculated in the NIA to provide estimates of selected utility impacts of potential new or amended energy conservation standards.

N. Employment Impact Analysis

DOE considers employment impacts in the domestic economy as one factor in selecting a proposed standard. Employment impacts from new or amended energy conservation standards include both direct and indirect impacts. Direct employment impacts are any changes in the number of employees of manufacturers of the products subject to standards, their suppliers, and related service firms. The MIA addresses those impacts. Indirect employment impacts are changes in national employment that occur due to the shift in expenditures and capital investment caused by the purchase and operation of more-efficient appliances. Indirect employment impacts from standards consist of the net jobs created or eliminated in the national economy, other than in the manufacturing sector being regulated, caused by (1) reduced spending by consumers on energy, (2) reduced spending on new energy supply by the utility industry, (3) increased consumer spending on the products to which the new standards apply and other goods and services, and (4) the effects of those three factors throughout the economy.

One method for assessing the possible effects on the demand for labor of such shifts in economic activity is to compare sector employment statistics developed by the Labor Department's Bureau of Labor Statistics ("BLS"). BLS regularly publishes its estimates of the number of jobs per million dollars of economic activity in different sectors of the economy, as well as the jobs created elsewhere in the economy by this same economic activity. Data from BLS indicate that expenditures in the utility sector generally create fewer jobs (both directly and indirectly) than expenditures in other sectors of the economy.[48] There are many reasons for these differences, including wage differences and the fact that the utility sector is more capital-intensive and less labor-intensive than other sectors. Energy conservation standards have the effect of reducing consumer utility bills. Because reduced consumer expenditures for energy likely lead to increased expenditures in other sectors of the economy, the general effect of efficiency standards is to shift economic activity from a less labor-intensive sector (*i.e.*, the utility sector) to more labor-intensive sectors (*e.g.*, the retail and service sectors). Thus, the BLS data suggest that net national employment may increase due to shifts in economic activity resulting from energy conservation standards.

DOE estimated indirect national employment impacts for the standard levels considered in this NOPR using an input/output model of the U.S. economy called Impact of Sector Energy Technologies version 4 ("ImSET").[49] ImSET is a special-purpose version of the "U.S. Benchmark National Input-Output" ("I-O") model, which was designed to estimate the national employment and income effects of energy-saving technologies. The ImSET software includes a computer- based I-O model having structural coefficients that characterize economic flows among 187 sectors most relevant to industrial, commercial, and residential building energy use.

---

[48] See U.S. Department of Commerce–Bureau of Economic Analysis. *Regional Input-Output Modeling System (RIMS II) User's Guide*. (Available at: *www.bea.gov/resources/methodologies/RIMSII-user-guide*) (last accessed Sept. 12, 2022).
[49] Livingston, O. V., S. R. Bender, M. J. Scott, and R. W. Schultz. *ImSET 4.0: Impact of Sector Energy Technologies Model Description and User Guide.* 2015. Pacific Northwest National Laboratory: Richland, WA. PNNL-24563.

DOE notes that ImSET is not a general equilibrium forecasting model, and that the uncertainties involved in projecting employment impacts, especially changes in the later years of the analysis. Because ImSET does not incorporate price changes, the employment effects predicted by ImSET may over-estimate actual job impacts over the long run for this rule. Therefore, DOE used ImSET only to generate results for near-term timeframes (2027-2032), where these uncertainties are reduced. For more details on the employment impact analysis, see chapter 16 of the NOPR TSD.

V. Analytical Results and Conclusions

The following section addresses the results from DOE's analyses with respect to the considered energy conservation standards for battery chargers. It addresses the TSLs examined by DOE, the projected impacts of each of these levels if adopted as energy conservation standards for battery chargers, and the standards levels that DOE is proposing to adopt in this NOPR. Additional details regarding DOE's analyses are contained in the NOPR TSD supporting this document.

A. Trial Standard Levels

In general, DOE typically evaluates potential amended standards for products and equipment by grouping individual efficiency levels for each class into TSLs. Use of TSLs allows DOE to identify and consider manufacturer cost interactions between the product classes, to the extent that there are such interactions, and market cross elasticity from consumer purchasing decisions that may change when different standard levels are set.

In the analysis conducted for this NOPR, DOE analyzed the benefits and burdens of four TSLs for battery chargers. DOE developed TSLs that combine efficiency levels for each analyzed product class. DOE presents the results for the TSLs in this document, while the results for all efficiency levels that DOE analyzed are in the NOPR TSD.

Table V.1 presents the TSLs and the corresponding efficiency levels that DOE has identified for potential amended energy conservation standards for battery chargers. TSL 4 represents the maximum technologically feasible ("max-tech") energy efficiency for all product classes.

Table V.1 Trial Standard Levels for Battery Chargers

	Product Class				
TSL	**1a Fixed-Location Wireless**	**1b Open-Placement Wireless**	**2a Low-Energy Wired**	**2b Medium-Energy Wired**	**2c High-Energy Wired**
1	1	1	1	1	1
2	1	1	2	2	2
3	2	2	2	2	2
4	3	3	3	3	3

DOE constructed the TSLs for this NOPR to include ELs representative of ELs with similar characteristics (*i.e.*, using similar technologies and/or efficiencies, and having roughly comparable product availability). The use of representative ELs provided for greater distinction between the TSLs. While representative ELs were included in the TSLs, DOE considered all efficiency levels as part of its analysis.[50]

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

DOE analyzed the economic impacts on battery chargers' consumers by looking at the effects that potential amended standards at each TSL would have on the LCC and PBP. DOE also examined the impacts of potential standards on selected consumer subgroups. These analyses are discussed in the following sections.

a. Life-Cycle Cost and Payback Period

In general, higher-efficiency products affect consumers in two ways: (1) purchase price increases and (2) annual operating costs decrease. Inputs used for calculating the LCC and PBP include total installed costs (*i.e.*, product price plus installation costs), and operating costs (*i.e.*, annual energy use, energy prices, energy price trends, repair costs, and maintenance costs). The LCC calculation also uses product lifetime and a discount rate. Chapter 8 of the NOPR TSD provides detailed information on the LCC and PBP analyses.

Table V.2 through Table V.6 show the LCC and PBP results for the TSLs considered for each product class. In the first of each pair of tables, the simple payback is measured relative to the baseline product. In the second table, impacts are measured

[50] Efficiency levels that were analyzed for this NOPR are discussed in section IV.C.4 of this document. Results by efficiency level are presented in TSD chapters 8, 10, and 12.

relative to the efficiency distribution in the no-new-standards case in the compliance year (see section IV.F of this document). Because some consumers purchase products with higher efficiency in the no-new-standards case, the average savings are less than the difference between the average LCC of the baseline product and the average LCC at each TSL. The savings refer only to consumers who are affected by a standard at a given TSL. Those who already purchase a product with efficiency at or above a given TSL are not affected. Consumers for whom the LCC increases at a given TSL experience a net cost.

Table V.2 Average LCC and PBP Results for Fixed-Location Wireless Chargers

EL	Average Costs and Savings (2021$)			Average LCC Savings* (2021$)	Percent of Consumers with Net Cost	Simple Payback (years)	Average Lifetime (years)
	Installed Cost	First Year's Operating Savings	Lifetime Operating Savings				
EL 1	$0.90	-$0.24	-$0.87	-$0.03	13.9%	3.8	3.9
EL 2	$1.57	-$0.26	-$0.93	-$0.64	35.5%	6.0	3.9
EL 3	$3.43	-$0.44	-$1.51	-$1.92	90.0%	7.8	3.9

* The savings represent the average LCC for affected consumers.
Numbers may not add up due to rounding.

Table V.3 Average LCC and PBP Results for Open-Placement Wireless Chargers

EL	Average Costs and Savings (2021$)			Average LCC Savings* (2021$)	Percent of Consumers with Net Cost	Simple Payback (years)	Average Lifetime (years)
	Installed Cost	First Year's Operating Savings	Lifetime Operating Savings				
EL 1	$0.71	-$0.17	-$0.83	$0.12	6.8%	4.1	5.5
EL 2	$1.69	-$0.18	-$0.89	-$0.81	38.4%	9.2	5.5
EL 3	$2.06	-$0.19	-$0.90	-$1.16	55.1%	11.0	5.5

* The savings represent the average LCC for affected consumers.
Numbers may not add up due to rounding.

Table V.4 Average LCC and PBP Results for Low-Energy Wired Chargers

EL	Average Costs and Savings (2021$)			Average LCC Savings* (2021$)	Percent of Consumers with Net Cost	Simple Payback (years)	Average Lifetime (years)
	Installed Cost	First Year's Operating Savings	Lifetime Operating Savings				
EL 1	$0.57	-$0.22	-$0.86	$0.28	11.2%	3.1	4.7
EL 2	$0.77	-$0.23	-$0.90	$0.13	39.0%	4.0	4.7
EL 3	$1.48	-$0.26	-$1.05	-$0.43	65.5%	6.4	4.7

* The savings represent the average LCC for affected consumers.
Numbers may not add up due to rounding.

Table V.5 Average LCC and PBP Results for Medium-Energy Wired Chargers

EL	Average Costs and Savings (2021$)			Average LCC Savings* (2021$)	Percent of Consumers with Net Cost	Simple Payback (years)	Average Lifetime (years)
	Installed Cost	First Year's Operating Savings	Lifetime Operating Savings				
EL 1	$3.17	-$0.90	-$4.61	$1.44	16.5%	4.5	5.5
EL 2	$3.42	-$0.96	-$4.96	$1.55	30.5%	4.4	5.5
EL 3	$3.66	-$1.02	-$5.27	$1.61	49.8%	4.4	5.5

* The savings represent the average LCC for affected consumers.
Numbers may not add up due to rounding.

Table V.6 Average LCC and PBP Results for High-Energy Wired Chargers

EL	Average Costs and Savings (2021$)			Average LCC Savings* (2021$)	Percent of Consumers with Net Cost	Simple Payback (years)	Average Lifetime (years)
	Installed Cost	First Year's Operating Savings	Lifetime Operating Savings				
EL 1	$4.95	-$3.46	-$16.41	$11.46	2.4%	1.4	9.2
EL 2	$5.92	-$4.04	-$20.24	$14.32	1.6%	1.5	9.2
EL 3	$7.69	-$5.24	-$26.63	$18.94	1.3%	1.5	9.2

* The savings represent the average LCC for affected consumers.
Numbers may not add up due to rounding.

b. Consumer Subgroup Analysis

In the consumer subgroup analysis, DOE estimated the impact of the considered TSLs on low-income households. Table V.7 to Table V.11 compare the average LCC savings and PBP at each efficiency level for the consumer subgroups with similar metrics for the entire consumer sample for battery chargers. In all cases, the average LCC savings and PBP for low-income households at the considered efficiency levels are not substantially different from the average for all households. Chapter 11 of the NOPR TSD presents the complete LCC and PBP results for the subgroups.

