This document, concerning uninterruptible power supplies 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

[Docket Number EERE–2016–BT–STD–0022]

RIN 1904-AD69

Energy Conservation Program: Energy Conservation Standards for Uninterruptible Power Supplies

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

ACTION: Notice of proposed rulemaking (NOPR) and announcement of public meeting.

SUMMARY: The Energy Policy and Conservation Act of 1975 (EPCA), as amended, prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including battery chargers**.** In this notice, the U.S. Department of Energy (DOE) proposes new energy conservation standards for uninterruptible power supplies, a class of 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 on Friday, September 9, 2016, from 9:30 a.m. to 2:00 p.m., in Washington, DC. The meeting will also be broadcast as a webinar. 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 notice of proposed rulemaking (NOPR) before and after the public meeting, but no later than [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. See section VII, "Public Participation," for details.

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

ADDRESSES: The public meeting will be held at the U.S. Department of Energy, Forrestal Building, Room 6E-069, 1000 Independence Avenue, SW, Washington, DC 20585.

Instructions: Any comments submitted must identify the NOPR on Energy Conservation Standards for Battery Chargers, and provide docket number EERE-2016–

BT–STD–0022 and/or regulatory information number (RIN) 1904-AD69. Comments may be submitted using any of the following methods:

1) Federal eRulemaking Portal: www.regulations.gov. Follow the instructions for submitting comments.
2) E-mail: BatteryChargersUPS2016STD0022@ee.doe.gov. Include the docket number and/or RIN in the subject line of the message. Submit electronic comments in WordPerfect, Microsoft Word, PDF, or ASCII file format, and avoid the use of special characters or any form of encryption.
3) Postal Mail: Mr. Jeremy Dommu, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
4) Hand Delivery/Courier: Mr. Jeremy Dommu, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., Washington, DC, 20024. Telephone: (202) 586-2945. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

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

Written comments regarding the burden-hour estimates or other aspects of the collection-of-information requirements contained in this proposed rule may be submitted to Office of Energy Efficiency and Renewable Energy through the methods listed above and by e-mail to Chad_S_Whiteman@omb.eop.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 before [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION]. Please indicate in the "Subject" line of your e-mail the title and Docket Number of this proposed rulemaking.

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

The docket web page can be found at: http://www.regulations.gov/#!docketDetail;D=EERE-2016-BT-STD-0022. This webpage contains a link to the docket for this notice on the www.regulations.gov site. The www.regulations.gov webpage contains simple instructions on how to access all documents, including public comments, in the docket. See section VII, "Public

Participation," for further information on how to submit comments through www.regulations.gov.

FOR FURTHER INFORMATION CONTACT:

Jeremy Dommu, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-9870. E-mail: battery_chargers_and_external_power_supplies@ee.doe.gov.

Celia Sher, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-6122. E-mail: Celia.Sher@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 Appliance and Equipment Standards Program staff at (202) 586-6636 or by e-mail: battery_chargers_and_external_power_supplies@ee.doe.gov .

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Synopsis of the Proposed Rule

Title III, Part B[1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Public Law 94-163 (42 U.S.C. 6291-6309, as codified), established the Energy Conservation Program for Consumer Products Other Than Automobiles.[2] 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 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)(1))

In accordance with these and other statutory provisions discussed in this document, DOE proposes new energy conservation standards for uninterruptible power supplies (hereafter referred to as "UPSs"), a class of battery chargers. The proposed standards, which are expressed in average load adjusted efficiency, are shown in Table I.1.

---

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

[2] All references to EPCA in this document refer to the statute as amended through the Energy Efficiency Improvement Act of 2015, Public Law 114-11 (Apr. 30, 2015).

These proposed standards, if adopted, would apply to all UPSs listed in Table I.1 and manufactured in, or imported into, the United States starting on and after the date two years after the publication of the final rule for this rulemaking.

Table I.1 Proposed Energy Conservation Standards for Uninterruptible Power Systems

UPS Product Class	Rated Output Power	Minimum Efficiency
Voltage and Frequency Dependent	$0\ W < P_{rated} \leq 300\ W$	-1.09E-06 * P_{rated}^2 + 6.50E-04 * P_{rated} + 0.876
	$300\ W < P_{rated} \leq 700\ W$	-5.63E-08 * P_{rated}^2 + 7.61E-05 * P_{rated} + 0.955
	$P_{rated} > 700\ W$	-6.22E-09 * P_{rated}^2 + 3.91E-06 * P_{rated} + 0.981
Voltage Independent	$0\ W < P_{rated} \leq 300\ W$	-6.45E-07 * P_{rated}^2 + 3.80E-04 * P_{rated} + 0.929
	$300\ W < P_{rated} \leq 700\ W$	-3.94E-08 * P_{rated}^2 + 4.87E-05 * P_{rated} + 0.974
	$P_{rated} > 700\ W$	-2.28E-09 * P_{rated}^2 – 7.40E-07 * P_{rated} + 0.990
Voltage and Frequency Independent	$0\ W < P_{rated} \leq 300\ W$	-3.13E-06 * P_{rated}^2 + 1.96E-03 * P_{rated} + 0.544
	$300\ W < P_{rated} \leq 700\ W$	-2.60E-07 * P_{rated}^2 + 3.65E-04 * P_{rated} + 0.765
	$P_{rated} > 700\ W$	-1.70E-08 * P_{rated}^2 + 3.85E-05 * P_{rated} + 0.877

A. Benefits and Costs to Consumers

Table I.2 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of UPSs, as measured by the average life-cycle cost (LCC) savings and the simple payback period (PBP).[3] The average LCC savings are positive for all product classes, and the PBP is less than the average lifetime of UPSs, which is estimated to be between 5 and 10 years, depending on product class (see section IV.F.6).

[3] The average LCC savings are measured relative to the efficiency distribution in the no-standards case, which depicts the market in the compliance year in the absence of standards (see section IV.F.8). The simple PBP, which is designed to compare specific efficiency levels, is measured relative to the baseline model (see section IV.F.9).

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

Product Class	Description	Average LCC Savings [2015$]	Simple Payback Period years
10a	VFD UPS	$33.1	0.0
10b	VI UPS	$6.09	4.6
10c	VFI UPS	$34.7	4.7

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 reference year through the end of the analysis period (2016 to 2048). Using a real discount rate of 6.1 percent, DOE estimates that the INPV for manufacturers of UPSs in the case without standards is $2,555 million in 2015$. Under the proposed standards, DOE expects that manufacturers may lose up to 23.4 percent of this INPV, which is approximately $598 million. Additionally, based on DOE's interviews with the manufacturers of UPSs, DOE does not expect significant impacts on manufacturing capacity or loss of employment for the industry as a whole to result from the proposed standards for UPSs.

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

C. National Benefits and Costs[4]

DOE's analyses indicate that the proposed energy conservation standards for UPSs would save a significant amount of energy. Relative to the case without new standards, the lifetime energy savings for UPSs purchased in the 30-year period that begins in the anticipated year of compliance with the new standards (2019–2048) amount to 1.18 quadrillion British thermal units (Btu), or quads.[5] This represents a savings of 22.6 percent relative to the energy use of these products in the case without new standards (referred to as the "no-standards case").

The cumulative net present value (NPV) of total consumer costs and savings of the proposed standards for UPSs ranges from $1.87 billion (at a 7-percent discount rate) to $4.40 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 UPSs purchased in 2019–2048.

In addition, the proposed standards for UPSs 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 72.0 million metric tons (Mt)[6] of carbon dioxide (CO_2), 40.9 thousand tons of sulfur dioxide

[4] All monetary values in this document are expressed in 2015 dollars and, where appropriate, are discounted to 2016 unless explicitly stated otherwise.
[5] 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.2.
[6] A metric ton is equivalent to 1.1 short tons. Results for emissions other than CO_2 are presented in short tons.

(SO_2), 130 thousand tons of nitrogen oxides (NO_X), 306 thousand tons of methane (CH_4), 0.850 thousand tons of nitrous oxide (N_2O), and 0.151 tons of mercury (Hg).[7] The cumulative reduction in CO_2 emissions through 2030 amounts to 19.1 Mt, which is equivalent to the emissions resulting from the annual electricity use of 2.63 million homes.

The value of the CO_2 reductions is calculated using a range of values per metric ton (t) of CO_2 (otherwise known as the "Social Cost of Carbon", or SCC) developed by a Federal interagency working group.[8] The derivation of the SCC values is discussed in section IV.L. Using discount rates appropriate for each set of SCC values (see Table I.3), DOE estimates the present monetary value of the CO_2 emissions reduction (not including CO_2 equivalent emissions of other gases with global warming potential) is between \$0.559 billion and \$7.49 billion, with a value of \$2.46 billion using the central SCC case represented by \$40.6/t in 2015. DOE also estimates the present monetary value of the NO_X emissions reduction to be \$126 million at a 7-percent discount rate and \$274 million at a 3-percent discount rate.[9] DOE is investigating appropriate valuation of the reduction in methane and other emissions, and did not include any values in this rulemaking.

[7] DOE calculated emissions reductions relative to the no-standards case, which reflects key assumptions in the Annual Energy Outlook 2015 (AEO 2015) Reference case, which generally represents current legislation and environmental regulations for which implementing regulations were available as of October 31, 2014.

[8] United States Government—Interagency Working Group on Social Cost of Carbon. Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, May 2013). Revised July 2015. Available at https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf.

[9] DOE estimated the monetized value of NO_X emissions reductions associated with electricity savings using benefit per ton estimates from the Regulatory Impact Analysis for the Clean Power Plan Final Rule, published in August 2015 by EPA's Office of Air Quality Planning and Standards. Available at www.epa.gov/cleanpowerplan/clean-power-plan-final-rule-regulatory-impact-analysis. See section IV.L for further discussion. The U.S. Supreme Court has stayed the rule implementing the Clean Power Plan

Table I.3 summarizes the national economic benefits and costs expected to result from the proposed standards for UPSs.

until the current litigation against it concludes. Chamber of Commerce, et al. v. EPA, et al., Order in Pending Case, 577 U.S. ___ (2016). However, the benefit-per-ton estimates established in the Regulatory Impact Analysis for the Clean Power Plan are based on scientific studies that remain valid irrespective of the legal status of the Clean Power Plan. DOE is primarily using a national benefit-per-ton estimate for NO_X emitted from the Electricity Generating Unit sector based on an estimate of premature mortality derived from the ACS study (Krewski et al. 2009). If the benefit-per-ton estimates were based on the Six Cities study (Lepuele et al. 2011), the values would be nearly two-and-a-half times larger.

Table I.3 Summary of National Economic Benefits and Costs of Proposed Energy Conservation Standards for UPSs (TSL 2)*

Category	Present Value billion 2015$	Discount Rate
Benefits		
Consumer Operating Cost Savings	4.40	7%
	9.02	3%
CO_2 Reduction Monetized Value ($12.4/t case)**	0.559	5%
CO_2 Reduction Monetized Value ($40.6/t case)**	2.46	3%
CO_2 Reduction Monetized Value ($63.2/t case)**	3.87	2.5%
CO_2 Reduction Monetized Value ($118/t case)**	7.49	3%
NO_X Reduction Monetized Value†	0.126	7%
	0.274	3%
Total Benefits‡	6.99	7%
	11.8	3%
Costs		
Consumer Incremental Installed Costs	2.53	7%
	4.62	3%
Total Net Benefits		
Including CO_2 and NO_X Reduction Monetized Value††	4.46	7%
	7.14	3%

* This table presents the costs and benefits associated with UPSs shipped in 2019−2048. These results include benefits to consumers which accrue after 2048 from the products purchased in 2019−2048. The costs account for the incremental variable and fixed costs incurred by manufacturers due to the standard, some of which may be incurred in preparation for the rule. Note that the Benefits and Costs may not sum to the Net Benefits due to rounding.

** The CO_2 values represent global monetized values of the SCC, in 2015$ per metric ton (t), in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5-percent, 3-percent, and 2.5-percent discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. The SCC time series incorporate an escalation factor.

† DOE estimated the monetized value of NO_X emissions reductions associated with electricity savings using benefit per ton estimates from the "Regulatory Impact Analysis for the Clean Power Plan Final Rule," published in August 2015 by EPA's Office of Air Quality Planning and Standards. (Available at www.epa.gov/cleanpowerplan/clean-power-plan-final-rule-regulatory-impact-analysis.) See section IV.L for further discussion. DOE is primarily using a national benefit-per-ton estimate for NO_X emitted from the Electricity Generating Unit sector based on an estimate of premature mortality derived from the ACS study (Krewski et al. 2009). If the benefit-per-ton estimates were based on the Six Cities study (Lepuele et al. 2011), the values would be nearly two-and-a-half times larger.

‡ Total Benefits for both the 3% and 7% cases are derived using the series corresponding to average SCC with 3-percent discount rate ($40.6/t case).

The benefits and costs of the proposed standards, for UPSs sold in 2019-2048, can also be expressed in terms of annualized values. The monetary values for the total annualized net benefits are the sum of (1) the national economic value of the benefits in reduced consumer operating costs, minus (2) the increase in product purchase prices and installation costs, plus (3) the value of the benefits of CO_2 and NO_X emission reductions, all annualized.[10]

Although the values of operating cost savings and CO_2 emission reductions are both important, two issues are relevant. First, the national operating savings are domestic U.S. consumer monetary savings that occur as a result of market transactions, whereas the value of CO_2 reductions is based on a global value. Second, the assessments of operating cost savings and CO_2 savings are performed with different methods that use different time frames for analysis. The national operating cost savings is measured for the lifetime of UPSs shipped in 2019–2048. Because CO_2 emissions have a very long residence time in the atmosphere,[11] the SCC values in future years reflect future CO_2-emissions impacts that continue beyond 2100.

[10] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2016, 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., 2020 or 2030), and then discounted the present value from each year to 2016. The calculation uses discount rates of 3 and 7 percent for all costs and benefits except for the value of CO_2 reductions, for which DOE used case-specific discount rates, as shown in Table I.3. 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.

[11] The atmospheric lifetime of CO_2 is estimated on the order of 30–95 years. Jacobson, M. Z. Correction to "Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming." J. Geophys. Res. 2005. 110: D14105. doi:10.1029/2005JD005888

Estimates of annualized benefits and costs of the proposed standards are shown in Table I.4. The results under the primary estimate are as follows. Using a 7-percent discount rate for benefits and costs other than CO_2 reduction (for which DOE used a 3-percent discount rate along with the average SCC series that has a value of $40.6/t in 2015),[12] the estimated cost of the standards proposed in this rule is $234 million per year in increased equipment costs, while the estimated annual benefits are $406 million in reduced equipment operating costs, $133 million in CO_2 reductions, and $11.6 million in reduced NO_X emissions. In this case, the net benefit amounts to $317 million per year. Using a 3-percent discount rate for all benefits and costs and the average SCC series that has a value of $40.6/t in 2015, the estimated cost of the proposed standards is $250 million per year in increased equipment costs, while the estimated annual benefits are $488 million in reduced operating costs, $133 million in CO_2 reductions, and $14.8 million in reduced NO_X emissions. In this case, the net benefit amounts to $386 million per year.

[12] DOE used a 3-percent discount rate because the SCC values for the series used in the calculation were derived using a 3-percent discount rate (section IV.L).