Table V.7 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households; Fixed-Location Wireless Chargers

	Low-Income Households	All Households
Average LCC Savings (2021$)		
EL 1	-$0.01	-$0.03
EL 2	-$0.63	-$0.64
EL 3	-$1.91	-$1.92
Payback Period (years)		
EL 1	3.7	3.8
EL 2	5.9	6.0
EL 3	7.7	7.8
Consumers with Net Cost (%)		
EL 1	14.4%	13.9%
EL 2	35.0%	35.5%
EL 3	90.9%	90.0%

Table V.8 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households; Open-Placement Wireless Chargers

	Low-Income Households	All Households
Average LCC Savings (2021$)		
EL 1	$0.14	$0.12
EL 2	-$0.80	-$0.81
EL 3	-$1.16	-$1.16
Payback Period (years)		
EL 1	4.0	4.1
EL 2	9.1	9.2
EL 3	10.8	11.0
Consumers with Net Cost (%)		
EL 1	7.5%	6.8%
EL 2	40.1%	38.4%
EL 3	56.0%	55.1%

Table V.9 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households; Low-Energy Wired Chargers

	Low-Income Households	All Households
Average LCC Savings (2021$)		
EL 1	$0.21	$0.28
EL 2	$0.06	$0.13
EL 3	-$0.52	-$0.43
Payback Period (years)		
EL 1	3.8	3.1
EL 2	4.7	4.0
EL 3	7.5	6.4
Consumers with Net Cost (%)		
EL 1	12.9%	11.2%
EL 2	43.0%	39.0%
EL 3	68.0%	65.5%

Table V.10 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households; Medium-Energy Wired Chargers

	Low-Income Households	All Households
Average LCC Savings (2021$)		
EL 1	$1.32	$1.44
EL 2	$1.40	$1.55
EL 3	$1.47	$1.61
Payback Period (years)		
EL 1	4.6	4.5
EL 2	4.5	4.4
EL 3	4.5	4.4
Consumers with Net Cost (%)		
EL 1	15.5%	16.5%
EL 2	30.1%	30.5%
EL 3	49.5%	49.8%

Table V.11 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households; High-Energy Wired Chargers

	Low-Income Households	All Households
Average LCC Savings (2021$)		
EL 1	$11.12	$11.46
EL 2	$16.39	$14.32
EL 3	$22.81	$18.94
Payback Period (years)		
EL 1	2.5	1.4
EL 2	2.1	1.5
EL 3	2.1	1.5
Consumers with Net Cost (%)		
EL 1	4.9%	2.4%
EL 2	3.2%	1.6%
EL 3	3.0%	1.3%

c. Rebuttable Presumption Payback

As discussed in section III.F.2, EPCA establishes a rebuttable presumption that an energy conservation standard is economically justified if the increased purchase cost for a product 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 TSLs, DOE used discrete values, and as required by EPCA, based the energy use calculation on the DOE test procedure for battery chargers.

In contrast, the PBPs presented in section V.B.1.a were calculated using distributions that reflect the range of energy use in the field.

Table V.12 presents the rebuttable-presumption payback periods for the considered TSLs for battery chargers. While DOE examined the rebuttable-presumption criterion, it considered whether the standard levels considered for the NOPR are economically justified through a more detailed analysis of the economic impacts of those levels, pursuant to 42 U.S.C. 6295(o)(2)(B)(i), that considers the full range of impacts to the consumer, manufacturer, Nation, and environment. The results of that analysis serve as the basis for DOE to definitively evaluate the economic justification for a potential standard level, thereby supporting or rebutting the results of any preliminary determination of economic justification.

Table V.12 Rebuttable-Presumption Payback Periods

EL	PC 1a	PC 1b	PC 2a	PC 2b	PC 2c
1	3.8	4.1	3.1	4.5	1.4
2	6.0	9.2	4.0	4.4	1.5
3	7.8	11.0	6.4	4.4	1.5

2. Economic Impacts on Manufacturers

DOE performed an MIA to estimate the impact of amended energy conservation standards on manufacturers of battery chargers. The following section describes the expected impacts on manufacturers at each considered TSL. Section IV.J of this document discusses the MIA methodology, and chapter 12 of the NOPR TSD explains the analysis in further detail.

a. Industry Cash Flow Analysis Results

In this section, DOE provides GRIM results from the analysis, which examines changes in the industry that would result from a standard. The following tables summarize the estimated financial impacts (represented by changes in INPV) of potential amended energy conservation standards on manufacturers of battery chargers as well as the conversion costs that DOE estimates manufacturers of battery chargers would incur at each TSL. These results are presented both at an all-industry level and for each industry segment.

Table V.13 Manufacturer Impact Analysis for Battery Chargers - Preservation of Gross Margin Scenario

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $78,912 millions)	78,872	78,685	78,637	78,265
All Change in INPV ($ millions)	(40)	(214)	(260)	(598)
All % Change in INPV	(0.1)	(0.3)	(0.3)	(0.8)
All Capital Conversion Costs ($ millions)	24.0	103.4	127.1	268.3
All Product Conversion Costs ($ millions)	57.2	294.8	358.8	868.4
Total Conversion Costs ($ millions)	81.3	398.1	485.9	1,136.7

Table V.14 Manufacturer Impact Analysis for Battery Chargers – Constant Price Scenario

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $78,912 millions)	77,427	75,328	74,596	70,039
All Change in INPV ($ millions)	(1,523)	(3,659)	(4,402)	(9,032)
All % Change in INPV (%)	(1.9)	(4.6)	(5.6)	(11.4)
All Capital Conversion Costs ($ millions)	24.0	103.4	127.1	268.3

All Product Conversion Costs ($ millions)	57.2	294.8	358.8	868.4
Total Conversion Costs ($ millions)	81.3	398.1	485.9	1,136.7

At TSL 1, DOE estimates impacts on INPV will range from approximately -$1,523 million to -$40.3 million, which represents a change of approximately -1.9 to -0.1 percent. At TSL 1, industry free cash-flow decreases to $6,265 million, which represents a decrease of approximately 0.5 percent, compared to the no-new-standards case value of $6,299 million in 2026, the year before the anticipated first full year of compliance, 2027.

TSL 1 would set the energy conservation standard at EL 1 for all product classes. DOE estimates that approximately 73 percent of low energy wired battery charger shipments, approximately 54 percent of medium energy wired battery charger shipments, approximately 75 percent of high energy wired battery charger shipments, approximately 92 percent of fixed location wireless battery charger shipments, and approximately 93 percent of open location wireless battery charger shipments would meet or exceed the efficiency levels analyzed at TSL 1 in 2027. DOE expects battery charger manufacturers to incur approximately $57.2 million in product conversion costs to redesign all non-compliant models and $24.0 million in related capital conversion costs.

At TSL 1, the shipment-weighted average MPC for battery chargers and battery charger applications slightly increases by less than 0.1 percent, relative to the no-new-standards case shipment-weighted average MPC in 2027. In the preservation of gross margin scenario, manufacturers can fully pass on this slight cost increase. The slight increase in shipment weighted average MPC is outweighed by the $81.6 million in conversion costs, causing a slightly negative change in INPV at TSL 1 under the preservation of gross margin scenario.

Under the constant price scenario, manufacturers do not adjust their product's price from the price in the no-new-standards case and do not pass on the cost increase to consumers. In this scenario, the 0.1 percent shipment weighted average MPC increase results in a reduction in the margin after the analyzed compliance year. This reduction in the margin and the $81.6 million in conversion costs incurred by manufacturers cause a slightly negative change in INPV at TSL 1 under the constant price scenario.

At TSL 2, DOE estimates impacts on INPV will range from -$3,658.8 million to -$214.1 million, which represents a change of -4.6 percent to -0.3 percent, respectively. At TSL 2, industry free cash-flow decreases to $6,131 million, which represents a decrease of approximately 2.7 percent, compared to the no-new-standards case value of $6,299 million in 2026, the year before the estimated first full year of compliance.

TSL 2 would set the energy conservation standard at EL 1 for wireless product classes and at EL 2 for wired product classes. DOE estimates that approximately 27 percent of low energy wired battery charger shipments, approximately 46 percent of medium energy wired battery charger shipments, approximately 26 percent of high energy wired battery charger shipments, approximately 92 percent of fixed location wireless battery charger shipments, and approximately 93 percent of open location wireless battery charger shipments would meet or exceed the efficiency levels analyzed at TSL 2 in 2027. DOE expects battery charger manufacturers to incur approximately $294.8 million in product conversion costs to redesign all non-compliant models and $103.4 in related capital conversion costs.

At TSL 2, the shipment-weighted average MPC for battery chargers slightly increases by 0.2 percent relative to the no-new-standards case shipment-weighted average MPC in 2027. In the preservation of gross margin scenario, manufacturers can fully pass on this slight cost increase. The slight increase in shipment weighted average MPC is outweighed by the $398.2 million in conversion costs, causing a slightly negative change in INPV at TSL 2 under the preservation of gross margin scenario.

Under the constant price scenario, manufacturers do not adjust their product's price from the price in the no-new-standards case and do not pass on the cost increase to consumers. This 0.2 percent reduction in the margin and the $398.2 million in conversion costs incurred by manufacturers cause a moderately negative change in INPV at TSL 2 under the constant price scenario.

At TSL 3, DOE estimates impacts on INPV will range from -$4,402 million to -$358.8 million, which represents a change of -5.6 percent to -0.3 percent, respectively. At TSL 3, industry free cash-flow decreases to $6,100 million, which represents a decrease of approximately 3.1 percent, compared to the no-new-standards case value of $6,299 million in 2026, the year before the estimated first full year of compliance.

TSL 3 would set the energy conservation standard at EL 2 for all product classes. DOE estimates that approximately 27 percent of low energy wired battery charger shipments, approximately 46 percent of medium energy wired BC shipments, approximately 26 percent of high energy wired battery charger shipments, approximately 66 percent of fixed location wireless battery charger shipments, and approximately 73 percent of open location wireless battery charger shipments would meet or exceed the efficiency levels analyzed at TSL 3 in 2027. DOE expects battery charger manufacturers to incur approximately $358.8 million in product conversion costs to redesign all non-compliant models and $127.1 in related capital conversion costs.

At TSL 3, the shipment-weighted average MPC for battery chargers slightly increases by 0.2 percent relative to the no-new-standards case shipment-weighted average MPC in 2027. In the preservation of gross margin scenario, manufacturers can fully pass on this slight cost increase. The slight increase in shipment weighted average MPC is outweighed by the $485.9 million in conversion costs, causing a slightly negative change in INPV at TSL 3 under the preservation of gross margin scenario.

Under the constant price scenario, manufacturers do not adjust their product's price from the price in the no-new-standards case and do not pass on the cost increase to consumers. This 0.2 percent reduction in the margin and the $485.9 million in conversion costs incurred by manufacturers cause a moderately negative change in INPV at TSL 3 under the constant price scenario.

At TSL 4, DOE estimates impacts on INPV will range from -$9,032 million to -$597.7 million, which represents a change of -11.4 percent to -0.8 percent, respectively. At TSL 4, industry free cash-flow decreases to $5,822 million, which represents a decrease of approximately 7.6 percent, compared to the no-new-standards case value of $6,299 million in 2026, the year before the estimated first full year of compliance.

TSL 4 would set the energy conservation standard at EL 3 for all product classes. DOE estimates that approximately 8 percent of low energy wired battery charger shipments, approximately 19 percent of medium energy wired battery charger shipments, approximately 12 percent of high energy wired battery charger shipments, approximately 8 percent of fixed location wireless battery charger shipments, and approximately 53 percent of open location wireless battery charger shipments would meet the efficiency levels analyzed at TSL 4 in 2027. DOE expects battery charger manufacturers to incur approximately $868.4 million in product conversion costs to redesign all non-compliant models and $262.3 in related capital conversion costs.

At TSL 4, the shipment-weighted average MPC for battery chargers slightly increases by 0.6 percent relative to the no-new-standards case shipment-weighted average MPC in 2027. In the preservation of gross margin scenario, manufacturers can fully pass on this slight cost increase. The slight increase in shipment weighted average MPC is outweighed by the $1,136.7 million in conversion costs, causing a slightly negative change in INPV at TSL 4 under the preservation of gross margin scenario.

Under the constant price scenario, manufacturers do not adjust their product's price from the price in the no-new-standards case and do not pass on the cost increase to consumers. In this scenario, the 0.6 percent shipment weighted average MPC increase results in a reduction in the margin after the analyzed compliance year. This reduction in the margin and the $1,136.7 million in conversion costs incurred by manufacturers cause a substantially negative change in INPV at TSL 4 under the constant price scenario.

b. Direct Impacts on Employment

DOE identified very limited domestic battery charger manufacturing, based on the industry profile developments for this NOPR analysis and manufacturer interviews that were conducted for this product as well as other products that use battery chargers. These domestic facilities are concentrated within the high energy industry subsector and support relatively low volumes for specialized applications. Since, energy conservation standards are not expected to alter production methodology, DOE does not expect that there would be any direct impacts on domestic production employment as a result of amended energy conservation standards.

DOE requests comment on how the proposed energy conservation standards might affect domestic battery charger manufacturing.

c. Impacts on Manufacturing Capacity

As noted in prior sections, DOE does not expect that energy conservation standards would result in substantial changes to battery charger manufacturing equipment. Further, DOE does not expect that there would be capacity issues providing components to battery charger manufacturers for more efficient battery charger.

DOE requests comment on possible impacts on manufacturing capacity stemming from amended energy conservation standards.

d. Impacts on Subgroups of Manufacturers

DOE identified five subgroups of manufactures that may experience disproportionate or different impacts as a result of amended standards—small appliances industry subgroup, consumer electronics industry subgroup, power tools industry subgroup, high energy industry subgroup, and small business manufacturers. Estimated quantitative impacts on the four industry subgroups are presented in tables V.15 through V.22. Analysis of the possible impact on small business manufacturers is discussed in Section VI.B of this document.

Table V.15 Manufacturer Impact Analysis for Battery Chargers - Preservation of Gross Margin Scenario – Small Appliance Industry Subgroup

	TSL 1	**TSL 2**	**TSL 3**	**TSL 4**
All INPV (No-New-Standards Case = $2,757 M)	2,747	2,715	2,688	2,562
All Change in INPV ($ M)	(10.2)	(42.0)	(68.5)	(195.3)
All % Change in INPV (%)	(0.4)	(1.5)	(2.5)	(7.1)
All Capital Conversion Costs ($ M)	5.6	20.1	32.2	84.9
All Product Conversion Costs ($ M)	9.8	43.9	71.5	216.1

Table V.16 Manufacturer Impact Analysis for Battery Chargers – Constant Price Scenario – Small Appliance Industry Subgroup

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $2,757 M)	2,525	2,229	1,901	902.0
All Change in INPV ($ M)	(231.9)	(527.5)	(855.5)	(1,854.8)
All % Change in INPV (%)	(8.4)	(9.1)	(31.0)	(67.3)
All Capital Conversion Costs ($ M)	5.6	20.1	32.2	84.9
All Product Conversion Costs ($ M)	9.8	43.9	71.5	216.1

Table V.17 Manufacturer Impact Analysis for Battery Chargers - Preservation of Gross Margin Scenario – Consumer Electronics Industry Subgroup

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $71,577 M)	71,544	71,400	71,378	71,150
All Change in INPV ($ M)	(28.9)	(160.0)	(179.8)	(372.7)
All % Change in INPV (%)	(0.0)	(0.2)	(0.3)	(0.5)
All Capital Conversion Costs ($ M)	16.6	75.4	87.0	166.8
All Product Conversion Costs ($ M)	60.2	305.1	353.1	767.9

Table V.18 Manufacturer Impact Analysis for Battery Chargers – Constant Price Scenario – Consumer Electronics Industry Subgroup

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $71,577 M)	70,433	68,816	68,412	65,045
All Change in INPV ($ M)	(1,178)	(2,831)	(3,247)	(6,686)
All % Change in INPV (%)	(1.6)	(4.0)	(4.5)	(9.3)
All Capital Conversion Costs ($ M)	16.6	75.4	87.0	166.8
All Product Conversion Costs ($ M)	60.2	305.1	353.1	767.9

Table V.19 Manufacturer Impact Analysis for Battery Chargers - Preservation of Gross Margin Scenario – Power Tools Industry Subgroup

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $822.5 M)	822.0	819.3	819.3	817.0
All Change in INPV ($ M)	(0.5)	(3.2)	(3.2)	(5.4)
All % Change in INPV (%)	(0.1)	(0.4)	(0.4)	(0.7)
All Capital Conversion Costs ($ M)	0.4	2.0	2.0	3.5
All Product Conversion Costs ($ M)	0.8	7.0	5.0	9.8

Table V.20 Manufacturer Impact Analysis for Battery Chargers – Constant Price Scenario – Power Tools Industry Subgroup

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $822.5 M)	798.6	759.3	759.3	712.6
All Change in INPV ($ M)	(23.9)	(63.1)	(63.1)	(109.8)
All % Change in INPV (%)	(2.9)	(7.7)	(7.7)	(13.4)
All Capital Conversion Costs ($ M)	0.4	2.0	2.0	3.5
All Product Conversion Costs ($ M)	0.8	7.0	5.0	9.8

Table V.21 Manufacturer Impact Analysis for Battery Chargers - Preservation of Gross Margin Scenario – High Energy Industry Subgroup

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $3,760 M)	3,759	3,751	3,751	3,736
All Change in INPV ($ M)	(0.7)	(9.0)	(8.9)	(24.3)
All % Change in INPV (%)	(0.0)	(0.3)	(0.4)	(0.8)
All Capital Conversion Costs ($ M)	1.4	5.8	5.8	13.0
All Product Conversion Costs ($ M)	3.1	16.3	16.3	41.3

Table V.22 Manufacturer Impact Analysis for Battery Chargers – Constant Price Scenario – High Energy Industry Subgroup

	TSL 1	TSL 2	TSL 3	TSL 4
All INPV (No-New-Standards Case = $3,760 M)	3,671	3,523	3,523	3,379
All Change in INPV ($ M)	(89.3)	(237.0)	(237.0)	(381.4)
All % Change in INPV	-2.4%	-6.3%	-6.3%	-10.1%
All Capital Conversion Costs ($ M)	1.4	5.8	5.8	13.0
All Product Conversion Costs ($ M)	3.1	16.3	16.3	41.3

e. Cumulative Regulatory Burden

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

Table V.15 Compliance Dates and Expected Conversion Expenses of Federal Energy Conservation Standards Affecting Battery Charger Manufacturers

Federal Energy Conservation Standard	Number of Manufacturers*	Number of Manufacturers Affected from this Rule**	Approx. Standards Year	Industry Conversion Costs *(millions)*	Industry Conversion Costs / Product Revenue***
Room Air Conditioners† 87 FR 20608 (Apr. 7, 2022)	8	3	2026	$22.8 (2020$)	0.5%
Microwave Ovens† 87 FR 52282 (Aug. 24, 2022)	19	6	2026	$46.1 (2021$)	0.7%
Clothes Dryers† 87 FR 51734 (Aug. 23, 2022)	15	2	2027	$149.7 (2020$)	1.8%
Residential Clothes Washers†‡	19	6	2027	$411.6 (2021$)	8.1%
Refrigerators, Refrigerator-Freezers, and Freezers 88 FR 12452† (Feb. 27, 2023)	49	7	2027	$1,324 (2021$)	10.5%
External Power Supplies 88 FR 7284 (Feb. 2, 2023)	611	154	2027	$17.1 (2021$)	0.6%

* This column presents the total number of manufacturers identified in the energy conservation standard rule contributing to cumulative regulatory burden.
** This column presents the number of manufacturers producing EPSs that are also listed as manufacturers in the listed energy conservation standard contributing to cumulative regulatory burden.
*** This column presents industry conversion costs as a percentage of product revenue during the conversion period. Industry conversion costs are the upfront investments manufacturers must make to sell compliant products/equipment. The revenue used for this calculation is the revenue from just the covered product/equipment associated with each row. The conversion period is the time frame over which conversion costs are made and lasts from the publication year of the final rule to the compliance year of the energy conservation standard. The conversion period typically ranges from 3 to 5 years, depending on the rulemaking.
† Indicates NOPR or SNOPR publications. Values may change on publication of a Final Rule.
‡ At the time of issuance of this battery charger proposed rule, this rulemaking has been issued and is pending publication in the Federal Register. Once published, the residential clothes washers proposed rule will be available at: www.regulations.gov/docket/EERE-2017-BT-STD-0014.

In addition to the rulemakings listed in Table V.15, DOE has ongoing rulemakings for other products or equipment that battery charger manufacturers produce, including air cleaners;[51] automatic commercial ice makers;[52] commercial clothes washers;[53] dehumidifiers,[54] and miscellaneous refrigeration products.[55] If DOE proposes or finalizes any energy conservation standards for these products or equipment prior to finalizing energy conservation standards for battery chargers, DOE will include the energy conservation standards for these other products or equipment as part of the cumulative regulatory burden for the battery charger final rule.

DOE requests information regarding the impact of cumulative regulatory burden on manufacturers of battery chargers associated with multiple DOE standards or product-specific regulatory actions of other Federal agencies.

3. National Impact Analysis

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

a. Significance of Energy Savings

To estimate the energy savings attributable to potential amended standards for battery chargers, DOE compared their energy consumption under the no-new-standards case to their anticipated energy consumption under each TSL. The savings are measured over the entire lifetime of products purchased in the 30-year period that begins in the year

[51] *www.regulations.gov/docket/EERE-2021-BT-STD-0035*
[52] *www.regulations.gov/docket/EERE-2017-BT-STD-0022*
[53] *www.regulations.gov/docket/EERE-2019-BT-STD-0044*
[54] *www.regulations.gov/docket/EERE-2019-BT-STD-0043*
[55] *www.regulations.gov/docket/EERE-2020-BT-STD-0039*

of anticipated compliance with amended standards (2027-2056). Table V.16 presents DOE's projections of the national energy savings for each TSL considered for battery chargers. The savings were calculated using the approach described in section IV.H of this document.

Table V.16 Cumulative National Energy Savings for battery chargers; 30 Years of Shipments (2027-2056)

	Trial Standard Level			
	1	**2**	**3**	**4**
	quads			
Primary energy	0.4	1.1	1.2	2.0
FFC energy	0.4	1.2	1.3	2.0

OMB Circular A-4[56] 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 product 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.[57] The review timeframe established in EPCA is generally not synchronized with the product lifetime, product manufacturing cycles, or other factors

[56] U.S. Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. *obamawhitehouse.archives.gov/omb/circulars_a004_a-4* (last accessed December 2, 2022).