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

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*	High Net Benefits Estimate*
		million 2015$/year		
Benefits				
Consumer Operating Cost Savings	7%	406	348	462
	3%	488	413	565
CO_2 Reduction Monetized Value ($12.4/t case)**	5%	40.1	35.5	44.4
CO_2 Reduction Monetized Value ($40.6/t case)**	3%	133	117	148
CO_2 Reduction Monetized Value ($63.2/t case)**	2.5%	194	171	216
CO_2 Reduction Monetized Value ($118/t case)**	3%	405	357	451
NO_X Reduction Monetized Value†	7%	11.6	10.4	28.6
	3%	14.8	13.1	37.5
Total Benefits‡	7% plus CO_2 range	458 to 823	394 to 716	535 to 941
	7%	551	476	638
	3% plus CO_2 range	543 to 908	462 to 783	647 to 1,050
	3%	636	544	751
Costs				
Consumer Incremental Product Costs	7%	234	209	256
	3%	250	221	277
Net Benefits				
Total‡	7% plus CO_2 range	224 to 589	185 to 507	278 to 685
	7%	317	267	382
	3% plus CO_2 range	293 to 658	241 to 563	369 to 776
	3%	386	323	473

* This table presents the annualized costs and benefits associated with UPSs shipped in 2019−2048. These results include benefits to consumers which accrue after 2048 from the products purchased in 2019−2048. The results account for the incremental variable and fixed costs incurred by manufacturers due to the standard, some of which may be incurred in preparation for the rule. The Primary, Low Net Benefits, and High Net Benefits Estimates utilize projections of energy prices from the AEO 2015 Reference case, Low Economic Growth case, and High Economic Growth case, respectively. .Note that the Benefits and Costs may not sum to the Net Benefits due to rounding.
** The CO_2 values represent global monetized values of the SCC, in 2015$ per metric ton (t), in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5-percent, 3-percent, and 2.5-percent discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3-percent discount rate. The SCC time series incorporate an escalation factor.
† DOE estimated the monetized value of NO_X emissions reductions associated with electricity savings using benefit per ton estimates from the "Regulatory Impact Analysis for the Clean Power Plan Final Rule," published in August 2015 by EPA's Office of Air Quality Planning and Standards. (Available at www.epa.gov/cleanpowerplan/clean-power-plan-final-rule-regulatory-impact-analysis.) See section IV.L for further discussion. For the Primary Estimate and Low Net Benefits Estimate, DOE used a national benefit-per-ton estimate for NO_X emitted from the Electric Generating Unit sector based on an estimate of premature mortality derived from the ACS study (Krewski et al. 2009). For DOE's High Net Benefits Estimate, the benefit-per-ton estimates were based on the Six Cities study (Lepuele et al. 2011), which are nearly two-and-a-half times larger than those from the ACS study.
‡ Total Benefits for both the 3% and 7% cases are derived using the series corresponding to the average SCC with a 3-percent discount rate ($40.6/t case). In the rows labeled "7% plus CO_2 range" and "3% plus CO_2 range," the operating cost and NO_X benefits are calculated using the labeled discount rate, and those values are added to the full range of CO_2 values.

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. DOE further notes that UPSs achieving these standard levels are already commercially available for all product classes covered by this proposal. Based on the analyses described above, DOE has tentatively concluded that the benefits of the proposed standards to the Nation (energy savings, positive NPV of consumer benefits, consumer

LCC savings, and emission reductions) would outweigh the burdens (loss of INPV for manufacturers and LCC increases for some consumers).

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 notice and related information collected and analyzed during the course of this rulemaking effort, DOE may adopt energy efficiency levels presented in this notice 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. DOE's regulations define "battery charger" as a device that charges batteries for consumer products, including battery chargers embedded in other consumer products. 10 CFR 430.2.

A. Authority

Title III, Part B of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Pub. L. 94-163 (codified as 42 U.S.C. 6291-6309) established the Energy Conservation Program for Consumer Products Other Than Automobiles, a program covering most major household appliances (collectively referred to as “covered products”), which includes battery chargers.

Section 309 of the Energy Independence and Security Act of 2007 (“EISA 2007”) amended EPCA by directing DOE to prescribe, by rule, definitions and test procedure for the power use of battery chargers (42 U.S.C. 6295(u)(1)), and to issue a final rule that prescribes energy conservation standards for battery chargers or classes of battery chargers or determine that no energy conservation standard is technologically feasible and economically justified. (42 U.S.C. 6295(u)(1)(E))

Pursuant to EPCA, DOE’s energy conservation program for covered products consists essentially of four parts: (1) testing, (2) labeling, (3) the establishment of Federal energy conservation standards, and (4) certification and enforcement procedures. The Federal Trade Commission (FTC) is primarily responsible for labeling, and DOE implements the remainder of the program. 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 (r)) Manufacturers of covered products must use the prescribed DOE test procedure as the basis for certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA and when making representations to the public regarding the energy use or efficiency of those products. (42 U.S.C. 6293(c) and 6295(s)) Similarly, DOE must use these test procedures to determine whether the products comply with standards adopted pursuant to EPCA. (42 U.S.C. 6295(s)) The

DOE test procedure for battery chargers appears at title 10 of the Code of Federal Regulations (CFR) part 430, subpart B, appendix Y.

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 is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A) and (3)(B)) Furthermore, DOE may not adopt any standard that would not result in the significant conservation of energy. (42 U.S.C. 6295(o)(3)) Moreover, DOE may not prescribe a standard: (1) for certain products, including 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 standard;

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

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

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

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

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

(42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

Further, EPCA, as codified, 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, as codified, 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))

Federal energy conservation requirements generally supersede State laws or 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 42 U.S.C. 6297(d)).

Finally, pursuant to the amendments contained in EISA 2007, any final rule for new or amended energy conservation standards promulgated after July 1, 2010, is required to address standby mode and off mode energy use. (42 U.S.C. 6295(gg)(3)) Specifically, when DOE adopts a standard for a covered 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))

B. Background

1. Current Standards

In a final rule published on June 13, 2016, DOE prescribed the current energy conservation standards for battery chargers manufactured on and after June 13, 2018. 81 FR 38266. These standards, which do not cover UPSs, are set forth in DOE's regulations at 10 CFR 430.32 and are repeated in Table II.1.

Table II.1 Federal Energy Conservation Standards for Battery Chargers

Product Class	Product Class Description	Battery Energy Watt-hours (Wh)	Special Characteristic or Battery Voltage	Adopted Standard as a Function of Battery Energy (kWh/yr)
1	Low-Energy	≤ 5 Wh	Inductive Connection in Wet Environments	3.04

2	Low-Energy, Low-Voltage	< 100 Wh	< 4 V	0.1440 * E_{batt} + 2.95
3	Low-Energy, Medium-Voltage		4 – 10 V	For E_{batt} < 10Wh, 1.42 kWh/y $E_{batt} \geq$ 10 Wh, 0.0255 * E_{batt} + 1.16
4	Low-Energy, High-Voltage		> 10 V	0.11 * E_{batt} + 3.18
5	Medium-Energy, Low-Voltage	100 – 3000 Wh	< 20 V	0.0257 * E_{batt} + .815
6	Medium-Energy, High-Voltage		≥ 20 V	0.0778 * E_{batt} + 2.4
7	High-Energy	> 3000 Wh	-	0.0502 * E_{batt} + 4.53

2. History of Standards Rulemaking for UPSs

DOE originally proposed energy conservation standards for battery chargers including UPSs in the battery charger energy conservation standards NOPR published on March 27, 2012 (March 2012 NOPR). In this NOPR, DOE proposed to test all covered battery chargers, including UPSs, using the battery charger test procedure finalized on June 1, 2011 and to regulate them using a unit energy consumption ("UEC") metric. See 77 FR 18478.

DOE issued a battery charger energy conservation standards supplemental notice of proposed rulemaking ("SNOPR") to propose revised energy standards for battery chargers on September 1, 2015. See 80 FR 52850. This notice did not propose standards for UPSs because of DOE's intention to regulate UPS as part of the separate rulemaking for computer and battery backup systems. DOE also issued a battery charger test procedure NOPR on August 6, 2015, which proposed to exclude backup battery chargers, including UPSs, from the scope of the battery charger test procedure. See 80 FR

46855. DOE held a public meeting on September 15, 2015 to discuss both of these notices.

During 2014, DOE explored whether to regulate UPSs as “computer systems.” See, e.g., 79 FR 11345 (Feb. 28, 2014) (proposed coverage determination); 79 FR 41656 (July 17, 2014) (computer systems framework document). DOE received a number of comments in response to those documents (and the related public meetings) regarding testing of UPSs and the appropriate venue to address these devices.

Additionally, DOE received a number of stakeholder comments on the August 2015 battery charger test procedure NOPR and the September 2015 battery charger energy conservation standard SNOPR regarding regulation of UPSs. After considering these comments, DOE reconsidered its position and found that since a UPS meets the definition of a battery charger, it is more appropriate to regulate UPSs as part of the battery charger rulemaking, rather than the computers rulemaking. While the changes proposed in the August 2015 battery charger test procedure NOPR and the September 2015 energy conservation standard SNOPR were finalized on May 20, 2016 (81 FR 31827) and June 13, 2016 (81 FR 38266), respectively, DOE continues to conduct rulemaking activities to consider test procedures and energy conservations standards for UPSs as part of ongoing and future battery charger rulemaking proceedings. To that end, DOE published a notice of proposed rulemaking on May 19, 2016 to amend the battery charger test procedure to include specific testing requirements for UPSs (“UPS test procedure NOPR”). See 81 FR 31542. DOE is now proposing energy conservation standards for UPSs as part of the battery charger regulations in this NOPR.

III. General Discussion

DOE developed this proposal after considering verbal 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. Test Procedure

DOE recently published the UPS test procedure NOPR on May 19, 2016. See 81 FR 31542. DOE advises all stakeholders to review that proposal.

B. 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. 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(i)

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; and (3) adverse impacts on health or safety. 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(ii)-(iv). Additionally, it is DOE policy not to include in its analysis any proprietary technology that is a unique pathway to achieving a certain efficiency level. Section IV.B of this notice discusses the results of the screening analysis for UPSs, 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 UPSs, 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.

C. Energy Savings

1. Determination of Savings

For each trial standard level (TSL), DOE projected energy savings from application of the TSL to UPSs purchased in the 30-year period that begins in the year of compliance with the proposed standards (2019–2048).[13] The savings are measured over the entire lifetime of UPSs purchased in the above 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-standards case. The no-standards case represents a projection of energy consumption that reflects how the market for a product would likely evolve in the absence of new 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 UPSs. The NIA spreadsheet model (described in section IV.H of this notice) calculates energy savings in terms of site energy, which is the energy directly consumed by products at the locations where they are used. Based on the site energy, DOE calculates NES in terms of primary energy savings at the site or at power plants, and also in terms of full-fuel-cycle (FFC) energy savings. The FFC metric includes the energy consumed in extracting, processing, and transporting primary fuels (i.e., coal, natural gas, petroleum fuels), and thus presents a more complete picture of the impacts of energy conservation standards.[14]

[13] Each TSL is composed of specific efficiency levels for each product class. The TSLs considered for this NOPR are described in section V.A. DOE conducted a sensitivity analysis that considers impacts for products shipped in a 9-year period.
[14] 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).

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.2 of this notice.

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)) Although the term "significant" is not defined in the Act, the U.S. Court of Appeals for the District of Columbia Circuit, in Natural Resources Defense Council v. Herrington, 768 F.2d 1355, 1373 (D.C. Cir. 1985), opined that Congress intended "significant" energy savings in the context of EPCA to be savings that are not "genuinely trivial." The energy savings for all of the TSLs considered in this rulemaking, including the proposed standards (presented in section V.B.3.a), are nontrivial, and, therefore, DOE considers them "significant" within the meaning of section 325 of EPCA.

D. Economic Justification

1. Specific Criteria

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

a. Economic Impact on Manufacturers and Consumers

In determining the impacts of a potential amended standard on manufacturers, DOE conducts a manufacturer impact analysis (MIA), as discussed in section IV.J. DOE first uses an annual cash-flow approach to determine the quantitative impacts. This step includes both a short-term assessment—based on the cost and capital requirements during the period between when a regulation is issued and when entities must comply with the regulation—and a long-term assessment over a 30-year period. The industry-wide impacts analyzed include (1) industry net present value (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 payback period (PBP) associated with new 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 disproportionately affected by a standard.

b. Savings in Operating Costs Compared to Increase in Price

EPCA requires DOE to consider the savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered 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 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 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.C, 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 NOPR 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 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.

The proposed standards also are likely to result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases (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 emissions impacts are reported in section V.B.6 of this NOPR. 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 interested parties submit any relevant information regarding economic justification that does not fit into the other categories described above, 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 IV.F.9 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 UPSs. 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 forecasts 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: https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=26. Additionally, DOE used output from the latest version of EIA's Annual Energy Outlook (AEO), a widely known energy forecast 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 UPSs. The key findings of DOE's market assessment are summarized below. See chapter 3 of the NOPR TSD for further discussion of the market and technology assessment.

1. Scope of Coverage and Product Classes

In the May 2016 UPS test procedure NOPR, DOE proposed the definition of UPS from section 3.1.1 of IEC 62040-3 Edition. 2.0, "Uninterruptible power systems (UPS) –

Method of specifying the performance and test requirements”, March 2011 (IEC 62040-3 Ed. 2.0). See 81 FR 31542.

DOE also proposed to include definitions for voltage and frequency dependent (VFD), voltage independent (VI), and voltage and frequency independent (VFI) UPS architectures based on the definitions from section 1.0 of ENERGY STAR UPS Version 1.0, “ENERGY STAR Program Requirements for Uninterruptible Power Supplies,” Rev. July 2012 (ENERGY STAR UPS V. 1.0) to differentiate between different UPS load ratings. The proposed definitions are as follows:

“Uninterruptible power supply or UPS means a combination of convertors, switches and energy storage devices (such as batteries), constituting a power system for maintaining continuity of load power in case of input power failure.”

“Voltage and frequency dependent UPS or VFD UPS means a UPS that produces an AC output where the output voltage and frequency are dependent on the input voltage and frequency. This UPS architecture does not provide corrective functions like those in voltage independent and voltage and frequency independent systems.”

“Voltage independent UPS or VI UPS means a UPS that produces an AC output within a specific tolerance band that is independent of under-voltage or over-voltage variations in the input voltage. The output frequency of a VI UPS is dependent on the input frequency, similar to a voltage and frequency dependent system.”

“Voltage and frequency independent UPS or VFI UPS means a UPS that produces an AC output voltage and frequency that is independent of input voltage and frequency variations and protects the load against adverse effects from such variations without depleting the stored energy source. The input voltage and frequency variations through which the UPS must remain in Normal Mode are as follows:

i. ± 10 % of the rated input voltage or the tolerance range specified by the manufacturer, whichever is greater

ii. ± 2 % of the rated input frequency or the tolerance range specified by the manufacturer, whichever is greater.”

DOE also specified in the May 2016 UPS test procedure NOPR that only the devices that meet the definition of a UPS as outlined above and have an AC output will be subject to the testing requirements proposed in the battery charger test procedure NOPR. See 81 FR 31542. For this rulemaking, DOE proposes to maintain the scope of coverage as defined by its current proposal for the battery charger test procedure.

When evaluating and establishing energy conservation standards, DOE often divides covered products into classes by the type of energy used, the capacity of the product, or any other performance-related feature that justifies different standard levels, such as features affecting consumer utility. (42 U.S.C. 6295(q)) DOE then conducts its analysis and considers establishing or amending standards to provide separate standard levels for each product class. DOE has created three product classes to analyze UPSs as follows: Product Class 10a (VFD UPSs), Product Class 10b (VI UPSs), and Product Class 10c (VFI UPSs). UPSs are tested at different load ratings and a normal mode average efficiency rating is calculated. This is based on ENERGY STAR UPSs. Within UPSs, VFD, VI, and VFI UPSs are different product classes based on the UPS's ability to filter and correct the incoming power against faults such as over and under-voltage conditions, noise, harmonic distortions and instability in the mains frequency. These product classes are VFD for units that do not provide any corrective functions, VI for units capable of correcting only the voltage and VFI for units that can correct the voltage as well as the frequency when they are outside specifications. In addition to providing such corrective functions, devices in these three product classes offer greater utility to sensitive loads by reducing the transfer time from utility power to the internal battery in the event of a power disruption. DOE recognizes that these additional utilities as well as increasing device capacity come at the cost of efficiency. DOE therefore proposes individual standards for each product class that scale with rated output power. This is consistent with ENERGY STAR Version 1.0, "ENERGY STAR Program Requirements for Uninterruptible Power Supplies," Rev. July 2012 (ENERGY STAR UPS V. 1.0) and IEC 62040-3 Edition 2.0. Additional details on DOE's assessment of UPS technologies can be found in chapter 3 of the NOPR TSD.