[57] 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.

specific to battery chargers. 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.17. The impacts are counted over the lifetime of battery chargers purchased in 2027-2036.

Table V.17 Cumulative National Energy Savings for battery chargers; 9 Years of Shipments (2027–2036)

	Trial Standard Level			
	1	**2**	**3**	**4**
	quads			
Primary energy	0.1	0.3	0.3	0.6
FFC energy	0.1	0.3	0.4	0.6

b. Net Present Value of Consumer Costs and Benefits

DOE estimated the cumulative NPV of the total costs and savings for consumers that would result from the TSLs considered for battery chargers. In accordance with OMB's guidelines on regulatory analysis,[58] DOE calculated NPV using both a 7-percent and a 3-percent real discount rate. Table V.18 shows the consumer NPV results with impacts counted over the lifetime of products purchased in 2027-2036.

Table V.18 Cumulative Net Present Value of Consumer Benefits for battery chargers; 30 Years of Shipments (2027–2036)

Discount Rate	Trial Standard Level			
	1	**2**	**3**	**4**
	billion (2021$)			
3 percent	2.4	7.5	7.7	9.6
7 percent	1.2	3.7	3.8	4.3

[58] U.S. Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. *obamawhitehouse.archives.gov/omb/circulars_a004_a-4* (last accessed December 2, 2022).

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.19. The impacts are counted over the lifetime of products purchased in 2027-2036. 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.19 Cumulative Net Present Value of Consumer Benefits for battery chargers; 9 Years of Shipments (2027–2036)

Discount Rate	Trial Standard Level			
	1	**2**	**3**	**4**
	billion (2021$)			
3 percent	0.8	2.6	2.6	2.6
7 percent	0.5	1.7	1.7	1.6

c. Indirect Impacts on Employment

It is estimated that that amended energy conservation standards for battery chargers would reduce energy expenditures for consumers of those products, with the resulting net savings being redirected to other forms of economic activity. These expected shifts in spending and economic activity could affect the demand for labor. As described in section V.B.2 of this document, DOE used an input/output model of the U.S. economy to estimate indirect employment impacts of the TSLs that DOE considered. There are uncertainties involved in projecting employment impacts, especially changes in the later years of the analysis. Therefore, DOE generated results for near-term timeframes (2027–2056), where these uncertainties are reduced.

The results suggest that the proposed standards would be likely to have a negligible impact on the net demand for labor in the economy. The net change in jobs is so small that it would be imperceptible in national labor statistics and might be offset by other, unanticipated effects on employment. Chapter 16 of the NOPR TSD presents detailed results regarding anticipated indirect employment impacts.

4. Impact on Utility or Performance of Products

As discussed in section III.F.1.d of this document, DOE has tentatively concluded that the standards proposed in this NOPR would not lessen the utility or performance of battery chargers under consideration in this rulemaking. Manufacturers of these products currently offer units that meet or exceed the proposed standards without a loss of utility or performance.

5. Impact of Any Lessening of Competition

DOE considered any lessening of competition that would be likely to result from new or amended standards. As discussed in section III.F.1.e, the Attorney General determines the impact, if any, of any lessening of competition likely to result from a proposed standard, and transmits such determination in writing to the Secretary, together with an analysis of the nature and extent of such impact. To assist the Attorney General in making this determination, DOE has provided DOJ with copies of this NOPR and the accompanying TSD for review. DOE will consider DOJ's comments on the proposed rule in determining whether to proceed to a final rule. DOE will publish and respond to DOJ's comments in that document. DOE invites comment from the public regarding the competitive impacts that are likely to result from this proposed rule. In addition, stakeholders may also provide comments separately to DOJ regarding these potential impacts. See the **ADDRESSES** section for information to send comments to DOJ.

6. Need of the Nation to Conserve Energy

Enhanced energy efficiency, where economically justified, improves the Nation's energy security, strengthens the economy, and reduces the environmental impacts (costs) of energy production. Reduced electricity demand due to energy conservation standards is also likely to reduce the cost of maintaining the reliability of the electricity system, particularly during peak-load periods. Chapter 15 in the NOPR TSD presents the estimated impacts on electricity generating capacity, relative to the no-new-standards case, for the TSLs that DOE considered in this rulemaking.

Energy conservation resulting from potential energy conservation standards for battery chargers is expected to yield environmental benefits in the form of reduced emissions of certain air pollutants and greenhouse gases. Table V.20 provides DOE's estimate of cumulative emissions reductions expected to result from the TSLs considered in this rulemaking. The emissions were calculated using the multipliers discussed in section IV.L. DOE reports annual emissions reductions for each TSL in chapter 13 of the NOPR TSD.

Table V.20 Cumulative Emissions Reduction for battery chargers Shipped in 2027-2056

	Trial Standard Level			
	1	**2**	**3**	**4**
Power Sector Emissions				
CO_2 (*million metric tons*)	14	38	40	65
CH_4 (*thousand tons*)	1.1	2.9	3.1	5.0
N_2O (*thousand tons*)	0.15	0.41	0.43	0.71
NO_X (*thousand tons*)	7	19	20	33
SO_2 (*thousand tons*)	7	18	19	31
Hg (*tons*)	0.04	0.11	0.12	0.19
Upstream Emissions				
CO_2 (*million metric tons*)	1.0	2.9	3.0	4.9
CH_4 (*thousand tons*)	98	269	284	462
N_2O (*thousand tons*)	0.01	0.01	0.02	0.03
NO_X (*thousand tons*)	16	43	46	74
SO_2 (*thousand tons*)	0.08	0.21	0.22	0.36
Hg (*tons*)	0.0002	0.0004	0.0005	0.0008
Total FFC Emissions				
CO_2 (*million metric tons*)	15	40	43	69
CH_4 (*thousand tons*)	99	272	287	467
N_2O (*thousand tons*)	0.15	0.42	0.45	0.73
NO_X (*thousand tons*)	23	62	66	107
SO_2 (*thousand tons*)	7	18	19	31
Hg (*tons*)	0.04	0.11	0.12	0.19

As part of the analysis for this rulemaking, DOE estimated monetary benefits likely to result from the reduced emissions of CO_2 that DOE estimated for each of the considered TSLs for battery chargers. Section IV.L of this document discusses the SC-CO_2 values that DOE used. Table V.21 presents the value of CO_2 emissions reduction at each TSL for each of the SC-CO_2 cases. The time-series of annual values is presented for the proposed TSL in chapter 14 of the NOPR TSD.

Table V.21 Present Value of CO_2 Emissions Reduction for battery chargers Shipped in 2027-2056

TSL	SC-CO_2 Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	million 2021$			
1	158	647	999	1,968
2	432	1,773	2,738	5,397
3	457	1,873	2,892	5,701
4	743	3,048	4,705	9,276

As discussed in section IV.L.2, DOE estimated the climate benefits likely to result from the reduced emissions of methane and N_2O that DOE estimated for each of the considered TSLs for battery chargers. Table V.22 presents the value of the CH_4 emissions reduction at each TSL, and Table V.23 presents the value of the N_2O emissions reduction at each TSL. The time-series of annual values is presented for the proposed TSL in chapter 14 of the NOPR TSD

Table V.22 Present Value of Methane Emissions Reduction for battery chargers Shipped in 2027-2056

TSL	SC-CH_4 Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	million 2021$			
1	48	135	186	358
2	131	370	510	981
3	139	390	538	1,035
4	225	635	874	1,683

Table V.23 Present Value of Nitrous Oxide Emissions Reduction for battery chargers Shipped in 2027-2056

TSL	SC-N_2O Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	million 2021$			
1	1	2	4	6
2	2	7	10	17
3	2	7	11	18
4	3	11	17	30

DOE is well aware that scientific and economic knowledge about the contribution of CO_2 and other GHG emissions to changes in the future global climate and the potential resulting damages to the global and U.S. economy continues to evolve rapidly. DOE, together with other Federal agencies, will continue to review methodologies for estimating the monetary value of reductions in CO_2 and other GHG emissions. This ongoing review will consider the comments on this subject that are part of the public record for this and other rulemakings, as well as other methodological assumptions and issues. DOE notes that the proposed standards would be economically justified even without inclusion of monetized benefits of reduced GHG emissions.

DOE also estimated the monetary value of the health benefits associated with NO_X and SO_2 emissions reductions anticipated to result from the considered TSLs for battery chargers. The dollar-per-ton values that DOE used are discussed in section IV.L of this document. Table V.24 presents the present value for NO_X emissions reduction for each TSL calculated using 7-percent and 3-percent discount rates, and Table V.25 presents similar results for SO_2 emissions reductions. The results in these tables reflect application of EPA's low dollar-per-ton values, which DOE used to be conservative. The time-series of annual values is presented for the proposed TSL in chapter 14 of the NOPR TSD.

Table V.24 Present Value of NO_X Emissions Reduction for battery chargers Shipped in 2027-2056

TSL	3% Discount Rate	7% Discount Rate
	million 2021$	
1	464	1,004
2	1,275	2,755
3	1,347	2,909
4	2,195	4,732

Table V.25 Present Value of SO_2 Emissions Reduction for battery chargers Shipped in 2027-2056

TSL	3% Discount Rate	7% Discount Rate
	million 2021$	
1	190	399
2	524	1,094
3	554	1,158
4	904	1,886

Not all the public health and environmental benefits from the reduction of greenhouse gases, NOx, and SO_2 are captured in the values above, and additional unquantified benefits from the reductions of those pollutants as well as from the reduction of direct PM, and other co-pollutants may be significant. DOE has not included monetary benefits of the reduction of Hg emissions because the amount of reduction is very small.

7. Other Factors

The Secretary of Energy, in determining whether a standard is economically justified, may consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6295(o)(2)(B)(i)(VII)) No other factors were considered in this analysis.

8. Summary of Economic Impacts

Table V.26 presents the NPV values that result from adding the estimates of the potential economic benefits resulting from reduced GHG and NO_X and SO_2 emissions to the NPV of consumer benefits calculated for each TSL considered in this rulemaking. The consumer benefits are domestic U.S. monetary savings that occur as a result of purchasing the covered battery chargers, and are measured for the lifetime of products shipped in 2027-2056. The climate benefits associated with reduced GHG emissions resulting from the adopted standards are global benefits, and are also calculated based on the lifetime of battery chargers shipped in 2027-2056.

Table V.26 Consumer NPV Combined with Present Value of Climate Benefits and Health Benefits

Category	TSL 1	TSL 2	TSL 3	TSL 4
3% discount rate for Consumer NPV and Health Benefits (billion 2021$)				
5% Average SC-GHG case	4.0	11.9	12.4	17.2
3% Average SC-GHG case	4.6	13.5	14.1	19.9
2.5% Average SC-GHG case	5.0	14.6	15.2	21.8
3% 95th percentile SC-GHG case	6.2	17.8	18.5	27.2
7% discount rate for Consumer NPV and Health Benefits (billion 2021$)				
5% Average SC-GHG case	2.0	6.1	6.3	8.4
3% Average SC-GHG case	2.6	7.7	8.0	11.1
2.5% Average SC-GHG case	3.0	8.8	9.1	13.0
3% 95th percentile SC-GHG case	4.1	11.9	12.5	18.4

C. Conclusion

When considering new or amended energy conservation standards, the standards that DOE adopts for any type (or class) of covered product 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. 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 NOPR, DOE considered the impacts of amended standards for battery chargers at each TSL, beginning with the maximum technologically feasible level, to determine whether that level was economically justified. Where the max-tech level was not justified, DOE then considered the next most efficient level and undertook the same evaluation until it reached the highest efficiency level that is both technologically feasible and economically justified and saves a significant amount of energy. DOE refers to this process as the "walk-down" analysis.

To aid the reader as DOE discusses the benefits and/or burdens of each TSL, tables in this section present a summary of the results of DOE's quantitative analysis for each TSL. In addition to the quantitative results presented in the tables, DOE also considers other burdens and benefits that affect economic justification. These include the impacts on identifiable subgroups of consumers who may be disproportionately affected by a national standard and impacts on employment.

DOE also notes that the economics literature provides a wide-ranging discussion of how consumers trade off upfront costs and energy savings in the absence of government intervention. Much of this literature attempts to explain why consumers appear to undervalue energy efficiency improvements. There is evidence that consumers undervalue future energy savings as a result of (1) a lack of information, (2) a lack of sufficient salience of the long-term or aggregate benefits, (3) a lack of sufficient savings to warrant delaying or altering purchases, (4) excessive focus on the short term, in the form of inconsistent weighting of future energy cost savings relative to available returns on other investments, (5) computational or other difficulties associated with the evaluation of relevant tradeoffs, and (6) a divergence in incentives (for example, between renters and owners, or builders and purchasers). Having less than perfect foresight and a high degree of uncertainty about the future, consumers may trade off these types of investments at a higher than expected rate between current consumption and uncertain future energy cost savings. Specifically, consumers of battery charger applications make purchasing decisions based on the application's overall feature set, performance, and design, but rarely on the basis of the accompanying charger's energy efficiency. While there are secondary advantages to a more efficient charging product—e.g., less heat output from a more efficient charger means the product form factor can be smaller and more portable— they affect choices when purchasing replacement products, not the original application. In either scenario, DOE does not expect that consumers are making these decisions with energy efficiency in mind, which undervalues the potential of energy savings.

In DOE's current regulatory analysis, potential changes in the benefits and costs of a regulation due to changes in consumer purchase decisions are included in two ways. First, if consumers forego the purchase of a product in the standards case, this decreases sales for product manufacturers, and the impact on manufacturers attributed to lost revenue is included in the MIA. Second, DOE accounts for energy savings attributable only to products actually used by consumers in the standards case; if a standard decreases the number of products purchased by consumers, this decreases the potential energy savings from an energy conservation standard. DOE provides estimates of shipments and changes in the volume of product purchases in chapter 9 of the NOPR TSD. However, DOE's current analysis does not explicitly control for heterogeneity in consumer preferences, preferences across subcategories of products or specific features, or consumer price sensitivity variation according to household income.[59]

While DOE is not prepared at present to provide a fuller quantifiable framework for estimating the benefits and costs of changes in consumer purchase decisions due to an energy conservation standard, DOE is committed to developing a framework that can support empirical quantitative tools for improved assessment of the consumer welfare impacts of appliance standards. DOE has posted a paper that discusses the issue of consumer welfare impacts of appliance energy conservation standards, and potential

[59] P.C. Reiss and M.W. White. Household Electricity Demand, Revisited. *Review of Economic Studies*. 2005. 72(3): pp. 853–883. doi: *10.1111/0034-6527.00354*.

enhancements to the methodology by which these impacts are defined and estimated in the regulatory process.[60] DOE welcomes comments on how to more fully assess the potential impact of energy conservation standards on consumer choice and how to quantify this impact in its regulatory analysis in future rulemakings.

1. Benefits and Burdens of TSLs Considered for Battery Chargers Standards

Table V.27 and Table V.28 summarize the quantitative impacts estimated for each TSL for battery chargers. The national impacts are measured over the lifetime of battery chargers purchased in the 30-year period that begins in the anticipated year of compliance with amended standards (2027-2056). The energy savings, emissions reductions, and value of emissions reductions refer to full-fuel-cycle results. The efficiency levels contained in each TSL are described in section V.A of this document.

[60] Sanstad, A.H. *Notes on the Economics of Household Energy Consumption and Technology Choice*. 2010. Lawrence Berkeley National Laboratory. *www1.eere.energy.gov/buildings/appliance_standards/pdfs/consumer_ee_theory.pdf* (last accessed December 2, 2022).

Table V.27 Summary of Analytical Results for battery chargers TSLs: National Impacts

Category	TSL 1	TSL 2	TSL 3	TSL 4
Cumulative FFC National Energy Savings				
Quads	0.4	1.2	1.3	2.0
Cumulative FFC Emissions Reduction				
CO_2 (*million metric tons*)	15	40	43	69
CH_4 (*thousand tons*)	99	272	287	467
N_2O (*thousand tons*)	0.15	0.42	0.45	0.73
SO_2 (*thousand tons*)	7	18	19	31
NO_X (*thousand tons*)	23	62	66	107
Hg (*tons*)	0.04	0.11	0.12	0.19
Present Value of Benefits and Costs (*3% discount rate, billion 2021$*)				
Consumer Operating Cost Savings	3.3	9.0	9.5	15.5
Climate Benefits*	0.8	2.1	2.3	3.7
Health Benefits**	1.4	3.8	4.1	6.6
Total Benefits†	5.5	15.0	15.8	25.8
Consumer Incremental Product Costs‡	0.8	1.4	1.8	5.9
Consumer Net Benefits	2.4	7.5	7.7	9.6
Total Net Benefits	4.6	13.5	14.1	19.9
Present Value of Benefits and Costs (*7% discount rate, billion 2021$*)				
Consumer Operating Cost Savings	1.7	4.6	4.9	8.0
Climate Benefits*	0.8	2.1	2.3	3.7
Health Benefits**	0.7	1.8	1.9	3.1
Total Benefits†	3.1	8.6	9.1	14.8
Consumer Incremental Product Costs‡	0.5	0.9	1.1	3.6
Consumer Net Benefits	1.2	3.7	3.8	4.3
Total Net Benefits	2.6	7.7	8.0	11.1

Note: This table presents the costs and benefits associated with battery chargers shipped in 2027-2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027-2056.

* Climate benefits are calculated using four different estimates of the SC-CO_2, SC-CH_4 and SC-N_2O. Together, these represent the global SC-GHG. For presentational purposes of this table, the climate benefits associated with the average SC-GHG at a 3 percent discount rate are shown, but the Department does not have a single central SC-GHG point estimate. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22-30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in Louisiana v. Biden, No. 21-cv-1074-JDC-KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from "adopting, employing, treating as binding, or relying upon" the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. As reflected in this proposed rule, DOE has reverted to its approach prior to the injunction and presents monetized benefits where appropriate and permissible under law.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for NO_X and SO_2) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from

reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. See section IV.L of this document for more details.
† Total and net benefits include consumer, climate, and health benefits. For presentation purposes, total and net benefits for both the 3-percent and 7-percent cases are presented using the average SC-GHG with 3-percent discount rate, but the Department does not have a single central SC-GHG point estimate. DOE emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates.
‡ Costs include incremental equipment costs.

Table V.28 Summary of Analytical Results for Battery Chargers TSLs: Manufacturer and Consumer Impacts

Category	TSL 1*	TSL 2*	TSL 3*	TSL 4*
Manufacturer Impacts				
Industry NPV (*million 2021*$) (No-new-standards case INPV = 78,929.8)	77,427 -78,872	75,328 -76,685	74,596 - 78,637	70,039 -78,265
Industry NPV *(% change*)	(1.9) - (0.1)	(4.6) - (0.3)	(5.6) – (0.3)	(11.4) – (0.8)
Consumer Average LCC Savings (2021$)				
Fixed-Location Wireless Chargers	-$0.03	-$0.03	-$0.64	-$1.92
Open-Placement Wireless Chargers	$0.12	$0.12	-$0.81	-$1.16
Low-Energy Wired Chargers	$0.28	$0.13	$0.13	-$0.43
Medium-Energy Wired Chargers	$1.44	$1.55	$1.55	$1.61
High-Energy Wired Chargers	$11.46	$14.32	$14.32	$18.94
Consumer Simple PBP (years)				
Fixed-Location Wireless Chargers	3.8	3.8	6.0	7.8
Open-Placement Wireless Chargers	4.1	4.1	9.2	11.0
Low-Energy Wired Chargers	3.1	4.0	4.0	6.4
Medium-Energy Wired Chargers	4..5	4.4	4.4	4.4
High-Energy Wired Chargers	1.4	1.5	1.5	1.5
Percent of Consumers that Experience a Net Cost				
Fixed-Location Wireless Chargers	13.9%	13.9%	35.5%	90.0%
Open-Placement Wireless Chargers	6.8%	6.8%	38.4%	55.1%
Low-Energy Wired Chargers	11.2%	39.0%	39.0%	65.5%
Medium-Energy Wired Chargers	16.5%	30.5%	30.5%	49.8%
High-Energy Wired Chargers	2.4%	1.6%	1.6%	1.3%

DOE first considered TSL 4, which represents the max-tech efficiency levels. These levels correspond to the most efficient units tested by DOE or among the top 10% of models identified in the market (as discussed in IV.C.1.b). TSL 4 would save an estimated 2.0 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be $4.34 billion using a discount rate of 7 percent, and $9.59 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 69 Mt of CO_2, 467 thousand tons of CH_4, and 0.73 thousand tons of N_2O, 31 thousand tons of SO_2, 107 thousand tons of NO_X, and 0.19 tons of Hg. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC-GHG at a 3-percent discount rate) at TSL 4 is $3.7 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 4 is $3.1 billion using a 7-percent discount rate and $6.6 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 4 is $11.1 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 4 is $19.9 billion. The estimated total NPV is provided for additional information, however DOE primarily relies upon the NPV of consumer benefits when determining whether a proposed standard level is economically justified.

At TSL 4, the average LCC impact is a savings of $18.94 for high-energy chargers, an average LCC savings $1.61 for medium-energy charger, an average LCC loss of $0.43 for low-energy chargers, an average LCC loss of $1.16 for open-placement wireless chargers, and an average LCC loss of $1.92 for fixed-location wireless chargers. The simple payback period is 1.5 years for high-energy chargers, 4.4 years for medium-energy chargers, 6.4 years for low-energy chargers, 11 years for open-placement wireless chargers, and 7.8 years for fixed-location wireless chargers. The fraction of consumers experiencing a net LCC cost is 1.3 percent for high-energy chargers, 49.8 percent for medium-energy chargers, 65.5 percent for low-energy chargers, 55.1 percent for open-placement wireless chargers, and 90 percent for fixed-location wireless chargers.

DOE further notes that for high-energy battery chargers, the overall battery charger performance can be heavily influenced by the performance of the battery or the combination of batteries it is tested with. These products are designed to work with a multitude of third party batteries (typically various types of lead acid batteries) and manufacturers have little control over the type of battery a consumer is likely to use with these high-energy battery chargers. DOE recognizes that the current market is still dominated by flooded lead acid batteries, which are used interchangeably with other lead acid battery subtypes for different applications (i.e., golf carts, marine application, and RVs), due to their low cost to acquire, abundant availability, and relatively lower safety risks; however, flooded lead acid batteries usually yield the least efficiency. When they are used to test corresponding high-energy battery chargers, DOE confirmed through internal testing that these flooded lead acid battery and charger combinations would not be able to meet TSL 4 standards. If TSL 4 was proposed, charger manufacturers would likely be unable to produce any chargers that are intended for flooded lead acid batteries, resulting in potentially millions of batteries left in the market without a proper charging solution.