2. Technology Options

In the July 2014 computer and battery backup systems (computer systems) framework document, DOE identified three technology options for UPSs that would be expected to improve the efficiency of UPSs. These technology options are:

semiconductor improvements, digital signal processing and space vector modulation, and transformer-less UPS topologies.[15] Since the July 2014 framework document for computer systems, DOE has identified the following additional technology options from stakeholder comments and manufacturer interviews for UPSs: use of core materials with high magnetic permeability such as Sendust and Litz wiring in inductor design, wide band gap semiconductors such as silicon carbide and gallium arsenide, capacitors with low equivalent series resistance (ESR), printed circuit boards (PCBs) with higher copper content, and variable speed fan control.

DOE's further research into space vector modulation technology for UPSs has shown that it may have limited advantage in the scope of this rule and is intended primarily for higher power applications. Therefore, DOE did not consider this technology.

DOE requests comment on the potential technology options identified for improving the efficiency of UPSs (see section VII.E).

After identifying all potential technology options for improving the efficiency of UPSs, DOE performed the screening analysis (see section IV.B of this document and chapter 4 of the NOPR TSD) on these technologies to determine which to consider further in the analysis and which to eliminate.

[15] See July 2014 computer and battery backup systems framework document, pp. 48-49.

B. Screening Analysis

DOE uses the following four screening criteria to determine which technology options are suitable for further consideration in an energy conservation standards rulemaking:

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

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

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

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

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

If DOE determines that a technology, or a combination of technologies, fails to meet one or more of the above four criteria, it will be excluded from further consideration in the engineering analysis. The reasons for eliminating any technology in this rulemaking are discussed below.

1. Screened-Out Technologies

Transformer-less UPS designs

Transformer-less UPS designs offer some of the highest efficiencies in the industry with lowered weight, wider input voltage tolerance, near unity input power factor, reduced harmonic distortion and need for components that mitigate electromagnetic interference (EMI) generated by the device. However, interviews with manufacturers have shown this to be a limited access technology with select manufacturers holding the intellectual property required for effective implementation. DOE therefore does not intend to consider this technology for this rule.

2. Remaining Technologies

Through a review of each technology, DOE tentatively concludes that all of the other identified technologies listed in section IV.A.2 met all four 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: use of materials with high magnetic permeability such as Sendust for the inductor core and Litz wiring in inductor coils, silicon carbide, gallium arsenide and other wide band gap semiconductors, capacitors with low ESR, PCBs with higher copper content and variable speed fan control.

DOE determined that these technology options are technologically feasible because they are being used or have previously been used in commercially-available products or working prototypes. DOE also finds that all of the remaining technology options meet the other screening criteria. For additional details, see chapter 4 of the NOPR TSD.

DOE requests comment on its screening analysis used to select the most viable options for consideration in setting today's proposed standards (see section VII.E).

C. Engineering Analysis

In the engineering analysis, DOE establishes the relationship between the manufacturer production cost (MPC) and improved UPS efficiency. This relationship serves as the basis for cost-benefit calculations for individual consumers, manufacturers, and the Nation. DOE typically structures the engineering analysis using one of three approaches: (1) design option, (2) efficiency level, or (3) reverse engineering (cost assessment). The design-option approach involves adding the estimated cost and associated efficiency of various efficiency-improving design changes to the baseline product to model different levels of efficiency. The efficiency-level approach uses estimates of costs and efficiencies of products available on the market at distinct efficiency levels to develop the cost-efficiency relationship. The reverse-engineering approach involves testing products for efficiency and determining cost from a detailed bill of materials (BOM) derived from reverse engineering representative products. The efficiency ranges from that of the least-efficient UPS sold today (i.e., the baseline) to the maximum technologically feasible efficiency level. At each efficiency level examined, DOE determines the MPC; this relationship is referred to as a cost-efficiency curve.

DOE used a combination of the design-option and efficiency-level approach when determining the efficiency curves for UPSs. UPSs are composed of a single highly integrated PCB consisting of control and power conversion circuitry without any interchangeable components. The efficiency-level approach therefore is more suited to creating the cost-efficiency relationship since components cannot be removed to understand their impact on overall power consumption. However, DOE did use the design-option approach to determine the maximum technologically feasible EL because these products are not available on the market currently.

DOE began its analysis by completing a comprehensive study of the market for units that are in scope. A review of retail sales data, the ENERGY STAR qualified product list of compliant devices and manufacturer interviews aided DOE in identifying the most prevalent units in the market as well as those that are the least and most expensive and efficient. DOE then purchased units for in-house efficiency testing according to the May 2016 UPS test procedure NOPR. This testing allowed DOE to choose representative units and create multiple ELs for each product class.

1. Testing

In taking the hybrid efficiency-level and design option approach, DOE tested multiple units of the same product class striving to ensure variations between successive units (e.g. LCDs, communication ports, etc.) were removed. The resultant efficiency values and data obtained from manufacturers were then curve-fitted and extrapolated to the entire power range (defined by the scope) to create multiple ELs. For example, DOE tested several VFD representative units in the 300-500 W range to create four ELs for VFD UPSs, which when compared against the device's MPC demonstrated a direct positive correlation.

2. Representative Units and Efficiency Levels

Individual ELs for a UPS product class were created by curve-fitting and extrapolating the efficiency values of a single test unit known as the representative unit for that particular EL. Each of the ELs are labeled EL 0 through EL 3 and reflect increasing efficiency due to technological advances. EL 0 represents baseline performance, EL 1 is the minimum required efficiency to be ENERGY STAR compliant, EL 2 is the best technology currently available in the market and EL 3 is the maximum efficiency theoretically achievable. As such, the representative unit for EL 0 was the least efficient unit tested by DOE with EL 1 and EL 2 being represented by the least and most efficient ENERGY STAR unit respectively. While DOE derived EL 0 through EL 2 via testing, DOE created EL 3 from data obtained during manufacturer interviews.

The proposed standard for UPSs varies based on its maximum output power rating. The standard is a set of curve-fit equations. Figure IV.1 through Figure IV.3 are graphical representations of the ELs for VFD UPS, VI UPS and VFI UPS types respectively. Each EL is subdivided into power ranges for simplicity and is a piecewise approximation of the units overall efficiency across the entire power range as shown in the figures. Chapter 5 of the NOPR TSD has additional detail on the curve-fit equations for each EL and UPS product class.

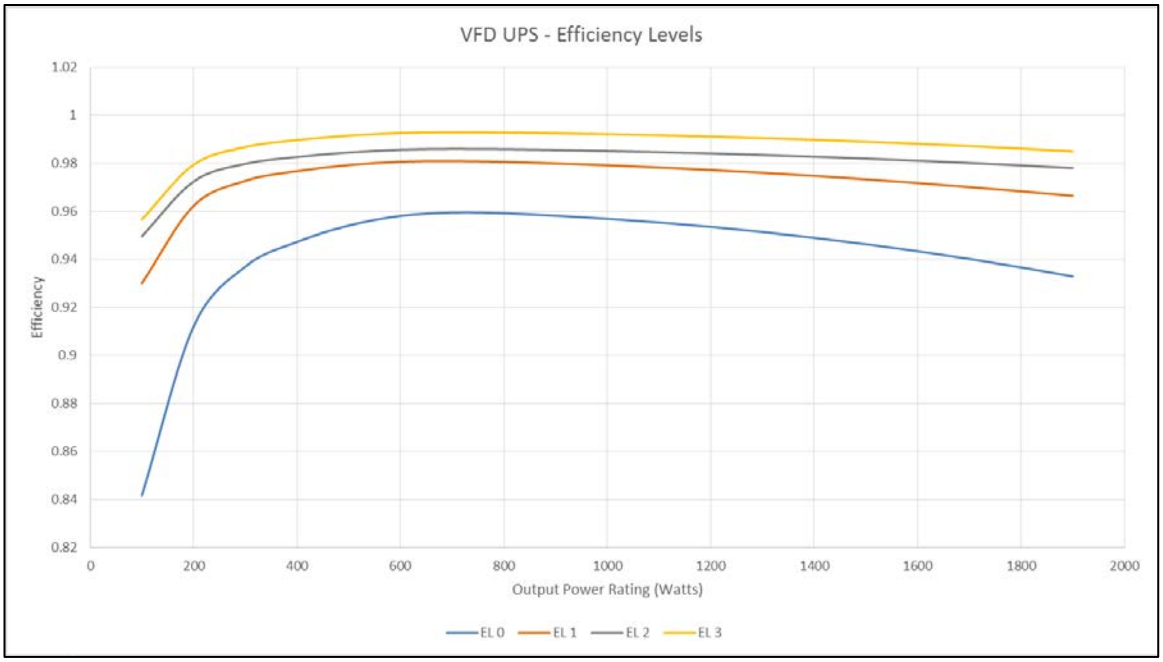

Figure IV.1 Graphical Representation of VFD UPS Efficiency Levels

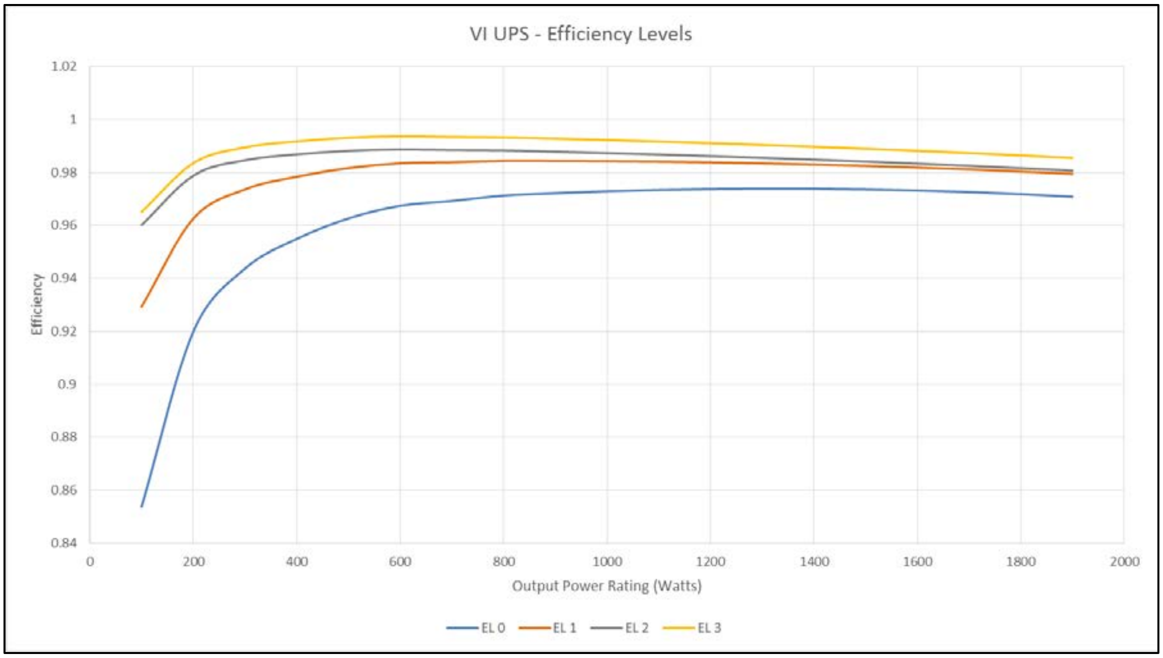

Figure IV.2 Graphical Representation of VI UPS Efficiency Levels

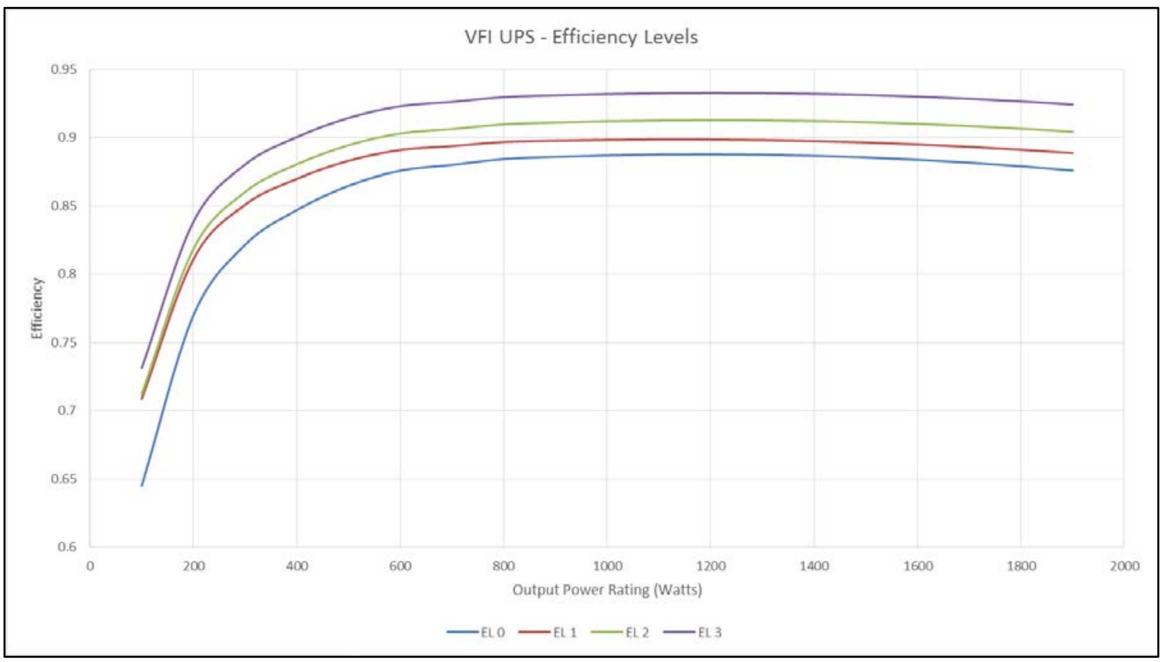

Figure IV.3 Graphical Representation of VFI UPS Efficiency Levels

DOE requests comment on the ELs selected for each product class for its analysis (see section VII.E).

3. Cost Analysis

For UPSs, DOE developed an average manufacturer and distribution markups for ELs by examining the annual Securities and Exchange Commission (SEC) 10-K reports filed by publicly-traded UPS manufacturers and distribution chains and further verified during stakeholder interviews. DOE used these validated markups to convert consumer prices into manufacturer selling prices (MSPs) and then into MPCs.

Table I.3 summarizes national economic costs expected to result from the proposed standards.

In general, DOE's cost analysis of representative units demonstrated a direct correlation between MPC and average load adjusted efficiency (see Figure 5.5.1 through 5.5.3 in chapter 5 of the Technical Support Document). However, the one exception to this correlation was the EL 1 representative unit for VFD UPSs. This representative unit has a higher output power rating and average load adjusted efficiency, but a lower MPC compared to the EL 0 representative unit of the same product class, resulting in a negative total incremental installed cost of $139 million and $253 million at seven and three percent discount rates, respectively.

In addition to the two representative units discussed here, DOE has found other VFD UPSs that demonstrate this negative correlation between MPC and average load adjusted efficiency between EL 0 and EL 1.

DOE believes that this exception to the otherwise direct correlation between MPC and average load adjusted efficiency of UPSs has several possible explanations. For the VFD UPSs in scope of this rulemaking, DOE believes consumers may typically be more concerned with the reliability of the protection the product provides, than its energy efficiency. Despite the presence of less expensive and more efficient units, DOE believes less efficient legacy units continue to be sold in the marketplace because consumers are familiar with these models and trust the level of protection and safety they offer even if more energy efficient UPS models with similar functionality and dependability are available at lower prices. Additionally, an unproven model that is more efficient yet less expensive may be perceived by consumers as less reliable. Therefore, UPS manufacturers may not have an incentive to improve the design of UPS models that have established a reputation of being reliable. It is also worth noting that the difference in MSP between the VFD UPS EL 0 and EL 1 representative units is $5.10 and while this can be significant on its own, it may only be a small fraction of the cost of the connected equipment that it is protecting or the potential loss in productivity if said connected equipment were to lose power. DOE believes this is one of the reasons why devices at EL 0 continue to exist in the market place at a price higher than more efficient EL 1 models.