At TSL 4, the projected change in INPV ranges from a decrease of $9,032 million to a decrease of $598 million, which represents a change of approximately -11.4 and -0.8 percent, respectively. DOE estimates that approximately 8 percent of low energy wired battery charger, approximately 19 percent of medium energy wired BC shipments, approximately 12 percent of high energy wired battery charger shipments, approximately 8 percent of fixed location wireless battery charger shipments, and approximately 53 percent of open location wireless battery charger shipments would meet the efficiency levels analyzed at TSL 4 in 2027. At TSL 4, many manufacturers would be required to redesign every battery charger model covered by this rulemaking. It is unclear if most manufacturers would have the engineering capacity to complete the necessary redesigns within the 2-year compliance period. If manufacturers require more than 2 years to redesign all their models, they will likely prioritize redesigns based on sales volume. The 12 percent of high energy wired battery charger shipments that presently would meet a TSL 4 standard are not designed to be used with flooded lead acid batteries. As noted previously, battery charger manufacturers would likely be unable to produce any charger that are intended for flooded lead acid batteries and there is risk that some other battery charger models will become either temporarily or permanently unavailable after the compliance date.

The Secretary tentatively concludes that at TSL 4 for battery chargers, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the economic burden on many consumers, and the impacts on manufacturers, including the large conversion costs and profit margin impacts that could result in a large reduction in INPV. A majority of consumers for most battery charger product classes (up to 90 percent for fixed-location wireless chargers) would experience a net cost and the average LCC savings would be negative, due to increased purchase prices. In particular, a majority of consumers of the product class with the most shipments (low-energy wired chargers) would experience a net cost. The potential reduction in INPV could be as high as 11.4 percent. In addition, the Secretary is concerned about the possibility of stranding certain categories of batteries that would not be able to find chargers that could comply with TSL 4 efficiencies. Consequently, the Secretary has tentatively concluded that TSL 4 is not economically justified.

DOE then considered TSL 3. TSL 3 represents efficiency level 2 for all battery charger product classes. TSL 3 represents above average models on the current market. TSL 3 would save an estimated 1.3 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be $3.8 billion using a discount rate of 7 percent, and $7.7 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 43 Mt of CO_2, 287 thousand tons of CH_4, and 0.45 thousand tons of N_2O, 19 thousand tons of SO_2, 66 thousand tons of NO_X, and 0.12 tons of Hg. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC-GHG at a 3-percent discount rate) at TSL 3 is $2.3 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 3 is $1.9 billion using a 7-percent discount rate and $4.1 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 3 is $8.0 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 3 is $14.1 billion. The estimated total NPV is provided for additional information, however DOE primarily relies upon the NPV of consumer benefits when determining whether a proposed standard level is economically justified.

At TSL 3, the average LCC impact is a savings of $14.32 for high-energy chargers, an average LCC savings $1.55 for medium-energy charger, an average LCC savings of $0.13 for low-energy chargers, an average LCC loss of $0.81 for open-placement wireless chargers, and an average LCC loss of $0.64 for fixed-location wireless chargers. The simple payback period is 1.5 years for high-energy chargers, 4.4 years for medium-energy chargers, 4.0 years for low-energy chargers, 9.2 years for open-placement wireless chargers, and 6.0 years for fixed-location wireless chargers. The fraction of consumers experiencing a net LCC cost is 1.6 percent for high-energy chargers, 30.5 percent for medium-energy chargers, 39.0 percent for low-energy chargers, 38.4 percent for open-placement wireless chargers, and 35.5 percent for fixed-location wireless chargers.

For wired battery chargers, TSL 3 provides meaningful energy savings amount with positive average LCC savings and acceptable conversion costs. DOE further notes that from internal testing and modeling, high-energy flooded lead acid battery chargers can also be compliant with TSL 3 with marginal added cost. However, TSL 3 for wireless chargers remains a challenging efficiency level to meet. DOE estimates that a large portion of wireless charger consumers will face net costs if standards were set at TSL 3. DOE also notes that the estimated PBP is longer than average product lifetime for these wireless battery chargers at TSL 3, indicating that consumers will likely not be able to recoup the additional cost in the long run. Furthermore, although the market for wireless chargers is quite developed already, new wireless charging products and options are still being introduced to the market on a regular basis. As such, prescribing standards at TSL 3 can limit the rate of growth for wireless charging market.

At TSL 3, the projected change in INPV ranges from a decrease of $4,402 million to a decrease of $260 million, which correspond to changes of -5.6 percent and -0.3 percent, respectively. DOE estimates that approximately 27 percent of low energy wired battery charger shipments, approximately 46 percent of medium energy wired battery charger shipments, approximately 26 percent of high energy wired battery charger shipments, approximately 66 percent of fixed location wireless battery charger shipments, and approximately 73 percent of open location wireless battery charger shipments would meet the efficiency levels analyzed at TSL 3 in 2027.

The Secretary tentatively concludes that at TSL 3 for battery chargers, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the economic burden on many consumers, and the impacts on manufacturers, including the large conversion costs, profit margin impacts that could result in a large reduction in INPV. Many battery charger consumers would experience a net cost and the average LCC savings would be negative for consumers of wireless battery chargers, due to increased purchase prices. These average LCC costs for wireless chargers are significant enough that, even with continued reductions in incremental purchase price, the LCC would not become positive for at least 10 years beyond the first year of compliance. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2, which represents efficiency level 2 for wired battery chargers and efficiency level 1 for wireless chargers. TSL 2 would save an estimated 1.2 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefit would be $3.7 billion using a discount rate of 7 percent, and $7.5 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 40 Mt of CO_2, 272 thousand tons of CH_4, and 0.42 thousand tons of N_2O, 18 thousand tons of SO_2, 62 thousand tons of NO_X, and 0.11 tons of Hg. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC-GHG at a 3-percent discount rate) at TSL 2 is $2.1 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 2 is $1.8 billion using a 7-percent discount rate and $3.8 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 2 is $7.7 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 2 is $13.5 billion. The estimated total NPV is provided for additional information, however DOE primarily relies upon the NPV of consumer benefits when determining whether a proposed standard level is economically justified.

At TSL 2, the average LCC impact is a savings of $14.32 for high-energy chargers, an average LCC savings $1.55 for medium-energy charger, an average LCC savings of $0.13 for low-energy chargers, an average LCC savings of $0.12 for open-placement wireless chargers, and an average LCC loss of $0.03 for fixed-location wireless chargers. For fixed-location wireless chargers, the average LCC quickly turns positive when considering the impact of reduction in prices experienced in the out years after the compliance date of the proposed standard, which is supported by the positive net present value over the 30-years of shipment. The simple payback period is 1.5 years for high-energy chargers, 4.4 years for medium-energy chargers, 4.0 years for low-energy chargers, 4.1 years for open-placement wireless chargers, and 3.8 years for fixed-location wireless chargers. The fraction of consumers experiencing a net LCC cost is 1.6 percent for high-energy chargers, 30.5 percent for medium-energy chargers, 39.0 percent for low-energy chargers, 6.8 percent for open-placement wireless chargers, and 13.9 percent for fixed-location wireless chargers.

At TSL 2, the projected change in INPV ranges from a decrease of $3,659 million to a decrease of $214 million, which correspond to changes of -4.6 percent and -0.3 percent, respectively. DOE estimates that industry must invest $398 million to comply with standards set at TSL 2. DOE estimates that approximately 27 percent of low energy wired battery chargers, approximately 46 percent of medium energy wired battery chargers shipments, approximately 26 percent of high energy wired battery charger shipments, approximately 92 percent of fixed location wireless battery charger shipments, and approximately 93 percent of open location wireless battery charger shipments would meet the efficiency levels analyzed at TSL 2 in 2027.

After considering the analysis and weighing the benefits and burdens, the Secretary has tentatively concluded that at a standard set at TSL 2 for battery chargers would be economically justified. At this TSL, a majority of consumers either experience a net benefit or are not impacted by the proposed rule, and the average LCC savings for consumers are positive or a minimally negative $0.03. The average incremental product costs for all battery chargers are very small relative to the costs of the applications using the battery charger, which are likely greater by several factors of 10 for some applications (*e.g.*, the cost of a smartphone is several hundreds of dollars, whereas the incremental cost of a more efficient battery charger for smartphones is a few dollars at most). Furthermore, due to price trends reducing incremental costs, the average LCC savings will grow in years beyond 2027 and fewer consumers would actually experience a net cost. In particular, the average LCC for fixed-location wireless chargers becomes positive after only 1 year beyond the first year of compliance. Low-income households are likely to experience very similar results and are not disproportionately disadvantaged at this TSL. The FFC national energy savings are significant and the NPV of consumer benefits is positive using both a 3-percent and 7-percent discount rate. The standard levels at TSL 2 are economically justified even without weighing the estimated monetary value of emissions reductions. When those emissions reductions are included – representing $2.1 billion in climate benefits (associated with the average SC-GHG at a 3-percent discount rate), and $3.8 billion (using a 3-percent discount rate) or $1.8 billion (using a 7-percent discount rate) in health benefits – the rationale becomes stronger still.

As stated, DOE conducts the walk-down analysis to determine the TSL that represents the maximum improvement in energy efficiency that is technologically feasible and economically justified as required under EPCA. The walk-down is not a comparative analysis, as a comparative analysis would result in the maximization of net benefits instead of the maximization of energy savings that are technologically feasible and economically justified, which would be contrary to the statute. 86 FR 70892, 70908. Although DOE has not conducted a comparative analysis to select the proposed energy conservation standards, DOE notes that at TSLs higher than the one proposed, a significant fraction of consumers for some product classes experience increased purchase costs greater than operating savings.

Although DOE considered proposed amended standard levels for battery chargers by grouping the efficiency levels for each product class into TSLs, DOE evaluates all analyzed efficiency levels in its analysis.

Therefore, based on the previous considerations, DOE proposes to adopt the energy conservation standards for battery chargers at TSL 2. The proposed amended energy conservation standards for battery chargers, which are expressed as active mode energy, or standby or off modes power, are shown in Table V.29.

Table V.29 Proposed Amended Energy Conservation Standards for Battery Chargers

<table>
<tr><th>Product Class</th><th>Battery Energy E_{batt} (Wh)</th><th>Active Mode Energy E_a (Wh)</th><th>Standby Mode Power P_{sb}* (W)</th><th>Off Mode Power P_{off} (W)</th></tr>
<tr><td>1a
Fixed-Location Wireless</td><td>≤100</td><td>1.718*Ebatt + 8.5</td><td>1.5</td><td>0</td></tr>
<tr><td>1b
Open-Placement Wireless</td><td>N/A</td><td>N/A</td><td>0.8 (P_{nb} only)</td><td>0</td></tr>
<tr><td>2a
Low-Energy</td><td>≤100</td><td>1.222*Ebatt + 4.980</td><td rowspan="3">0.00098*Ebatt + 0.4</td><td rowspan="3">0</td></tr>
<tr><td>2b
Medium-Energy</td><td>100–1000</td><td>1.367*Ebatt + -9.560</td></tr>
<tr><td>2c
High-Energy</td><td>>1000</td><td>1.323*Ebatt + 34.361</td></tr>
</table>

*Standby mode power is the sum of no-battery mode power and maintenance mode power, unless noted otherwise.

2. Annualized Benefits and Costs of the Proposed Standards

The benefits and costs of the proposed standards can also be expressed in terms of annualized values. The annualized net benefit is (1) the annualized national economic value (expressed in 2021$) of the benefits from operating products that meet the proposed standards (consisting primarily of operating cost savings from using less energy, minus increases in product purchase costs, and (2) the annualized monetary value of the climate and health benefits from emission reductions.

Table V.30 shows the annualized values for battery chargers under TSL 2, expressed in 2021$. The results under the primary estimate are as follows.

Using a 7-percent discount rate for consumer benefits and costs and health benefits from reduced NOx and SO_2 emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated cost of the standards proposed in this rule is $89 million per year in increased equipment costs, while the estimated annual benefits are $457 million in reduced equipment operating costs, $120 million in climate benefits, and $178 million in health benefits. In this case. The net benefit would amount to $665 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards is $81 million per year in increased equipment costs, while the estimated annual benefits are $500 million in reduced operating costs, $120 million in climate benefits, and $215 million in health benefits. In this case, the net benefit would amount to $754 million per year.

Table V.30 Annualized Benefits and Costs of Proposed Energy Conservation Standards for Battery Chargers (TSL 2)

	Million 2021$/year		
	Primary Estimate	**Low-Net-Benefits Estimate**	**High-Net-Benefits Estimate**
3% discount rate			
Consumer Operating Cost Savings	500	487	516
Climate Benefits*	120	120	120
Health Benefits**	215	215	215
Total Benefits†	834	821	850
Consumer Incremental Product Costs	81	90	71
Net Benefits	754	731	779
7% discount rate			
Consumer Operating Cost Savings	457	447	469
Climate Benefits* (3% discount rate)	120	120	120
Health Benefits**	178	178	178
Total Benefits†	754	744	766
Consumer Incremental Product Costs	89	98	79
Net Benefits	665	646	687

Note: This table presents the costs and benefits associated with battery chargers shipped in 2027−2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027−2056. The Primary, Low Net Benefits, and High Net Benefits Estimates utilize projections of energy prices from the AEO2022 Reference case, Low Economic Growth case, and High Economic Growth case, respectively. In addition, incremental equipment costs reflect a medium decline rate in the Primary Estimate, a low decline rate in the Low Net Benefits Estimate, and a high decline rate in the High Net Benefits Estimate. Note that the Benefits and Costs may not sum to the Net Benefits due to rounding.
* Climate benefits are calculated using four different estimates of the global SC-GHG (see section IV.L of this NOPR). For presentational purposes of this table, the climate benefits associated with the average SC-GHG at a 3 percent discount rate are shown, but the Department does not have a single central SC-GHG point estimate, and it emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22-30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana v. Biden*, No. 21-cv-1074-JDC-KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from "adopting, employing, treating as binding, or relying upon" the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. As reflected in this proposed rule, DOE has reverted to its approach prior to the injunction and presents monetized benefits where appropriate and permissible under law.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. See section IV.L of this document for more details.
† Total benefits for both the 3-percent and 7-percent cases are presented using the average SC-GHG with 3-percent discount rate, but the Department does not have a single central SC-GHG point estimate.

D. Reporting, Certification, and Sampling Plan

Manufacturers, including importers, must use product-specific certification templates to certify compliance to DOE. For battery chargers, the certification template reflects the general certification requirements specified at 10 CFR 429.12 and the product-specific requirements specified at 10 CFR 429.39. As discussed in the previous paragraphs, DOE is not proposing to amend the product-specific certification requirements for these products.

VI. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

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

Section 6(a) of E.O. 12866 also requires agencies to submit "significant regulatory actions" to OIRA for review. OIRA has determined that this proposed regulatory action constitutes a "significant regulatory action within the scope of section 3(f)(1)" of E.O. 12866. Accordingly, pursuant to section 6(a)(3)(C) of E.O. 12866, DOE has provided to OIRA an assessment, including the underlying analysis, of benefits and costs anticipated from the proposed regulatory action, together with, to the extent feasible, a quantification of those costs; and an assessment, including the underlying analysis, of costs and benefits of potentially effective and reasonably feasible alternatives to the planned regulation, and an explanation why the planned regulatory action is preferable to the identified potential alternatives. These assessments are summarized in this preamble and further detail can be found in the technical support document for this rulemaking.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 et seq.) requires preparation of an initial regulatory flexibility analysis ("IRFA") 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 (*www.energy.gov/gc/office-general-counsel*). DOE has prepared the following IRFA for the products that are the subject of this rulemaking.

For manufacturers of battery chargers, the Small Business Administration (SBA) has set a size threshold, which defines those entities classified as "small businesses" for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. (See 13 CFR part 121.) The size standards are listed by North American Industry Classification System ("NAICS") code and industry description and are available at www.sba.gov/document/support-table-size-standards. Manufacturing of battery chargers is classified under NAICS 335999, "All Other Miscellaneous Electrical Equipment and

Component Manufacturing." The SBA sets a threshold of 500 employees or fewer for an entity to be considered as a small business for this category.

1. Description of Reasons Why Action Is Being Considered

EPCA requires 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)).

2. Objectives of, and Legal Basis for, Rule

DOE must follow specific statutory criteria for prescribing new or amended standards for covered equipment, including BCs. 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 42 U.S.C. 6295(o)(3)(B))

3. Description on Estimated Number of Small Entities Regulated

DOE conducted a more focused inquiry of the companies that could be small businesses that manufacture or sell battery chargers covered by this rulemaking. DOE referenced DOE's publicly available CCD to generate a list of businesses producing or selling covered products and referenced D&B Hoovers reports, as well as the online presence of identified businesses in order to determine whether they might the criteria of a small business. DOE screened out companies that do not offer products covered by this rulemaking, do not meet the definition of a "small business," or are foreign owned and operated. Additionally, DOE filters out businesses that do not directly produce BCs, but that rather sell sourced BCs with other products or relabel sourced BCs to sell separately.

From these sources, DOE identified 296 unique businesses associated with at least one covered BC model and that fall under SBA's employee threshold for this rulemaking. While each of these small businesses certify models with DOE's CCD, DOE has only been able to identify a small number of domestic battery charger manufacturing facilities and therefore does not expect that many of the small businesses manufacture battery chargers, even if they may be OEM manufacturers of battery charger applications. From this list, DOE was able to identify three domestic small business manufacturers of battery chargers covered by this rulemaking—all operating in the high energy industry subsector.

DOE requests comment on the number of small businesses identified that manufacture battery chargers covered by this rulemaking.

4. Description and Estimate of Compliance Requirements for Small Entities

DOE has estimated that conversion costs would be proportional to the annual revenue attributable to battery chargers that do not meet the standards. In way of a maximum-costs estimate—if, as a result of standards, one of the small businesses were to need to redesign all of their battery charger models, DOE expects that these small businesses would incur product conversion costs equivalent to one additional annual R&D expenditure across the two-year compliance window. DOE estimated the high energy subsector average annual R&D expenditure to be approximately 3.6 percent of annual revenue. DOE also expects that small businesses, under the same circumstances, would incur capital conversion costs equivalent to 75 percent of an additional annual capital expenditure—in the form of new tooling, plastic molding, and additional quality control equipment—across the compliance period. DOE estimated the high energy industry average annual capital expenditure to be 3.0 percent annual of non-compliant battery charger revenue. Therefore, DOE conservatively estimates that small manufacturers may incur conversion costs of up to 5.85 percent of revenue attributable to battery charger sales across the two-year compliance period.

Table VI.1 Small Business Impacts

Small Business	Estimated Annual Revenue	Estimated Product Conversion Costs	Estimated Capital Conversion Costs	Total Conversion Cost as a Percentage of Annual Revenue
Small Business 1	$13,130,000	$472,700	$295,425	5.85%
Small Business 2	$10,890,000	$392,000	$245,025	5.85%
Small Business 3	$40,470,000	$1,456,900	$910,575	5.85%

Additional information about product conversion costs and small business impacts is in chapter 12 of the NOPR TSD.

DOE requests comment on the estimated product conversion costs of small businesses that manufacture or sell battery chargers covered by this rulemaking.

5. Duplication, Overlap, and Conflict with Other Rules and Regulations

DOE is not aware of any other rules or regulations that duplicate, overlap, or conflict with the rule being considered today.

6. Significant Alternatives to the Rule

The discussion in the previous section analyzes impacts on small businesses that would result from DOE's proposed rule, represented by TSL 2. In reviewing alternatives to the proposed rule, DOE examined energy conservation standards set at lower efficiency levels. While selecting TSL 1, would reduce the possible impacts on small businesses, it would come at the expense of a significant reduction in energy savings. TSL 2 achieves approximately 300 percent of the energy savings compared to the energy savings at TSL 1. DOE additionally estimates that TSL 1 would result in a lower net present value of consumer benefits than TSL 2 to the order of approximately $2,568 million.

Based on the presented discussion, establishing standards at TSL 2 balances the benefits of the energy savings at TSL 2 with the potential burdens placed on BCs manufacturers and small businesses. Accordingly, DOE does not propose one of the other TSLs considered in the analysis, or the other policy alternatives examined as part of the regulatory impact analysis and included in chapter 17 of the NOPR TSD.

Additional compliance flexibilities may be available through other means. EPCA provides that a manufacturer whose annual gross revenue from all of its operations does not exceed $8 million may apply for an exemption from all or part of an energy conservation standard for a period not longer than 24 months after the effective date of a final rule establishing the standard. (42 U.S.C. 6295(t)) Additionally, manufacturers subject to DOE's energy efficiency standards may apply to DOE's Office of Hearings and Appeals for exception relief under certain circumstances. Manufacturers should refer to 10 CFR part 430, subpart E, and 10 CFR part 1003 for additional details.

C. Review Under the Paperwork Reduction Act

Under the procedures established by the Paperwork Reduction Act of 1995 ("PRA"), a person is not required to respond to a collection of information by a Federal agency unless that collection of information displays a currently valid OMB Control Number.

OMB Control Number 1910-1400, Compliance Statement Energy/Water Conservation Standards for Appliances, is currently valid and assigned to the certification reporting requirements applicable to covered equipment, including battery chargers.

DOE's certification and compliance activities ensure accurate and comprehensive information about the energy and water use characteristics of covered products and covered equipment sold in the United States. Manufacturers of all covered products and covered equipment must submit a certification report before a basic model is distributed in commerce, annually thereafter, and if the basic model is redesigned in such a manner to increase the consumption or decrease the efficiency of the basic model such that the certified rating is no longer supported by the test data. Additionally, manufacturers must report when production of a basic model has ceased and is no longer offered for sale as part of the next annual certification report following such cessation. DOE requires the manufacturer of any covered product or covered equipment to establish, maintain, and retain the records of certification reports, of the underlying test data for all certification testing, and of any other testing conducted to satisfy the requirements of part 429, part 430, and/or part 431. Certification reports provide DOE and consumers with comprehensive, up-to date efficiency information and support effective enforcement.