However, negative compliance costs are unexpected in an economic theory that assumes a perfect capital market with perfect rationality of agents having complete information. In such a market, because more efficient UPSs save consumers money on operating costs compared to the baseline product, consumers would have an incentive to purchase them even in the absence of standards. For these reasons, DOE requests comment on its understanding of why less efficient UPSs continue to exist in the market place at a price higher than more efficient units and the impact that energy conservation standards for UPSs will have on the costs and efficiencies of existing UPS models, including various aspects of the inputs to the installed cost analysis, such as assumptions about consumers' response to first cost versus long-term operating cost, assumptions for manufacturer capital and product conversion costs, and other factors.

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 consumer prices, derived in the engineering analysis, into the MSPs for each product class and EL. The MSPs calculated in the markups analysis are then used as inputs to the MIA. The prices derived in the engineering analysis are marked up to reflect the distribution chain of UPSs. At each step in the distribution channel, companies mark up the price of the product to cover business costs and profit margin. For UPSs, the main parties in the distribution chain are retailers. The final prices, which also include sales taxes, are then used in the LCC and PBP analyses.

For retailers, DOE developed separate markups for baseline products (baseline markups) and for the incremental cost of more-efficient products (incremental markups). Incremental markups are coefficients that relate the change in the MSP of higher-efficiency models to the change in the retailer sales price. DOE relied on economic data from the U.S. Census Bureau[16] to estimate average baseline and incremental markups.

The manufacturer markups, which convert MSPs to MPCs are calculated as part of the MIA and are not presented in the markups analysis. DOE developed average manufacturer markups by examining the annual SEC 10-K reports filed by publicly traded UPS manufacturers then refining these estimates based on manufacturer feedback.

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

E. Energy Use Analysis

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

[16] U.S. Census Bureau. Annual Retail Trade Survey, Electronics and Appliance Stores. 2012. www.census.gov/retail/arts/historic_releases.html.

To develop energy use estimates, DOE multiplied UPS power loss as a function of rated output power, as derived in the engineering analysis, by annual operating hours. DOE assumed that UPSs are operated for 24 hours per day, 365 days per year, at a typical load specific to each product class. In early 2015, UPS manufacturers indicated that a majority of in-scope products were used to back up and condition power to servers and desktop computers, with most VFD and low-end VI products attached to desktop computers and workstations. The average loading assumptions from ENERGY STAR UPS V. 1.0 with input power less than or equal to 1500 W are 67.5 percent for VFD and 75 percent for VI and VFI UPSs.[17] However, the devices to which UPSs provide power may not always be on, especially in the case of desktop computers. Thus there is some uncertainty about how many hours per year UPSs are typically operated at various load points.

The responses to manufacturer interviews conducted in early 2015 suggest that most VFD products are used with personal computers, around three quarters of low-end VI products are used with computers and workstations, and around three quarters of higher-end VI and VFI products are used with servers. To account for the typical power draw of desktop computers, and because such computers spend some time in off or standby modes, DOE assumed average loading for VFD UPSs to be 25 percent. DOE further assumed average loading for VI products, which are operated in conjunction with both computers and servers, to be 50 percent, and average loading for VFI products to be

[17] These were calculated by multiplying the proportion of time spent at each specified proportion of the reference test load in Table 1 of the following reference. ENERGY STAR. ENERGY STAR Program Requirements: Product Specification for Uninterruptible Power Supplies (UPSs), Version 1.0. 2012.

75 percent, in line with ENERGY STAR UPS V. 1.0. DOE requests further comment on the average loading conditions for these product classes (see section VII.E).

To capture the diversity of products available to consumers, DOE collected data on the distribution of UPS output power rating from product specifications listed on online retail websites. DOE then developed product samples for each UPS product class based on a market-weighted distribution of product features found to impact efficiency as determined by the engineering analysis.

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

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 UPSs. 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 (life-cycle cost) 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 (payback period) 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-standards case, which reflects the estimated efficiency distribution of UPSs 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, as well as one for commercial buildings. For each sample household and commercial building, DOE determined the energy consumption for the UPS and the appropriate electricity price. By developing a representative sample of households and commercial buildings, the analysis captured the variability in energy consumption and energy prices associated with the use of UPSs.

DOE was unable to locate a survey sample specific to UPS users for either the residential or commercial sector. However, as mentioned in the previous section, manufacturer interviews indicate that most VFD products are used with personal computers, around three quarters of low-end VI products are used with computers and workstations, and around three quarters of higher-end VI and VFI products are used with servers. DOE thus created residential and commercial samples for desktop computers as a proxy for the sample of VFD and VI UPS owners, and a sample for servers as a proxy for the sample of VFI UPS owners.

DOE developed its residential sample from the set of individual responses to the Consumer Electronics Association's (CEA's) 16th Annual CE Ownership and Market Potential Study.[18] CEA administered the survey to a random, nationally representative sample of more than 2,000 U.S. adults in January and February 2014. The individual-level survey data that CEA provided to DOE were weighted to reflect the known demographics of the sample population; weighting by geographic region, gender, age, and race were used to make the data generalizable to the entire U.S. adult population. From this dataset, DOE constructed its household sample for UPSs by considering the number of desktop computers per household in conjunction with 2013 household income and state of residence.

To create a commercial building sample, DOE relied on EIA's Commercial Buildings Energy Consumption Survey (CBECS), a nationally representative survey with

[18] Available for purchase at http://store.ce.org/Default.aspx?TabID=251&productId=782583.

a rich dataset of energy-related characteristics of the nation's stock of commercial buildings.[19] Individual survey responses from the most recent survey in 2012 allowed DOE to consider how the commercial penetration of servers and desktop computers varies by principal building activity and by Census Division. DOE used these microdata to construct the commercial sample of UPSs, which are assumed to back up and condition power for servers and desktop computers.

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 and PBP relies on a Monte Carlo simulation to incorporate uncertainty and variability into the analysis. The Monte Carlo simulations randomly sample input values from the probability distributions and UPS user samples. The model calculated the LCC and PBP for products at each efficiency level for 10,000 housing units and 10,000 commercial buildings per simulation run.

[19] U.S. Department of Energy—U.S. Energy Information Administration. Commercial Buildings Energy Consumption Survey (CBECS). 2012 Public Use Microdata File. 2015. Washington, DC. http://www.eia.gov/consumption/commercial/data/2012/index.cfm?view=microdata.

DOE calculated the LCC and PBP for all consumers of UPSs as if each were to purchase a new product in the expected year of required compliance with new standards. Any new standards would apply to UPSs manufactured two years after the date on which any new standard is published. At this time, DOE estimates publication of a final rule in 2017. Therefore, for purposes of its analysis, DOE used 2019 as the first year of compliance with any new standards for UPSs.

Table IV.1 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.1 Summary of Inputs and Methods for the LCC and PBP Analysis*

Inputs	Source/Method
Product Cost	Derived by multiplying MPCs by manufacturer and retailer markups and sales tax, as appropriate. Used historical data to derive a price scaling index to forecast product costs.
Installation Costs	Assumed no change with efficiency level.
Annual Energy Use	Power loss (a function of rated output power) multiplied by annual operating hours. Average number of hours at a typical load based on manufacturer input. Variability: Distribution of rated power from online retail websites.
Energy Prices	Electricity: Based on 2014 marginal electricity price data from the Edison Electric Institute. Variability: Electricity prices vary by season, U.S. region, and baseline electricity consumption level.
Energy Price Trends	Based on AEO 2015 price forecasts.
Repair and Maintenance Costs	Assumed no change with efficiency level.
Product Lifetime	Based on literature review and manufacturer interviews. Variability: Based on a Weibull distribution.
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	2019.

* 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 above (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. The prices used in the LCC and PBP analysis are MPC in the compliance year, as described in chapter 5 of the TSD.

Examination of historical price trends for a number of appliances that have been subject to energy conservation standards indicates that an assumption of constant real prices and costs may overestimate long-term trends in appliance prices. Economic literature and historical data suggest that the real costs of these products may in fact trend downward over time according to “learning” or “experience” curves. On February 22, 2011, DOE published a notice of data availability (NODA) stating that DOE may consider refining its analysis by addressing equipment price trends. 76 FR 9696. It also raised the possibility that once sufficient long-term data are available on the cost or price trends for a given product subject to energy conservation standards, DOE would consider these data to forecast future trends. However, DOE found no data or manufacturer input to suggest appreciable price trends for UPSs, and thus assumed no price trend for UPSs.

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous materials and parts needed to install the product. DOE found no evidence that installation costs would be impacted with increased efficiency levels for UPSs.

3. Annual Energy Consumption

For each sampled household and commercial building, DOE determined the energy consumption for a UPS at different efficiency levels using the approach described above in section IV.E of this document.

4. Energy Prices

DOE used marginal electricity prices to characterize the incremental savings associated with ELs above the baseline. The marginal electricity prices vary by season, region, and baseline household electricity consumption level for the LCC. DOE estimated these prices using data published with the Edison Electric Institute (EEI) Typical Bills and Average Rates reports for summer and winter 2014.[20] DOE assigned seasonal marginal prices to each household or commercial building in the LCC sample based on its location and its baseline monthly electricity consumption for an average summer or winter month. For a detailed discussion of the development of electricity prices, see appendix 8B of the NOPR TSD.

The Information Technology Industry Council (ITI) suggested that EIA's Annual Energy Outlook (AEO) be used for estimating current and forecasted energy prices. (ITI, No. 0010 at p. 18) Available information suggests that marginal electricity prices more accurately represent savings associated with a new standard, and therefore DOE relied on EEI data instead of AEO data for current prices. However, to estimate energy prices in future years, DOE multiplied the average regional energy prices by the forecast of annual change in national-average residential energy price in the Reference case from AEO 2015, which has an end year of 2040.[21] To estimate price trends after 2040, DOE used the average annual rate of change in prices from 2020 to 2040.

[20] Edison Electric Institute. Typical Bills and Average Rates Report. Winter 2014 published April 2014, Summer 2014 published October 2014. http://www.eei.org/resourcesandmedia/products/Pages/Products.aspx.

[21] U.S. Department of Energy—Energy Information Administration. Annual Energy Outlook 2015 with Projections to 2040. 2015. http://www.eia.gov/forecasts/aeo/.

5. Maintenance and Repair Costs

Repair costs are associated with repairing or replacing product components that have failed in an appliance; maintenance costs are associated with maintaining the operation of the product. For UPSs, DOE assumed that small incremental increases in product efficiency produce no changes in repair and maintenance costs compared to baseline efficiency products. This assumption is supported by the National Electrical Manufacturers Association (NEMA's) comment that no increased maintenance, repair, or installation costs are associated with more efficient UPS designs. (NEMA, No. 0015 at p. 7)

6. Product Lifetime

For UPSs, DOE performed a search of the published literature to identify minimum and maximum average lifetimes from a variety of sources. DOE also considered input from manufacturer interviews conducted in early 2015. ITI commented that UPS products have lifetimes of up to 20 years. (ITI, No. 0010 at p. 19) Table IV.2 summarizes the UPS lifetimes that DOE compiled from the literature and manufacture interviews. Where a range for lifetime was given, DOE noted the minimum and maximum values; where there was only one figure, DOE recorded this figure as both the minimum and maximum value. DOE computed mean lifetime by averaging these values across the product class.

Table IV.2 UPS Product Lifetimes from Literature and Manufacturer Input

Product Class	**Description**	**Lifetimes (years)**			
		Minimum	Mean	Median	Maximum
10a	VFD UPS	3	5	5	7

10b	VI UPS	5	6.3	6	8
10c	VFI UPS	8	10	10	12

Using these minimum, maximum, and mean lifetimes, DOE constructed survival functions for the various UPS product classes. No more than 10 percent of units were assumed to fail before the minimum lifetime, and no more than 90 percent of units were assumed to fail before the maximum lifetime. DOE assumed these survival functions have the form of a cumulative Weibull distribution, a probability distribution commonly used to model appliance lifetimes. Its form is similar to that of an exponential distribution, which models a fixed failure rate, except a Weibull distribution allows for a failure rate that can increase over time as appliances age. For additional discussion of UPS lifetimes, refer to chapter 8 of the NOPR TSD.

7. Discount Rates

In the calculation of LCC, DOE applies discount rates appropriate to households to estimate the present value of future operating costs. DOE estimated a distribution of residential discount rates for UPSs based on consumer financing costs and opportunity cost of funds related to appliance energy cost savings and maintenance costs.

To establish residential discount rates for the LCC analysis, DOE identified all relevant household debt or asset classes in order to approximate a consumer's opportunity cost of funds related to appliance energy cost savings. It estimated the average percentage shares of the various types of debt and equity by household income group using data from the Federal Reserve Board's Survey of Consumer Finances[22] (SCF) for 1995, 1998, 2001, 2004, 2007, and 2010. 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 4.4 percent. See chapter 8 of the NOPR TSD for further details on the development of consumer discount rates.

To establish commercial discount rates for the LCC analysis, DOE estimated the cost of capital for companies that purchase a UPS. The weighted average cost of capital is commonly used to estimate the present value of cash flows to be derived from a typical company project or investment. Most companies use both debt and equity capital to fund investments, so their cost of capital is the weighted average of the cost to the firm of equity and debt financing, as estimated from financial data for publicly traded firms in the sectors that purchase UPSs. For this analysis, DOE used Damodaran online[23] as the source of information about company debt and equity financing. The average rate across all types of companies, weighted by the shares of each type, is 5.2 percent. See chapter 8 of the NOPR TSD for further details on the development of commercial discount rates.

---

[22] Board of Governors of the Federal Reserve System. Survey of Consumer Finances. Various dates. Washington, DC. http://www.federalreserve.gov/pubs/oss/oss2/scfindex.html.
[23] Damodaran, A. Cost of Capital by Sector. January 2014. (Last accessed September 25, 2014.) New York, NY. http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/wacc.htm.

8. Efficiency Distribution in the No-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-standards case (i.e., the case without amended or new energy conservation standards). To estimate the efficiency distribution of UPSs for 2019, DOE examined a recent ENERGY STAR qualified product list. Although these model lists are not sales-weighted, DOE assumed they were a reasonable representation of the market.

The estimated market penetration of ENERGY STAR-qualified UPSs was 78 percent in 2013, the most recent year for which data were available.[24] DOE assumed market penetration to be 78 percent for all three UPS product classes, as the 2013 Unit Shipment Data report does not distinguish between UPS architectures. In order to assess how qualified products fit into proposed efficiency levels, DOE analyzed a qualified product list downloaded on February 16, 2016, after cross-checking inconsistencies in reported UPS product type with product specifications on retail websites. For the 266 qualified in-scope models, DOE compared average efficiency to the efficiency required for each EL, as determined in the engineering analysis. Finally, DOE assumed that the market share represented by non-ENERGY-STAR-qualified products would belong to the least-efficient efficiency level analyzed. The estimated market shares for the no-standards case for UPSs are shown in Table IV.3. See chapter 8 of the NOPR TSD for further information on the derivation of the efficiency distributions.

[24] Environmental Protection Agency—ENERGY STAR Program. Certification Year 2013 Unit Shipment Data. 2014. Washington, DC. https://www.energystar.gov/index.cfm?c=partners.unit_shipment_data.

Table IV.3 Estimated Market Shares (%) in each Efficiency Level for No-Standards Case

Product Class	Description	Efficiency Level			
		EL 0 (baseline)	EL 1	EL 2	EL 3
10a	VFD UPS	47	31	21	1.5
10b	VI UPS	72	25	3.9	0
10c	VFI UPS	77	17	5.8	0

9. Payback Period Analysis

The payback period is the amount of time it takes the consumer to recover the additional installed cost of more-efficient products, compared to baseline products, through energy cost savings. Payback periods are expressed in years. 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. The PBP calculation uses the same inputs as the LCC analysis, except that discount rates are not needed.

As noted above, EPCA, as amended, 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 forecast for the year in which compliance with the new standards would be required.

G. Shipments Analysis

DOE uses forecasts of annual product shipments to calculate the national impacts of potential amended energy conservation standards on energy use, NPV, and future manufacturer cash flows.[25] Because UPSs back up and condition power for electronics, whose technology evolves more rapidly than many other appliances, DOE did not rely on a stock accounting approach common to other appliances. Instead, DOE largely elected to extrapolate forecasted trends from market research data. Data from Frost & Sullivan[26] and ENERGY STAR unit shipments[27] provided the foundation for DOE's shipments analysis for UPSs. DOE calculated shipment values for 30 years, from 2019, the first year of compliance, through 2048, the last year of the analysis period.

[25] 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.
[26] Cherian, A. Analysis of the Global Uninterruptible Power Supplies Market: Need for Greater Power Reliability Driving Growth. Frost & Sullivan. 2013. San Antonio, TX. http://www.frost.com/c/10077/sublib/display-report.do?id=NC62-01-00-00-00.
[27] Environmental Protection Agency—ENERGY STAR Program. Certification Year 2013 UPS Unit Shipment Data. 2013. Washington, DC. https://www.energystar.gov/index.cfm?c=partners.unit_shipment_data.

1. Shipment Projections in the No-standards Case

DOE relied on data from Frost & Sullivan and ENERGY STAR to develop the shipments in the no-standards case for UPSs.[28] Frost & Sullivan provide global UPS unit shipments from 2009 to 2019 for the relevant output range <1000 W. Because the next power range for which shipments are provided is 1-5 kilo-watts (kW), and only UPSs with rated output power ≤1500 W are in scope, DOE excluded this power range from the shipments analysis. For <1000 W, Frost & Sullivan supply North American revenue as a percent of global revenue 2009 to 2019, so DOE assumed that percent of revenue is a reasonable proxy for percent of shipments. Multiplying global shipments by the North American percentage of revenue, and then by 0.9 under the assumption that the United States makes up 90 percent of the North American market, yielded U.S. UPS shipments.

Frost & Sullivan provided no classification by type of UPS within the relevant power range. However, the 2013 ENERGY STAR unit shipment data collection process[29] provides such a breakdown; in that year, market penetration of UPSs was 78 percent[30], so DOE assumed these data are representative of the market. DOE used these data to determine how <1000 W UPSs are apportioned among different topologies for 2013 to 2019, assuming this allocation stays constant: 50 percent VFD, 39 percent VI, and 12 percent VFI. The Frost & Sullivan data indicate that the commercial sector

[28] Cherian, A. Analysis of the Global Uninterruptible Power Supplies Market: Need for Greater Power Reliability Driving Growth. Frost & Sullivan. 2013. San Antonio, TX. http://www.frost.com/c/10077/sublib/display-report.do?id=NC62-01-00-00-00

[29] Environmental Protection Agency—ENERGY STAR Program. Certification Year 2013 UPS Unit Shipment Data. 2013. Washington, DC. https://www.energystar.gov/index.cfm?c=partners.unit_shipment_data.

[30] Ibid.

dominates UPS revenue in the <1000 W market segment; therefore, DOE assumed a split of 90 percent commercial and 10 percent residential shipments.

To project UPS shipments from 2020-2048, DOE extrapolated the linear trends forecasted by Frost & Sullivan from 2014 to 2019. In conjunction with the 2013 fixed split between topologies and a fixed portion of 0.9 for the United States relative to North American shipments, DOE projected the increasing linear trend in global UPS shipments <1 kW and the decreasing linear share of North American revenue to forecast shipments from 2019 to 2048. DOE requests additional information on UPS shipments and projections (see section VII.E).

2. Shipment Projections in the Standards Case

Increases in product prices resulting from standards may affect shipment volumes. To DOE's knowledge, price elasticity estimates are not readily available in existing literature for UPSs, and hence DOE assumed a price elasticity of demand of zero. DOE requests comment on commercial and residential price elasticity data for UPS product classes (see section VII.E).

ITI commented that voluntary programs such as ENERGY STAR are what drive manufacturers to design products to be as efficient as possible and NEMA commented that because of the significant influence of ENERGY STAR on UPSs, little potential remains in product efficiency. (ITI, No. 0010 at p. 19) (NEMA, No. 0015 at p. 3)

DOE disagrees with the claim that little potential remains in product efficiency for UPSs. DOE's engineering analysis indicates that UPSs with higher efficiency than that required for ENERGY STAR designation are now or could be available, and the economic analysis indicates that some of these higher levels are economically justified. In the absence of standards, it is unlikely that the entire market would move to these levels. At present, approximately 20 percent of UPSs sold have efficiency below the ENERGY STAR level.

See chapter 9 of the NOPR TSD for further details on the development of shipments projections.

H. National Impact Analysis

The NIA assesses the national energy savings (NES) and the national net present value (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.[31] ("Consumer" in this context refers to consumers of the product being regulated.) DOE calculates the NES and NPV for the potential standard levels considered based on projections of annual product shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses.[32] For the present analysis, DOE forecasted the energy savings, operating cost savings, product costs, and NPV of consumer benefits over the lifetime of UPSs sold from 2019 through 2048.

[31] The NIA accounts for impacts in the 50 states and U.S. territories.
[32] For the NIA, DOE adjusts the installed cost data from the LCC analysis to exclude sales tax, which is a transfer.

DOE evaluates the impacts of new and amended standards by comparing a case without such standards with standards-case projections. The no-standards case characterizes energy use and consumer costs for each product class in the absence of new 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-standards case with projections characterizing the market for each product class if DOE adopted new 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.4 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.4 Summary of Inputs and Methods for the National Impact Analysis

Inputs	**Method**
Shipments	Annual shipments from shipments model.
Compliance Date of Standard	2019.
Efficiency Trends	No-standards case: no efficiency trend. Standards cases: “roll-up” scenario.
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 Prices	AEO 2015 forecasts (to 2040) and extrapolation through 2048.
Energy Site-to-Primary and FFC Conversion	A time-series conversion factor based on AEO 2015.
Discount Rate	3 percent and 7 percent.
Present Year	2016.

1. Product Efficiency Trends

A key component of the NIA is the trend in energy efficiency projected for the no-standards case and each of the standards cases. Section IV.F.8 of this notice describes how DOE developed an energy efficiency distribution for the no-standards case (which yields a shipment-weighted average efficiency) for each of the considered product classes for the year of anticipated compliance with a new standard. To project the trend in efficiency for UPSs over the entire shipments projection period, DOE examined past improvements in efficiency over time. Little data exists to suggest that UPS efficiencies would improve in the 30 years following 2019 in the no-standards case. The approach is further described in chapter 10 of the NOPR TSD. DOE requests further comment on relevant efficiency trends for UPSs (see section VII.E).

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 (2019). In this scenario, the market shares of products in the no-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 2019, DOE implemented the same trend as in the no-standards case: zero percent for UPSs.

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 in the case with no 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-standards case and for each higher efficiency standard case. DOE estimated energy consumption and savings based on site energy and converted the electricity consumption and savings to primary energy (i.e., the energy consumed by power plants to generate site electricity) using annual conversion factors derived from AEO 2015. Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

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 full-fuel-cycle (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 approach used for deriving FFC measures of energy use and emissions is described in appendix 10A 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 savings in operating costs, and (3) a discount factor to calculate the present value of costs and savings. DOE calculates net savings each year as the difference between the no-standards case and each standards case in terms of total savings in operating costs versus total increases in

[33] For more information on NEMS, refer to The National Energy Modeling System: An Overview, DOE/EIA-0581(98), February 1998. Available at www.eia.gov/forecasts/aeo/index.cfm.

installed costs. DOE calculates operating cost savings over the lifetime of each product shipped during the forecast period.

The operating cost savings are energy cost savings, which are calculated using the estimated energy savings in each year and the projected price of the appropriate form of energy. To estimate energy prices in future years, DOE multiplied the average regional energy prices by the forecast of annual national-average residential energy price changes in the Reference case from AEO 2015, which has an end year of 2040. To estimate price trends after 2040, DOE used the average annual rate of change in prices from 2020 through 2040. As part of the NIA, DOE also analyzed scenarios that used inputs from the AEO 2015 Low Economic Growth and High Economic Growth cases. Those cases have higher and lower energy price trends compared to the Reference case. NIA results based on these cases are presented in appendix 10B of the NOPR TSD.

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

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

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.

CEA commented that DOE should not use a 30-year projection to calculate national energy savings given the short product lifecycle of consumer electronics. (CEA, No. 0012 at p. 6) NEMA also disagreed with the 30-year projection and suggested a 6-year projection. (NEMA, No. 0015 at p. 2)

In performing the NIA for its energy conservation standards rulemakings, DOE has used a 30-year analysis period, beginning on the effective date of the standard, because it matches the lifetime of the longest-lived products among the products being considered for standards. Matching the lifetime of the longest-lived products allows for a full turnover of the stock. Because products have varying lifetimes, DOE uses a 30-year analysis period to maintain a consistent time frame to compare the energy savings and economic impacts from all the standards rulemakings. DOE acknowledges that using a 30-year period for shorter-lived products such as UPSs presents challenges with respect to projecting future trends. However, DOE also provides a 9-year sensitivity analysis that considers impacts for products shipped in a 9-year period. Further, with respect to the economic analysis, projected impacts for products shipped in the later part of the 30-year period play a relatively small role due to the effects of discounting.

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 two subgroups: (1) low-income households and (2) small businesses. DOE used the LCC and PBP spreadsheet model to estimate the impacts of 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 new energy conservation standards on manufacturers of UPSs and to estimate the potential impacts of such standards on domestic employment, manufacturing capacity, and cumulative regulatory burden for those manufacturers. The MIA has both quantitative and qualitative aspects. The quantitative part of the MIA includes analyses of forecasted industry cash flows to create the INPV, as well as an analysis of the additional investments in research and development (R&D) and manufacturing capital necessary to comply with new standards, and the potential impact on domestic manufacturing employment. Additionally, the MIA seeks to qualitatively determine how new energy conservation standards might affect manufacturers' capacity and competition, as well as how standards contribute to manufacturers' 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 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 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 on domestic manufacturing employment. The model uses standard accounting principles to estimate the impacts of new energy conservation standards on the UPS manufacturing industry by comparing changes in INPV and domestic manufacturing employment between the no-standards case and each of the standards levels. To capture the uncertainty relating to manufacturer pricing strategies following potential new 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, and 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 the first phase of the MIA, DOE prepared a profile of the UPS manufacturing industry based on the market and technology assessment, preliminary manufacturer interviews, and publicly-available information. This included a top-down analysis of UPS 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 UPS manufacturing industry, including company filings of 10-K from the SEC,[35] corporate annual reports, and the U.S. Census Bureau's Economic Census.[36]

In the second phase of the MIA, DOE prepared a framework industry cash-flow analysis to quantify the potential impacts of new energy conservation standards. The GRIM uses several factors to determine a series of annual cash flows starting with the announcement of the standards and extending over a 30-year period following the compliance date of the standards. 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)

[35] http://www.sec.gov/edgar.shtml
[36] http://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml

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 addition, during the second phase, DOE developed an interview guide to distribute to UPS manufacturers in order to develop other key GRIM inputs, including product and capital conversion costs, and to gather additional information on the anticipated effects of new energy conservation standards on revenue, direct employment, capital assets, industry competition, and manufacturer subgroup impacts.

In the third phase of the MIA, DOE conducted structured, detailed interviews with representative UPS manufacturers. During these interviews, DOE discussed engineering, manufacturing, procurement, and financial topics to validate assumptions used in the GRIM and to identify key issues or concerns. See section IV.J.4 for a description of the key issues raised by manufacturers during the interviews. As part of the third phase, DOE also evaluated manufacturer subgroups that may be disproportionately impacted by new 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, niche players, and/or manufacturers exhibiting a cost structure that largely differs from the industry average.

DOE identified one manufacturer subgroup for a separate impact analysis – small business manufacturers – using the small business employee threshold of 500 total employees published by the Small Business Administration (SBA). This threshold includes all employees in a business' parent company and any other subsidiaries. The complete MIA is presented in chapter 12 and in sections V.B.2.d and VII.B, and the analysis required by the Regulatory Flexibility Act, 5 U.S.C. 601, et. seq., is presented in section VI.B of this NOPR.

2. GRIM Analysis and Key Inputs

DOE uses the GRIM to quantify the changes in cash flows over time due to new energy conservation standards. These changes in cash flows result in either a higher or lower INPV for the standards cases compared to the no-standards case. The GRIM analysis uses a standard annual cash flow analysis that incorporates manufacturer costs, manufacturer markups, shipments, and industry financial information as inputs. It then models changes in costs, investments, and manufacturer margins that result from new energy conservation standards. The GRIM uses these inputs to calculate a series of annual cash flows beginning with the reference year of the analysis, 2016, and continuing to 2048. DOE computes INPV by summing the stream of annual discounted cash flows during the analysis period.

DOE used a real discount rate of 6.1 percent for UPS manufacturers. The discount rate estimate was derived from industry corporate annual reports to the Securities and Exchange Commission (SEC 10-Ks). During manufacturer interviews, UPS manufacturers were asked to provide feedback on this specific discount rate. Based on this feedback, DOE determined that a discount rate of 6.1 percent was appropriate to use for the UPS industry. Many of the GRIM inputs came from the engineering analysis, the NIA, manufacturer interviews, and other research conducted during the MIA. The major GRIM inputs are described in detail in the following sections.

DOE seeks comment on its use of 6.1 percent as a discount rate for UPS manufacturers (see section VII.E).

a. Capital and Product Conversion Costs

DOE expects new energy conservation standards for UPSs to cause manufacturers to incur conversion costs to bring their production facilities and product designs into compliance with new standards. For the MIA, DOE classified these conversion costs into two major groups: (1) capital conversion costs and (2) product conversion costs. Capital conversion costs are investments in property, plant, and equipment necessary to adapt or change existing production facilities such that new product designs can be fabricated and assembled. Product conversion costs are investments in research, development, testing, marketing, certification, and other non-capitalized costs necessary to make product designs comply with new standards.

Using feedback from manufacturer interviews, DOE conducted a bottom-up analysis of the conversion costs necessary to comply with new standards for all product classes at each analyzed EL. DOE used manufacturer input from manufacturer interviews regarding the types and dollar amounts of discrete capital and product expenditures that would be necessary to convert specific production lines for each product class at each EL.

DOE determined that UPS manufacturers would not incur any additional capital conversion costs in the standards cases that would not be incurred in the no-standards case. Manufacturers stated that any product redesigns required to meet the proposed ELs would represent changes in component configuration as opposed to changes in the tooling and equipment used to manufacture more efficient UPSs (DOE does capture the additional costs of the more efficient components in the MPCs). Additionally, manufacturers stated that product design cycles for the majority of covered UPSs would be three years or less. The potential standards proposed in this NOPR would have a three-year compliance timeframe between the announcement of the potential standards and the compliance year of those standards. Therefore, the majority of these product design cycles would coincide with or take place before the compliance year of any potential standards. For manufacturers that have product design cycles that do not coincide with or take place before the compliance year and would have to redesign their UPSs to comply with the proposed standards, DOE included the cost of product redesign in the product conversion costs.

DOE seeks comment on its determination that product redesigns necessary to meet the ELs required by the proposed standard would not require investments in equipment and tooling and on its determination that the majority of product design cycles would either take place before or coincide with the compliance period of the potential standards for UPSs (see section VII.E).

DOE also assumes that there would be no stranded capital assets for UPS manufacturers. Again, DOE made this determination based on manufacturer feedback stating that no investments in equipment and tooling are necessary to comply with proposed standards.

The two main types of product conversion costs for UPSs that manufacturers shared with DOE during manufacturer interviews were the engineering time and effort necessary to redesign their products to meet higher efficiency standards and the testing and certification costs necessary to comply with efficiency standards. Once DOE had compiled these product conversion costs, DOE then took average values for a UPS platform (i.e., average number of hours or average dollar amounts) based on the range of responses given by manufacturers for the product conversion cost of each product class at each EL. Finally, DOE scaled the per platform costs by the estimated number of platforms that would need to be redesigned at each EL to calculate the total industry product conversion cost at each EL that was used in the MIA.