Revised certification data would be required for battery chargers were this NOPR to be finalized as proposed; however, DOE is not proposing amended certification or reporting requirements for battery chargers in this NOPR. Instead, DOE may consider proposals to establish certification requirements and reporting for battery chargers under a separate rulemaking regarding appliance and equipment certification. DOE will address changes to OMB Control Number 1910-1400 at that time, as necessary.

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

D. Review Under the National Environmental Policy Act of 1969

DOE is analyzing this proposed regulation in accordance with the National Environmental Policy Act of 1969 ("NEPA") and DOE's NEPA implementing regulations (10 CFR part 1021). DOE's regulations include a categorical exclusion for rulemakings that establish energy conservation standards for consumer products or industrial equipment. 10 CFR part 1021, subpart D, appendix B5.1. DOE anticipates that this rulemaking qualifies for categorical exclusion B5.1 because it is a rulemaking that establishes energy conservation standards for consumer products or industrial equipment, none of the exceptions identified in categorical exclusion B5.1(b) apply, no extraordinary circumstances exist that require further environmental analysis, and it 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 rule.

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 rule 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 Executive Order 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 rule 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. Pub. L. 104-4, section 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 *www.energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf*.

Although this proposed rule does not contain a Federal intergovernmental mandate, it may require expenditures of $100 million or more in any one year by the private sector. Such expenditures may include: (1) investment in research and development and in capital expenditures by battery charger manufacturers in the years between the final rule and the compliance date for the new standards and (2) incremental additional expenditures by consumers to purchase higher-efficiency battery chargers, starting at the compliance date for the applicable standard.

Section 202 of UMRA authorizes a Federal agency to respond to the content requirements of UMRA in any other statement or analysis that accompanies the proposed rule. (2 U.S.C. 1532(c)) The content requirements of section 202(b) of UMRA relevant to a private sector mandate substantially overlap the economic analysis requirements that apply under section 325(o) of EPCA and Executive Order 12866. The **SUPPLEMENTARY INFORMATION** section of this NOPR and the TSD for this proposed rule respond to those requirements.

Under section 205 of UMRA, the Department is obligated to identify and consider a reasonable number of regulatory alternatives before promulgating a rule for which a written statement under section 202 is required. (2 U.S.C. 1535(a)) DOE is required to select from those alternatives the most cost-effective and least burdensome alternative that achieves the objectives of the proposed rule unless DOE publishes an explanation for doing otherwise, or the selection of such an alternative is inconsistent with law. As required by 42 U.S.C. 6295(m), this proposed rule would establish amended energy conservation standards for battery chargers that are designed to achieve the maximum improvement in energy efficiency that DOE has determined to be both technologically feasible and economically justified, as required by 42 U.S.C 6295(o)(2)(A) and 6295(o)(3)(B). A full discussion of the alternatives considered by DOE is presented in chapter 17 of the TSD for this proposed rule.

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 rule 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 rule would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

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

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for Federal agencies to review most disseminations of information to the public under information quality guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). Pursuant to OMB Memorandum M-19-15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at *www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf*. DOE has reviewed this NOPR under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

E.O. 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OIRA at OMB, a Statement of Energy Effects for any proposed significant energy action. A "significant energy action" is defined as any action by an agency that promulgates or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (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.

DOE has tentatively concluded that this regulatory action, which proposes amended energy conservation standards for battery chargers, is not a significant energy action because the proposed standards are not likely to have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as such by the Administrator at OIRA. Accordingly, DOE has not prepared a Statement of Energy Effects on this proposed rule.

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." 70 FR 2664, 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.[61] Generation of this report involved a rigorous, formal, and documented evaluation using objective criteria and qualified and independent reviewers to make a judgment as to the technical/scientific/business merit, the actual or anticipated results, and the productivity and management effectiveness of programs and/or projects. Because available data, models, and technological understanding have changed since 2007, DOE has engaged with the National Academy of Sciences to review DOE's analytical methodologies to

[61] The 2007 "Energy Conservation Standards Rulemaking Peer Review Report" is available at the following website: *energy.gov/eere/buildings/downloads/energy-conservation-standards-rulemaking-peer-review-report-0* (last accessed December 2, 2022).

ascertain whether modifications are needed to improve the Department's analyses. DOE is in the process of evaluating the resulting report.[62] .

VII. Public Participation

A. Participation in the Webinar

The time and date of the webinar meeting are listed in the DATES section at the beginning of this document. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website: *https://www.energy.gov/eere/buildings/public-meetings-and-comment-deadlines*. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has an interest in the topics addressed in this NOPR, or who is representative of a group or class of persons that has an interest in these issues, may request an opportunity to make an oral presentation at the webinar. Such persons may submit to *ApplianceStandardsQuestions@ee.doe.gov*. Persons who wish to speak should include with their request a computer file in WordPerfect, Microsoft Word, PDF, or text (ASCII) file format that briefly describes the nature of their interest in this rulemaking

[62] The report is available at *www.nationalacademies.org/our-work/review-of-methods-for-setting-building-and-equipment-performance-standards.*

and the topics they wish to discuss. Such persons should also provide a daytime telephone number where they can be reached.

C. Conduct of the Webinar

DOE will designate a DOE official to preside at the webinar/public meeting and may also use a professional facilitator to aid discussion. The meeting will not be a judicial or evidentiary-type public hearing, but DOE will conduct it in accordance with section 336 of EPCA. (42 U.S.C. 6306) A court reporter will be present to record the proceedings and prepare a transcript. DOE reserves the right to schedule the order of presentations and to establish the procedures governing the conduct of the webinar. There shall not be discussion of proprietary information, costs or prices, market share, or other commercial matters regulated by U.S. anti-trust laws. After the webinar and until the end of the comment period, interested parties may submit further comments on the proceedings and any aspect of the rulemaking.

The webinar will be conducted in an informal, conference style. DOE will a general overview of the topics addressed in this rulemaking, allow time for prepared general statements by participants, and encourage all interested parties to share their views on issues affecting this rulemaking. Each participant will be allowed to make a general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will permit, as time permits, other participants to comment briefly on any general statements.

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly. Participants should be prepared to answer questions by DOE and by other participants concerning these issues. DOE representatives may also ask questions of participants concerning other matters relevant to this rulemaking. The official conducting the webinar/public meeting will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the above procedures that may be needed for the proper conduct of the webinar.

A transcript of the webinar will be included in the docket, which can be viewed as described in the Docket section at the beginning of this document. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule before or after the public meeting, but no later than the date provided in the **DATES** section at the beginning of this proposed rule. 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 *www.regulations.gov*. The *www.regulations.gov* webpage 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 *www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information ("CBI")). Comments submitted through *www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

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

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

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

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

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

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

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

E. Issues on Which DOE Seeks Comment

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

(1) DOE requests feedback on DOE's approach of establishing these higher efficiency CSLs and welcomes stakeholders to submit any data on the actual market distribution of these higher efficiency CSLs.

(2) DOE requests stakeholder feedbacks on these analyzed incremental costs as well as any topic covered in chapter 5 of the NOPR TSD. DOE also welcomes stakeholders to submit their own cost-efficiency results, should there be any.

(3) DOE requests comment on how the proposed energy conservation standards might affect domestic battery charger manufacturing.

(4) DOE requests comment on possible impacts on manufacturing capacity stemming from amended energy conservation standards.

(5) DOE requests comment on potential impacts on fit, function, and utility of the battery chargerss from the proposed standard.

(6) DOE requests information regarding the impact of cumulative regulatory burden on manufacturers of battery chargers associated with multiple DOE standards or product-specific regulatory actions of other Federal agencies.

(7) DOE requests comment on the number of small businesses identified that manufacture battery chargers covered by this rulemaking.

(8) DOE requests comment on the estimated product conversion costs of small businesses that manufacture or sell battery chargers covered by this rulemaking.

Additionally, DOE welcomes comments on other issues relevant to the conduct of this rulemaking that may not specifically be identified in this document.

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this notice of proposed rulemaking and announcement of public meeting.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Intergovernmental relations, Small businesses.

Signing Authority

This document of the Department of Energy was signed on March 3, 2023, by Francisco Alejandro Moreno, Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on March 3, 2023.

X FRANCISCO MORENO

Digitally signed by FRANCISCO MORENO
Date: 2023.03.03 09:14:20 -05'00'

Francisco Alejandro Moreno
Acting Assistant Secretary for Energy Efficiency and Renewable Energy
U.S. Department of Energy

For the reasons set forth in the preamble, DOE proposes to amend part 430 of chapter II, subchapter D, of title 10 of the Code of Federal Regulations, as set forth below:

PART 430 - ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

1. The authority citation for part 430 continues to read as follows:

Authority: 42 U.S.C. 6291-6309; 28 U.S.C. 2461 note.

2. Amended §430.32 by revising paragraph (z)(1) to read as follows:

§430.32 Energy and water conservation standards and their compliance dates.

* * * * *

(z) *Battery chargers.*

(1)(i) Battery chargers manufactured on or after June 13, 2018, and before [*date two years after publication of the final rule]*, must have a unit energy consumption (UEC) less than or equal to the prescribed "Maximum UEC" standard when using the equations for the appropriate product class and corresponding rated battery energy as shown in the following table:

Product class	Product class description	Rated battery energy (E_{batt}**)	Special characteristic or battery voltage	Maximum UEC (kWh/year) (as a function of E_{batt}**)
1	Low-Energy	≤5 Wh	Inductive Connection*	3.04
2	Low-Energy, Low-Voltage	<100 Wh	<4 V	$0.1440*E_{batt} + 2.95$
3	Low-Energy, Medium-Voltage	<100 Wh	4-10 V	For $E_{batt}<10$ Wh, 1.42; For $E_{batt}\geq 10$ Wh, $0.0255*E_{batt} + 1.16$

4	Low-Energy, High-Voltage	<100 Wh	>10 V	$0.11 * E_{batt} + 3.18$
5	Medium-Energy, Low-Voltage	100-3000 Wh	<20 V	$0.0257 * E_{batt} + 0.815$
6	Medium-Energy, High-Voltage	100-3000 Wh	≥20 V	$0.0778 * E_{batt} + 2.4$
7	High-Energy	>3000 Wh		$0.0502 * E_{batt} + 4.53$

* Inductive connection and designed for use in a wet environment (*e.g.,* electric toothbrushes).

** E_{batt} = Rated battery energy as determined in 10 CFR part 429.39(a).

(ii) Battery chargers manufactured on or after *[date two years after publication of the final rule]*, must meet the following active mode energy, standby mode power, and off mode power standards:

Product Class	Battery Energy E_{batt} (Wh)	Active Mode Energy E_a (Wh)	Standby Mode Power P_{sb}* (W)	Off Mode Power P_{off} (W)
1a Fixed-Location Wireless	≤100	1.718*Ebatt + 8.5	1.5	0
1b Open-Placement Wireless	N/A	N/A	0.8 (P_{nb} only)	0
2a Low-Energy	≤100	1.222*Ebatt + 4.980	0.00098*Ebatt + 0.4	0
2b Medium-Energy	100–1000	1.367*Ebatt + -9.560		
2c High-Energy	>1000	1.323*Ebatt + 34.361		

* Standby mode power is the sum of no-battery mode power and maintenance mode power, unless noted otherwise.