DOE seeks comment on its methodology used to calculate product conversion costs, including the assumption of no capital conversion costs or stranded assets for UPS manufacturers at analyzed ELs (see section VII.E).

See chapter 12 of the NOPR TSD for a complete description of DOE's assumptions for the product conversion costs.

b. Manufacturer Production Costs

Manufacturing more efficient UPSs is more expensive than manufacturing baseline products due to the need for more costly materials and components. The higher MPCs for these more efficient products can affect the revenue and gross margin, which will then affect total volume of future shipments, and the cash flows of UPS manufacturers. DOE developed MPCs for UPSs by using efficiency testing and market data to determine the cost-efficiency relationship for UPSs currently on the market that met each efficiency level in each product class. For more information about MPCs, see section IV.C of this NOPR.

For a complete description of the MPCs, see chapter 5 of this NOPR TSD.

c. Shipment Scenarios

INPV, the key GRIM output, depends on industry revenue, which depends on the quantity and prices of UPSs shipped in each year of the analysis period. Industry revenue calculations require forecasts of: (1) total annual shipment volume of UPSs; (2) the distribution of shipments across product classes (because prices vary by product class); and, (3) the distribution of shipments across ELs (because prices vary by efficiency).

In the no-standards case shipment analysis, shipments of UPSs were based on market forecast data. Since UPS technology evolves more rapidly than other appliance technologies, DOE extrapolated forecasted trends from market research data instead of relying on a stock accounting approach. Market forecasts from Frost and Sullivan as well as ENERGY STAR were used as the basis for standards case UPS shipments.

In the standards cases, DOE modeled a roll-up shipment scenario for UPSs. In the roll-up shipment scenario, consumers who would have purchased UPSs that fail to meet the new standards in the no-standards case, purchase UPSs that just meet the new standards, but are not more efficient than those standards, in the standards cases. Those consumers that would have purchased compliant UPSs in the no-standards case continue to purchase the exact same UPSs in the standards cases.

DOE believes that consumers purchasing UPSs covered by this rulemaking are primarily driven by the first cost of the UPSs and, therefore, most consumers will continue to purchase the lowest-cost UPSs available. This behavior is best modeled by the roll-up shipment scenario.

For a complete description of the shipments see the shipments analysis discussion in section IV.G of this NOPR.

d. Markup Scenarios

As discussed in section IV.J.2.b, the MPCs for each of the UPS product classes are the UPS manufacturers' costs for those products. These costs include materials, direct labor, depreciation, and overhead, which are collectively referred to as the cost of goods sold (COGS). The MSP is the price received by UPS manufacturers from their customers, typically a distributor but could be the direct users, regardless of the downstream distribution channel through which the UPSs are ultimately sold. The MSP is not necessarily the cost the end-user pays for the UPS since there are typically multiple sales along the distribution chain and various markups applied to each sale. The MSP equals the MPC multiplied by the manufacturer markup. The manufacturer markup covers all the UPS manufacturer's non-production costs (i.e., SG&A, R&D, and interest, etc.) as well as profit. Total industry revenue for UPS manufacturers equals the MSPs at each EL for each product class multiplied by the number of shipments at that EL.

Modifying these manufacturer markups in the standards cases yields a different set of impacts on UPS manufacturers than in the no-standards case. For the MIA, DOE modeled two standards case markup scenarios to represent the uncertainty regarding the potential impacts on prices and profitability for UPS manufacturers following the implementation of new energy conservation standards. The two markup scenarios are; (1) a preservation of gross margin, or flat, markup scenario and (2) a pass through markup scenario. Each scenario leads to different manufacturer markup values, which, when applied to the inputted MPCs, result in varying revenue and cash flow impacts on UPS manufacturers.

The preservation of gross margin markup scenario assumes that the MPC for each product is marked up by a flat percentage to cover SG&A expenses, R&D expenses, interest expenses, and profit. This allows manufacturers to preserve the same gross margin percentage in the standards cases as in the no-standards case. This markup scenario represents the upper bound of the UPS industry's profitability in the standards cases because UPS manufacturers are able to fully pass on additional costs due to standards to their consumers.

To derive the preservation of gross margin markup percentages for UPSs, DOE examined the SEC 10-Ks of all publicly traded UPS manufacturers to estimate the average UPS manufacturer markup. DOE analyzed manufacturer markups for each product class separately since, based on manufacturer interviews, manufacturers frequently apply different markups to different product classes. The manufacturer markup represents the markup manufacturers apply to their MPCs to arrive at their MSPs. Based on SEC 10-Ks, DOE found the typical manufacturer markup for manufacturers that produce UPSs was 1.57.

During manufacturer interviews, DOE asked UPS manufacturers if 1.57 was an appropriate manufacturer markup to use for all UPSs. While most manufacturers agreed that 1.57 was an appropriate average manufacturer markup for all VFI, VI and VFD UPSs, these manufacturers stated that their manufacturer markup tends to vary by product class. Therefore, based on manufacturer feedback, DOE increased the manufacturer markup for VFI UPSs to 1.76 and decreased the manufacturer markup for VFD UPSs to 1.55. DOE kept the manufacturer markup for VI UPSs at 1.57 based on manufacturer feedback.

DOE included an alternative markup scenario, the pass through markup, because UPS manufacturers stated they do not expect to be able to mark up the additional cost of production in the standards cases, given the highly competitive UPS market. The pass through markup scenario assumes that UPS manufacturers are able to pass through the incremental costs of more efficient UPSs to their consumers, but without earning any additional operating profit on those higher costs. This scenario results in overall manufacturer margin compression and adverse financial impacts as UPS costs increase due to new energy conservation standards.

The pass through markup scenario represents the lower bound of industry profitability in the standards cases. This is because manufacturers are not able to markup up the additional costs necessitated by UPS energy conservation standards, as they are able to do in the preservation of gross margin markup scenario. Therefore, manufacturers earn less revenue in the pass through markup scenario than they do in the preservation of gross margin markup scenario.

DOE seeks comment on its methodology used to calculate manufacturer markups, its use of different manufacturer markups for each product class, and the specific manufacturer markups DOE estimated for each UPS product class (see section VII.E).

3. Discussion of Comments

Interested parties commented on the assumptions and results of the July 2014 framework document. NEMA stated that if DOE sets ELs at or above the current

ENERGY STAR levels for UPSs, UPS manufacturers would lose investments previously made to meet these ENERGY STAR requirements. (NEMA, No. 0015 at p. 7) DOE acknowledges that UPS energy conservation standards set at or above ENERGY STAR levels for UPSs could render some product designs obsolete. This could cause manufactures to make additional investments in product redesign and testing. DOE accounts for the one-time conversion costs that UPS manufacturers would have to make at each potential standard level as part of the MIA. Additionally, because UPS technology evolves rapidly, DOE determined that all UPSs would be redesigned in the three year time period between the publication of any UPS final rule and the compliance year of that rulemaking, so manufactures would have to redesign those products even in the no-standards case. See section V.B.2.a of this NOPR for a complete discussion of the manufacturer investments necessary to comply with the analyzed energy conservation standards.

4. Manufacturer Interviews

DOE conducted interviews with manufacturers following the publication of the July 2014 framework document in preparation for the NOPR analysis. In these interviews, DOE asked manufacturers to describe their major concerns with this UPS rulemaking. UPS manufacturers identified one key issue during these interviews, the burden of testing and certification.

UPS manufacturers stated that the costs associated with testing and certifying all of their products covered by this rulemaking could be burdensome. UPS manufacturers commented that since efficient products do not typically earn a premium in the UPS market, manufacturers do not regularly conduct efficiency testing or pursue energy-efficient certifications for the majority of their product offerings. As a result, the testing and certification required for compliance with a potential standard represents additional costs to the typical product testing conducted by UPS manufacturers. Since a potential standard would require all UPS offerings to be tested and certified, UPS manufacturers explained that this process could become expensive. The UPS test procedure NOPR (81 FR 31542) analyzes the testing and certification costs manufacturers must make to comply with the analyzed energy conservation standards.

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 all species due to “upstream” activities in the fuel production chain. These upstream activities comprise extraction, processing, and transporting fuels to the site of combustion. The associated emissions are referred to as upstream emissions.

The analysis of power sector emissions uses marginal emissions factors that were derived from data in AEO 2015, as described in section IV.M. Details of the methodology are described in the appendices of chapters 13 and 15 of the NOPR TSD.

Combustion emissions of CH_4 and N_2O are estimated using emissions intensity factors published by the EPA: GHG Emissions Factors Hub.[37] The FFC upstream emissions are estimated based on the methodology described in chapter 15 of the NOPR TSD. The upstream emissions include both emissions from fuel combustion during extraction, processing, and transportation of fuel, and "fugitive" emissions (direct leakage to the atmosphere) of CH_4 and CO_2.

The emissions intensity factors are expressed in terms of physical units per MWh or MMBtu of site energy savings. Total emissions reductions are estimated using the energy savings calculated in the national impact analysis.

For CH_4 and N_2O, DOE calculated emissions reduction in tons and also in terms of units of carbon dioxide equivalent (CO_2eq). Gases are converted to CO_2eq by multiplying each ton of gas by the gas's global warming potential (GWP) over a 100-year time horizon. Based on the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,[38] DOE used GWP values of 28 for CH_4 and 265 for N_2O.

[37] Available at www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub.

[38] Intergovernmental Panel on Climate Change. Anthropogenic and Natural Radiative Forcing. In Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Chapter 8. 2013. Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P.M. Midgley, Editors. Cambridge University Press: Cambridge, United Kingdom and New York, NY, USA.

The AEO incorporates the projected impacts of existing air quality regulations on emissions. AEO 2015 generally represents current legislation and environmental regulations, including recent government actions, for which implementing regulations were available as of October 31, 2014. DOE's estimation of impacts accounts for the presence of the emissions control programs discussed in the following paragraphs.

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 28 eastern States and D.C. were also limited under the Clean Air Interstate Rule (CAIR). 70 FR 25162 (May 12, 2005). CAIR created an allowance-based trading program that operates along with the Title IV program. In 2008, CAIR was remanded to EPA by the U.S. Court of Appeals for the District of Columbia Circuit, but it remained in effect.[39] In 2011, EPA issued a replacement for CAIR, the Cross-State Air Pollution Rule (CSAPR). 76 FR 48208 (Aug. 8, 2011). On August 21, 2012, the D.C. Circuit issued a decision to vacate CSAPR,[40] and the court ordered EPA to continue administering CAIR. On April 29, 2014, the U.S. Supreme Court reversed the judgment of the D.C. Circuit and remanded

[39] See North Carolina v. EPA, 550 F.3d 1176 (D.C. Cir. 2008); North Carolina v. EPA, 531 F.3d 896 (D.C. Cir. 2008).
[40] See EME Homer City Generation, LP v. EPA, 696 F.3d 7, 38 (D.C. Cir. 2012), cert. granted, 81 U.S.L.W. 3567, 81 U.S.L.W. 3696, 81 U.S.L.W. 3702 (U.S. June 24, 2013) (No. 12-1182).

the case for further proceedings consistent with the Supreme Court's opinion.[41] On October 23, 2014, the D.C. Circuit lifted the stay of CSAPR.[42] Pursuant to this action, CSAPR went into effect (and CAIR ceased to be in effect) as of January 1, 2015.

EIA was not able to incorporate CSAPR into AEO 2015, so it assumes implementation of CAIR. Although DOE's analysis used emissions factors that assume that CAIR, not CSAPR, is the regulation in force, the difference between CAIR and CSAPR is not significant for the purpose of DOE's analysis of emissions impacts from energy conservation standards.

The attainment of emissions caps is typically flexible among EGUs and is enforced through the use of emissions allowances and tradable permits. 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 any regulated EGU. In past rulemakings, DOE recognized that there was uncertainty about the effects of efficiency standards on SO_2 emissions covered by the existing cap-and-trade system, but it concluded that negligible reductions in power sector SO_2 emissions would occur as a result of standards.

---

[41] See EPA v. EME Homer City Generation, 134 S. Ct. 1584, 1610 (U.S. 2014). The Supreme Court held in part that EPA's methodology for quantifying emissions that must be eliminated in certain States due to their impacts in other downwind States was based on a permissible, workable, and equitable interpretation of the Clean Air Act provision that provides statutory authority for CSAPR.
[42] See Georgia v. EPA, Order (D.C. Cir. filed October 23, 2014) (No. 11-1302).

Beginning in 2016, however, SO_2 emissions will fall as a result of the Mercury and Air Toxics Standards (MATS) for power plants. 77 FR 9304 (Feb. 16, 2012). In the MATS rule, EPA established a standard for hydrogen chloride as a surrogate for acid gas hazardous air pollutants (HAP), and also established a standard for SO_2 (a non-HAP acid gas) as an alternative equivalent surrogate standard for acid gas HAP. The same controls are used to reduce HAP and non-HAP acid gas; thus, SO_2 emissions will be reduced as a result of the control technologies installed on coal-fired power plants to comply with the MATS requirements for acid gas. AEO 2015 assumes that, in order to continue operating, coal plants must have either flue gas desulfurization or dry sorbent injection systems installed by 2016. Both technologies, which are used to reduce acid gas emissions, also reduce SO_2 emissions. Under the MATS, emissions will be far below the cap established by CAIR, so 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 any regulated EGU.[43] Therefore, DOE believes that energy conservation standards will generally reduce SO_2 emissions in 2016 and beyond.

CAIR established a cap on NO_X emissions in 28 eastern States and the District of Columbia.[44] Energy conservation standards are expected to have little effect on NO_X

[43] DOE notes that the Supreme Court remanded EPA's 2012 rule regarding national emission standards for hazardous air pollutants from certain electric utility steam generating units. See Michigan v. EPA (Case No. 14-46, 2015). DOE has tentatively determined that the remand of the MATS rule does not change the assumptions regarding the impact of energy efficiency standards on SO_2 emissions. Further, while the remand of the MATS rule may have an impact on the overall amount of mercury emitted by power plants, it does not change the impact of the energy efficiency standards on mercury emissions. DOE will continue to monitor developments related to this case and respond to them as appropriate.

[44] CSAPR also applies to NO_X, and it supersedes the regulation of NO_X under CAIR. As stated previously, the current analysis assumes that CAIR, not CSAPR, is the regulation in force. The difference between CAIR and CSAPR with regard to DOE's analysis of NO_X emissions is slight.

emissions in those States covered by CAIR because excess NO_X emissions allowances resulting from the lower electricity demand could be used to permit offsetting increases in NO_X emissions from other facilities. However, standards would be expected to reduce NO_X emissions in the States not affected by the caps, so DOE estimated NO_X emissions reductions from the standards considered in this NOPR for these States.

The MATS limit mercury emissions from power plants, but they do not include emissions caps and, as such, DOE's energy conservation standards would likely reduce Hg emissions. DOE estimated mercury emissions reduction using emissions factors based on AEO 2015, which incorporates the MATS.

L. Monetizing Carbon Dioxide and Other Emissions Impacts

As part of the development of this proposed rule, DOE considered the estimated monetary benefits from the reduced emissions of CO_2 and NO_X 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 forecast period for each TSL. This section summarizes the basis for the monetary values used for CO_2 and NO_X emissions and presents the values considered in this NOPR.

1. Social Cost of Carbon

The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) climate-change-related changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services. Estimates of the SCC are provided in dollars per metric ton of CO_2. A domestic SCC value is meant to reflect the value of damages in the United States resulting from a unit change in CO_2 emissions, while a global SCC value is meant to reflect the value of damages worldwide.

Under section 1(b)(6) of Executive Order 12866, “Regulatory Planning and Review,” 58 FR 51735 (Oct. 4, 1993), agencies must, to the extent permitted by law, “assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.” The purpose of the SCC estimates presented here is to allow agencies to incorporate the monetized social benefits of reducing CO_2 emissions into cost-benefit analyses of regulatory actions. The estimates are presented with an acknowledgement of the many uncertainties involved and with a clear understanding that they should be updated over time to reflect increasing knowledge of the science and economics of climate impacts.

As part of the interagency process that developed these SCC estimates, technical experts from numerous agencies met on a regular basis to consider public comments, explore the technical literature in relevant fields, and discuss key model inputs and assumptions. The main objective of this process was to develop a range of SCC values using a defensible set of input assumptions grounded in the existing scientific and economic literatures. In this way, key uncertainties and model differences transparently and consistently inform the range of SCC estimates used in the rulemaking process.

a. Monetizing Carbon Dioxide Emissions

When attempting to assess the incremental economic impacts of CO_2 emissions, the analyst faces a number of challenges. A report from the National Research Council[45] points out that any assessment will suffer from uncertainty, speculation, and lack of information about (1) future emissions of GHGs, (2) the effects of past and future emissions on the climate system, (3) the impact of changes in climate on the physical and biological environment, and (4) the translation of these environmental impacts into economic damages. As a result, any effort to quantify and monetize the harms associated with climate change will raise questions of science, economics, and ethics and should be viewed as provisional.

Despite the limits of both quantification and monetization, SCC estimates can be useful in estimating the social benefits of reducing CO_2 emissions. The agency can estimate the benefits from reduced (or costs from increased) emissions in any future year by multiplying the change in emissions in that year by the SCC values appropriate for that year. The NPV of the benefits can then be calculated by multiplying each of these future benefits by an appropriate discount factor and summing across all affected years.

[45] National Research Council. Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use. 2009. National Academies Press: Washington, DC.

It is important to emphasize that the interagency process is committed to updating these estimates as the science and economic understanding of climate change and its impacts on society improves over time. In the meantime, the interagency group will continue to explore the issues raised by this analysis and consider public comments as part of the ongoing interagency process.

b. Development of Social Cost of Carbon Values

In 2009, an interagency process was initiated to offer a preliminary assessment of how best to quantify the benefits from reducing carbon dioxide emissions. To ensure consistency in how benefits are evaluated across Federal agencies, the Administration sought to develop a transparent and defensible method, specifically designed for the rulemaking process, to quantify avoided climate change damages from reduced CO_2 emissions. The interagency group did not undertake any original analysis. Instead, it combined SCC estimates from the existing literature to use as interim values until a more comprehensive analysis could be conducted. The outcome of the preliminary assessment by the interagency group was a set of five interim values: global SCC estimates for 2007 (in 2006$) of $55, $33, $19, $10, and $5 per metric ton of CO_2. These interim values represented the first sustained interagency effort within the U.S. government to develop an SCC for use in regulatory analysis. The results of this preliminary effort were presented in several proposed and final rules.

c. Current Approach and Key Assumptions

After the release of the interim values, the interagency group reconvened on a regular basis to generate improved SCC estimates. Specially, the group considered public comments and further explored the technical literature in relevant fields. The interagency group relied on three integrated assessment models commonly used to estimate the SCC: the FUND, DICE, and PAGE models. These models are frequently cited in the peer-reviewed literature and were used in the last assessment of the Intergovernmental Panel on Climate Change (IPCC). Each model was given equal weight in the SCC values that were developed.

Each model takes a slightly different approach to model how changes in emissions result in changes in economic damages. A key objective of the interagency process was to enable a consistent exploration of the three models, while respecting the different approaches to quantifying damages taken by the key modelers in the field. An extensive review of the literature was conducted to select three sets of input parameters for these models: climate sensitivity, socio-economic and emissions trajectories, and discount rates. A probability distribution for climate sensitivity was specified as an input into all three models. In addition, the interagency group used a range of scenarios for the socio-economic parameters and a range of values for the discount rate. All other model features were left unchanged, relying on the model developers' best estimates and judgments.

In 2010, the interagency group selected four sets of SCC values for use in regulatory analyses. Three sets of values are based on the average SCC from the three integrated assessment models, at discount rates of 2.5, 3, and 5 percent. The fourth set, which represents the 95th percentile SCC estimate across all three models at a 3-percent discount rate, was included to represent higher-than-expected impacts from climate change further out in the tails of the SCC distribution. The values grow in real terms over time. Additionally, the interagency group determined that a range of values from 7 percent to 23 percent should be used to adjust the global SCC to calculate domestic effects,[46] although preference is given to consideration of the global benefits of reducing CO_2 emissions. Table IV.5 presents the values in the 2010 interagency group report,[47] which is reproduced in appendix 14A of the NOPR TSD.

[46] It is recognized that this calculation for domestic values is approximate, provisional, and highly speculative. There is no a priori reason why domestic benefits should be a constant fraction of net global damages over time.

[47] United States Government–Interagency Working Group on Social Cost of Carbon. Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866. February 2010. https://www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf.

Table IV.5 Annual SCC Values from 2010 Interagency Report, 2010–2050 (2007$ per metric ton CO_2)

Year	Discount Rate			
	5%	3%	2.5%	3%
	Average	Average	Average	95th Percentile
2010	4.7	21.4	35.1	64.9
2015	5.7	23.8	38.4	72.8
2020	6.8	26.3	41.7	80.7
2025	8.2	29.6	45.9	90.4
2030	9.7	32.8	50.0	100.0
2035	11.2	36.0	54.2	109.7
2040	12.7	39.2	58.4	119.3
2045	14.2	42.1	61.7	127.8
2050	15.7	44.9	65.0	136.2

The SCC values used for this document were generated using the most recent versions of the three integrated assessment models that have been published in the peer-reviewed literature, as described in the 2013 update from the interagency working group (revised July 2015).[48] Table IV.6 shows the updated sets of SCC estimates from the latest interagency update in 5-year increments from 2010 through 2050. The full set of annual SCC estimates from 2010 through 2050 is reported in appendix 14B of the NOPR TSD. The central value that emerges is the average SCC across models at the 3-percent discount rate. However, for purposes of capturing the uncertainties involved in regulatory impact analysis, the interagency group emphasizes the importance of including all four sets of SCC values.

Table IV.6 Annual SCC Values from 2013 Interagency Update (Revised July 2015), 2010–2050 (2007$ per metric ton CO_2)

Year	Discount Rate

[48] United States Government–Interagency Working Group on Social Cost of Carbon. Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866. May 2013. Revised July 2015. https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf.

	5%	3%	2.5%	3%
	Average	**Average**	**Average**	**95th Percentile**
2010	10	31	50	86
2015	11	36	56	105
2020	12	42	62	123
2025	14	46	68	138
2030	16	50	73	152
2035	18	55	78	168
2040	21	60	84	183
2045	23	64	89	197
2050	26	69	95	212

It is important to recognize that a number of key uncertainties remain, and that current SCC estimates should be treated as provisional and revisable because they will evolve with improved scientific and economic understanding. The interagency group also recognizes that the existing models are imperfect and incomplete. The National Research Council report mentioned previously points out that there is tension between the goal of producing quantified estimates of the economic damages from an incremental ton of carbon and the limits of existing efforts to model these effects. There are a number of analytical challenges that are being addressed by the research community, including research programs housed in many of the Federal agencies participating in the interagency process to estimate the SCC. The interagency group intends to periodically review and reconsider those estimates to reflect increasing knowledge of the science and economics of climate impacts, as well as improvements in modeling.[49]

[49] In November 2013, OMB announced a new opportunity for public comment on the interagency technical support document underlying the revised SCC estimates. 78 FR 70586. In July 2015 OMB published a detailed summary and formal response to the many comments that were received; this is available at https://www.whitehouse.gov/blog/2015/07/02/estimating-benefits-carbon-dioxide-emissions-reductions. It also stated its intention to seek independent expert advice on opportunities to improve the estimates, including many of the approaches suggested by commenters.

In summary, in considering the potential global benefits resulting from reduced CO_2 emissions, DOE used the values from the 2013 interagency report (revised July 2015), adjusted to 2015$ using the implicit price deflator for gross domestic product (GDP) from the Bureau of Economic Analysis. For each of the four sets of SCC cases specified, the values for emissions in 2015 were $12.4, $40.6, $63.2, and $118 per metric ton avoided (values expressed in 2015$). DOE derived values after 2050 based on the trend in 2010–2050 in each of the four cases.

DOE multiplied the CO_2 emissions reduction estimated for each year by the SCC value for that year in each of the four cases. 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 SCC values in each case.

2. Social Cost of Other Air Pollutants

As noted previously, DOE has estimated how the considered energy conservation standards would decrease power sector NO_X emissions in those 22 States not affected by the CAIR.

DOE estimated the monetized value of NO_X emissions reductions from electricity generation using benefit per ton estimates from the "Regulatory Impact Analysis for the Clean Power Plan Final Rule," published in August 2015 by EPA's Office of Air Quality

Planning and Standards.[50] The report includes high and low values for NO_X (as $PM_{2.5}$) for 2020, 2025, and 2030 using discount rates of 3 percent and 7 percent; these values are presented in chapter 14 of the NOPR TSD. DOE primarily relied on the low estimates to be conservative.[51] DOE assigned values for 2021–2024 and 2026–2029 using, respectively, the values for 2020 and 2025. DOE assigned values after 2030 using the value for 2030. DOE developed values specific to the end-use category for UPSs using a method described in appendix 14C of the NOPR TSD.

DOE multiplied the emissions reduction (in tons) in each year by the associated $/ton values, and then discounted each series using discount rates of 3 percent and 7 percent as appropriate.

DOE is evaluating appropriate monetization of avoided SO_2 and Hg emissions in energy conservation standards rulemakings. DOE has not included monetization of those emissions in the current analysis.

---

[50] Available at www.epa.gov/cleanpowerplan/clean-power-plan-final-rule-regulatory-impact-analysis. See Tables 4A-3, 4A-4, and 4A-5 in the report. The U.S. Supreme Court has stayed the rule implementing the Clean Power Plan until the current litigation against it concludes. Chamber of Commerce, et al. v. EPA, et al., Order in Pending Case, 577 U.S. ___ (2016). However, the benefit-per-ton estimates established in the Regulatory Impact Analysis for the Clean Power Plan are based on scientific studies that remain valid irrespective of the legal status of the Clean Power Plan.

[51] For the monetized NO_X benefits associated with PM2.5, the related benefits are primarily based on an estimate of premature mortality derived from the ACS study (Krewski et al. 2009), which is the lower of the two EPA central tendencies. Using the lower value is more conservative when making the policy decision concerning whether a particular standard level is economically justified. If the benefit-per-ton estimates were based on the Six Cities study (Lepuele et al. 2012), the values would be nearly two-and-a-half times larger. (See chapter [14] of the final rule TSD for further description of the studies mentioned above.)

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 AEO 2015. 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. DOE uses published side cases to estimate the marginal impacts of reduced energy demand on the utility sector. These marginal factors are estimated based on the changes to electricity sector generation, installed capacity, fuel consumption and emissions in the AEO 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 new or amended energy conservation standards.

Schneider Electric and ITI both commented that NEMS-BT was identified as inadequate for modeling beyond 2025 during a DOE distribution transformer rulemaking. (Schneider Electric, No. 0008 at p. 16) (ITI, No. 0010 at p. 19)

AEO 2015 has an end year of 2040. Beyond 2040, DOE extrapolates various factors. DOE acknowledges that any long-range projections are subject to considerable uncertainty, but NEMS provides a self-consistent framework that accounts for a wide range of factors in the energy sector and the larger economy.

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 end users on energy, (2) reduced spending on new energy supply by the utility industry, (3) increased consumer spending on new products to which the new standards apply, 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.[52] 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

[52] See U.S. Department of Commerce–Bureau of Economic Analysis. Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II). 1997. U.S. Government Printing Office: Washington, DC. Available at http://www.bea.gov/scb/pdf/regional/perinc/meth/rims2.pdf.

of Sector Energy Technologies version 3.1.1 (ImSET).[53] 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.

DOE notes that ImSET is not a general equilibrium forecasting model, and understands 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 generated results for near-term timeframes (2019-2024), 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 UPSs. It addresses the TSLs examined by DOE, the projected impacts of each of these levels if adopted as energy conservation standards for UPSs, and the standards levels that DOE is proposing to adopt in this

[53] J. M. Roop, M. J. Scott, and R. W. Schultz. ImSET 3.1: Impact of Sector Energy Technologies. 2009. Pacific Northwest National Laboratory: Richland, WA. PNNL-18412. Available at www.pnl.gov/main/publications/external/technical_reports/PNNL-18412.pdf.

NOPR. Additional details regarding DOE's analyses are contained in the NOPR TSD supporting this notice.

A. Trial Standard Levels

DOE analyzed the benefits and burdens of four TSLs for UPSs. These TSLs were developed by combining specific efficiency levels for each of the product classes analyzed by DOE. 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 for UPSs. DOE examined product classes individually.

Table V.1 Trial Standard Levels for UPSs

Product Class	**Description**	**Trial Standard Level**			
		TSL 1	**TSL 2**	**TSL 3**	**TSL 4**
10a	VFD UPSs	EL 1	EL 1	EL 2	EL 3
10b	VI UPSs	EL 1	EL 2	EL 2	EL 3
10c	VFI UPSs	EL 1	EL 1	EL 1	EL 3

TSL 1 is the minimum possible standard considered, and also corresponds to the maximum consumer NPV for each product class. TSL 2 represents an intermediate level of performance above the baseline, with maximum NES while at a positive NPV for all product classes. TSL 3 represents an intermediate level of performance above TSL 2, and corresponds to maximum NES while at positive NPV in aggregate across all three product classes (the NPV of VFD UPSs is marginally negative). Finally, TSL 4 represents the maximum technologically feasible ("max-tech") energy efficiency for all product classes and therefore, the maximum NES.

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

DOE analyzed the economic impacts on UPS consumers by looking at the effects potential new standards at each TSL would have on the LCC and PBP. DOE also examined the impacts of potential standards on consumer subgroups. These analyses are discussed below.

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.4 show the LCC and PBP results for the TSL efficiency levels considered for each product class. In the first of each pair of tables, the simple payback is measured relative to the baseline product (EL 0). In Table V.5 through Table V.7, impacts are measured relative to the efficiency distribution in the no-standards case in the compliance year (see section IV.F.8 of this notice). Because some consumers purchase products with higher efficiency in the no-standards case, the average savings are less than the difference between the average LCC of EL 0 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 by Efficiency Level for Product Class 10a (VFD UPSs)

TSL	EL	Average Costs 2015$				Simple Payback years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
Residential							
--	0	97	14	64	162	--	5.0
1	1	92	6	25	117	0.0	5.0
2	1	92	6	25	117	0.0	5.0
3	2	121	4	18	139	2.3	5.0
4	3	139	3	14	153	3.8	5.0
Commercial							
--	0	70	10	46	116	--	5.0
1	1	66	4	18	84	0.0	5.0
2	1	66	4	18	84	0.0	5.0
3	2	91	3	13	104	2.8	5.0
4	3	107	2	10	117	4.5	5.0

Note: The results for each TSL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline (EL 0) product.

Table V.3 Average LCC and PBP Results by Efficiency Level for Product Class 10b (VI UPSs)

TSL	EL	Average Costs 2015$				Simple Payback years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
Residential							
--	0	111	19	108	219	--	6.3
1	1	141	9	53	193	3.0	6.3
2	2	162	6	34	196	3.9	6.3
3	2	162	6	34	196	3.9	6.3
4	3	623	4	20	643	33.2	6.3
Commercial							
--	0	80	14	76	156	--	6.3
1	1	106	7	37	143	3.6	6.3
2	2	125	4	24	149	4.7	6.3
3	2	125	4	24	149	4.7	6.3
4	3	533	3	14	547	39.8	6.3

Note: The results for each TSL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline (EL 0) product.

Table V.4 Average LCC and PBP Results by Efficiency Level for Product Class 10c (VFI UPSs)

TSL	EL	Average Costs 2015$				Simple Payback years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
Residential							
--	0	408	125	1066	1474	--	10.0
1	1	460	111	948	1408	3.7	10.0
2	1	460	111	948	1408	3.7	10.0
3	1	460	111	948	1408	3.7	10.0
4	3	1180	71	609	1789	14.4	10.0
Commercial							
--	0	293	86	693	986	--	10.0
1	1	338	77	616	955	4.8	10.0
2	1	338	77	616	955	4.8	10.0
3	1	338	77	616	955	4.8	10.0
4	3	974	49	396	1371	18.5	10.0

Note: The results for each TSL are calculated assuming that all consumers use products at that efficiency level. The PBP is measured relative to the baseline (EL 0) product.

Table V.5 Average LCC Savings Relative to the No-Standards Case for Product Class 10a (VFD UPSs)

TSL	EL	Life-Cycle Cost Savings	
		Average LCC Savings* (2015$)	Percent of Consumers that Experience Net Cost
Residential			
1	1	44	0%
2	1	44	0%
3	2	5	37%
4	3	-10	74%
Commercial			
1	1	32	0%
2	1	32	0%
3	2	-1	38%
4	3	-14	79%

* The savings represent the average LCC for affected consumers.

Table V.6 Average LCC Savings Relative to the No-Standards Case for Product Class 10b (VI UPSs)

TSL	EL	Life-Cycle Cost Savings	
		Average LCC Savings* (2015$)	Percent of Consumers that Experience Net Cost
Residential			
1	1	26	6%
2	2	18	35%
3	2	18	35%
4	3	-430	100%
Commercial			
1	1	13	8%
2	2	5	45%
3	2	5	45%
4	3	-394	100%

* The savings represent the average LCC for affected consumers.

Table V.7 Average LCC Savings Relative to the No-Standards Case for Product Class 10c (VFI UPSs)

TSL	EL	Life-Cycle Cost Savings	
		Average LCC Savings* (2015$)	**Percent of Consumers that Experience Net Cost**
Residential			
1	1	66	3%
2	1	66	3%
3	1	66	3%
4	3	-331	91%
Commercial			
1	1	31	2%
2	1	31	2%
3	1	31	2%
4	3	-390	100%

* The savings represent the average LCC for affected consumers.

b. Consumer Subgroup Analysis

In the consumer subgroup analysis, DOE estimated the impact of the considered TSLs on low-income households and small businesses. Table V.8 through Table V.10 compares the average LCC savings and PBP at each efficiency level for low-income households, along with the average LCC savings for the entire residential sample. Table V.11 through Table V.13 compares the average LCC savings and PBP at each TSL for small businesses, along with the average LCC savings for the commercial sample. In most cases, the average LCC savings and PBP for low-income households and small businesses at the considered efficiency levels are not substantially different from the average values found for the entire residential and commercial samples, respectively. Chapter 11 of the NOPR TSD presents the complete LCC and PBP results for the subgroups.

Table V.8 Comparison of LCC Savings and PBP for Low-Income Households and All Households for Product Class 10a (VFD UPSs)

	Average Life-Cycle Cost Savings (2015$)		Simple Payback Period (years)	
TSL	**Low-Income Households**	**All Households**	**Low-Income Households**	**All Households**
1	47	44	0.0	0.0
2	47	44	0.0	0.0
3	7	5	2.2	2.3
4	-8	-10	3.5	3.8

Table V.9 Comparison of LCC Savings and PBP for Low-Income Households and All Households for Product Class 10b (VI UPSs)

	Average Life-Cycle Cost Savings (2015$)		Simple Payback Period (years)	
TSL	**Low-Income Households**	**All Households**	**Low-Income Households**	**All Households**
1	30	26	2.8	3.0
2	22	18	3.6	3.9
3	22	18	3.6	3.9
4	-426	-430	31.0	33.2

Table V.10 Comparison of LCC Savings and PBP for Low-Income Households and All Households for Product Class 10c (VFI UPSs)

	Average Life-Cycle Cost Savings (2015$)		Simple Payback Period (years)	
TSL	**Low-Income Households**	**All Households**	**Low-Income Households**	**All Households**
1	75	66	3.5	3.7
2	75	66	3.5	3.7
3	75	66	3.5	3.7
4	-302	-331	13.5	14.4

Table V.11 Comparison of LCC Savings and PBP Small Businesses and All Businesses for Product Class 10a (VFD UPSs)

	Average Life-Cycle Cost Savings (2015$)		Simple Payback Period (years)	
TSL	Small Businesses	All Businesses	Small Businesses	All Businesses
1	31	32	0.0	0.0
2	31	32	0.0	0.0
3	-1	-1	2.8	2.8
4	-14	-14	4.5	4.5

Table V.12 Comparison of LCC Savings and PBP Small Businesses and All Businesses for Product Class 10b (VI UPSs)

	Average Life-Cycle Cost Savings (2015$)		Simple Payback Period (years)	
TSL	Small Businesses	All Businesses	Small Businesses	All Businesses
1	12	13	3.6	3.6
2	3	5	4.7	4.7
3	3	5	4.7	4.7
4	-396	-394	39.8	39.8

Table V.13 Comparison of LCC Savings and PBP Small Businesses and All Businesses for Product Class 10c (VFI UPSs)

	Average Life-Cycle Cost Savings (2015$)		Simple Payback Period (years)	
TSL	Small Businesses	All Businesses	Small Businesses	All Businesses
1	28	31	4.8	4.8
2	28	31	4.8	4.8
3	28	31	4.8	4.8
4	-400	-390	18.5	18.5

c. Rebuttable Presumption Payback

As discussed in section III.D.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 UPSs. 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.

TableV.14 presents the rebuttable-presumption payback periods for the considered TSLs for UPSs. 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.14 Rebuttable Presumption PBPs for Product Classes 10a, 10b, and 10c

TSL	**10a (VFD UPSs)**	**10b (VI UPSs)**	**10c (VFI UPSs)**
Residential			
1	0.0	2.8	3.5
2	0.0	3.7	3.5
3	2.0	3.7	3.5
4	3.0	29.6	14.1

Commercial			
1	0.0	3.3	4.5
2	0.0	4.5	4.5
3	2.5	4.5	4.5
4	3.6	35.6	18.1

2. Economic Impacts on Manufacturers

DOE performed an MIA to estimate the impact of new energy conservation standards on UPS manufacturers. The following section describes the estimated impacts on UPS manufacturers at each analyzed TSL. Chapter 12 of the NOPR TSD explains the analysis in further detail.

a. Industry Cash Flow Analysis Results

Table V.15 and Table V.16 present the financial impacts (represented by changes in INPV) of analyzed standards on UPS manufacturers as well as the conversion costs that DOE estimates UPS manufacturers would incur at each TSL. To evaluate the range of cash-flow impacts on the UPS industry, DOE modeled two markup scenarios that correspond to the range of anticipated market responses to new standards. Each scenario results in a unique set of cash flows and corresponding industry values at each TSL.

To assess the upper (less severe) bound of the range of potential impacts on UPS manufacturers, DOE modeled a preservation of gross margin markup scenario. This scenario assumes that in the standards cases, manufacturers would be able to fully pass on higher production costs required to produce more efficient products to their consumers. Specifically, the industry would be able to maintain its average no-standards case gross margin (as a percentage of revenue) despite the higher product costs in the standards cases. In general, the larger the product price increases, the less likely manufacturers are to achieve the cash flow from operations calculated in this scenario because it is less likely that manufacturers would be able to fully mark up these larger cost increases.

To assess the lower (more severe) bound of the range of potential impacts on manufacturers, DOE modeled the pass through markup scenario. In this scenario DOE assumes that manufacturers are able to pass through the incremental costs of more efficient UPSs to their customers, but without earning any additional operating profit on those higher costs. This scenario represents the lower bound of the range of potential impacts on manufacturers because manufacture margins are compressed as a result of this markup scenario.

Table V.15 Manufacturer Impact Analysis for Uninterruptible Power Supplies – Preservation of Gross Margin Markup Scenario

	Units	No Standards Case	Trial Standard Level			
			1	2	3	4
INPV	2015$ millions	2,555	2,746	2,849	2,983	7,400
Change in INPV	2015$ millions	-	191	295	428	4,845
	%	-	7.5	11.5	16.8	189.7
Product Conversion Costs	2015$ millions	-	16	20	20	23
Capital Conversion Costs	2015$ millions	-	-	-	-	-
Total Conversion Costs	2015$ millions	-	16	20	20	23

Table V.16 Manufacturer Impact Analysis for Uninterruptible Power Supplies – Pass Through Markup Scenario

	Units	No Standards Case	Trial Standard Level			
			1	2	3	4
INPV	2015$ millions	2,555	2,166	1,957	1,619	(667)
Change in INPV	2015$ millions	-	(389)	(598)	(936)	(3,222)
	%	-	(15.2)	(23.4)	(36.6)	(126.1)
Product Conversion Costs	2015$ millions	-	16	20	20	23
Capital Conversion Costs	2015$ millions	-	-	-	-	-
Total Conversion Costs	2015$ millions	-	16	20	20	23

* Numbers in parentheses indicate negative numbers.

TSL 1 sets the efficiency level at EL 1 for all UPSs. At TSL 1, DOE estimates impacts on INPV to range from -$389 million to $191 million, or a change in INPV of -15.2 percent to 7.5 percent. At this TSL, industry free cash flow is estimated to decrease by approximately 6.3 percent to $81 million, compared to the no-standards case value of $86 million in 2018, the year leading up to the proposed standard.

DOE does not expect that UPS manufacturers will incur any capital conversion costs at any of the TSLs. DOE does expect that manufacturers will incur product conversion costs of $16.2 million at TSL 1, primarily driven by testing and certifying all covered UPSs as well as by increased R&D efforts necessary to redesign UPSs that do not meet efficiency levels required at TSL 1.

At TSL 1, the shipment-weighted-average MPCs increase by approximately 11 percent for VFI UPSs and 21 percent for VI UPSs and decrease by approximately 3 percent for VFD UPSs relative to the no-standards case MPCs in 2019, the expected compliance year of the standards. In the preservation of gross margin markup scenario, manufacturers are able to recover their $16.2 million in conversion costs over the course of the analysis period through the increases in MPCs for VFI and VI UPSs causing a slightly positive change in INPV at TSL 1 under the preservation of gross margin markup scenario.

Under the pass through markup scenario, the MPC increases at TSL 1 result in reductions in manufacturer markups from 1.76 in the no-standards case to 1.67 for VFI UPSs at TSL 1 and from 1.57 in the no-standards case to 1.44 for VI UPSs at TSL 1. The MPC decrease for VFD UPSs at TSL 1 results in an increase in manufacturer markup from 1.55 in the no-standards case to 1.57 at TSL 1. The reductions in manufacturer markups for VFI and VI UPSs and $16.2 million in conversion costs incurred by manufacturers cause a moderately negative change in INPV at TSL 1 under the pass through markup scenario.

TSL 2 sets the efficiency level at EL 1 for VFI and VFD UPSs and EL 2 for VI UPSs. At TSL 2, DOE estimates impacts on INPV to range from -$598 million to $295 million, or a change in INPV of -23.4 percent to 11.5 percent. At this TSL, industry free cash flow is estimated to decrease by approximately 7.6 percent to $80 million, compared to the no-standards case value of $86 million in 2018, the year leading up to the proposed standard.

DOE expects that product conversion costs will rise from $16.2 million at TSL 1 to $19.6 million at TSL 2. Product conversion costs incurred at TSL 2 are primarily driven by testing and certifying all covered UPSs as well as by increased R&D efforts necessary to redesign UPSs that do not meet efficiency levels required at TSL 2 and VI UPSs to have best-in-market efficiency.

At TSL 2, the shipment-weighted-average MPCs increase by approximately 11 percent for VFI UPSs and 41 percent for VI UPSs and decrease by approximately 3 percent for VFD UPSs relative to the no-standards case MPCs in 2019, the expected compliance year of the standards. In the preservation of gross margin markup scenario, manufacturers are able to recover their $19.6 million in conversion costs over the course of the analysis period through the increases in MPCs for VFI and VI UPSs causing a moderately positive change in INPV at TSL 2 under the preservation of gross margin markup scenario.

Under the pass through markup scenario at TSL 2, the MPC increases result in reductions in manufacturer markups from 1.76 in the no-standards case to 1.67 for VFI UPSs at TSL 2 and from 1.57 in the no-standards case to 1.37 for VI UPSs at TSL 2. The MPC decrease for VFD UPSs at TSL 2 results in an increase in manufacturer markup from 1.55 in the no-standards case to 1.57 in the standards case at TSL 2. The reductions in manufacturer markups for VFI and VI UPSs and $19.6 million in conversion costs cause a significantly negative change in INPV at TSL 2 under the pass through markup scenario.

TSL 3 sets the efficiency level at EL 1 for VFI UPSs and EL 2 for VI and VFD UPSs. At TSL 3, DOE estimates impacts on INPV to range from -$936 million to $428 million, or a change in INPV of -36.6 percent to 16.8 percent. At this TSL, industry free cash flow is estimated to decrease by approximately 8.0 percent to $80 million, compared to the no-standards case value of $86 million in 2018, the year leading up to the proposed standard.

DOE expects that product conversion costs will rise slightly from $19.6 million at TSL 2 to $20.4 million at TSL 3. Product conversion costs incurred at TSL 3 are primarily driven by testing and certifying all covered UPSs as well as by increased R&D efforts necessary to redesign UPSs that do not meet efficiency levels required at TSL 3 and VI and VFD UPSs to have best-in-market efficiency at TSL 3.

At TSL 3, the shipment-weighted-average MPCs increase by approximately 11 percent for VFI UPSs, 41 percent for VI UPSs, and 24 percent for VFD UPSs relative to the no-standards case MPCs in 2019, the expected compliance year of the standards. In the preservation of gross margin markup scenario, manufacturers are able to recover their $20.4 million in conversion costs over the course of the analysis period through the increases in MPCs causing a moderately positive change in INPV at TSL 3 under the preservation of gross margin markup scenario.

Under the pass through markup scenario at TSL 3, the increases in shipment-weighted-average MPCs result in reductions in manufacturer markups, from 1.76 in the no-standards case to 1.67 for VFI UPSs at TSL 3, from 1.57 in the no-standards case to 1.37 for VI UPSs at TSL 3, and from 1.55 in the no-standards case to 1.43 for VFD UPSs at TSL 3. These reductions in manufacturer markups and $20.4 million in conversion costs incurred by manufacturers cause a significantly negative change in INPV at TSL 3 under the pass through markup scenario.

TSL 4 sets the efficiency level at EL 3 for all UPSs, which represents max-tech. At TSL 4, DOE estimates impacts on INPV to range from -$3,222 million to $4,845 million, or a change in INPV of -126.1 percent to 189.7 percent. At this TSL, industry free cash flow is estimated to decrease by approximately 9.0 percent to $79 million, compared to the no-standards case value of $86 million in 2018, the year leading up to the proposed standard.

DOE expects that product conversion costs will rise from $20.4 million at TSL 3 to $23.0 million at TSL 4. Product conversion costs incurred at TSL 4 are primarily driven by testing and certifying all covered UPSs as well as by increased R&D efforts necessary to redesign UPSs that do not meet efficiency levels required at TSL 4 to have best-in-market efficiency and to use the most efficient materials and semiconductor components available.

At TSL 4, the shipment-weighted-average MPCs increase significantly by approximately 209 percent for VFI UPSs, 504 percent for VI UPSs, and 45 percent for VFD UPSs relative to the no-standards case MPCs in 2019, the expected compliance year of the standards. In the preservation of gross margin markup scenario, manufacturers are able to recover their $23.0 million in conversion costs over the course of the analysis period through the increases in MPCs causing a significantly positive change in INPV at TSL 4 under the preservation of gross margin markup scenario.

Under the pass through markup scenario at TSL 4, the MPC increases result in reductions in manufacturer markups, from 1.76 in the no-standards case to 1.30 for VFI UPSs at TSL 4, from 1.57 in the no-standards case to 1.30 for VI UPSs at TSL 4, and from 1.55 in the no-standards case to 1.36 for VFD UPSs at TSL 4. These reductions in manufacturer markups and $23.0 million in conversion costs incurred by manufacturers cause a significantly negative change in INPV at TSL 4 under the pass through markup scenario.

b. Impacts on Employment

As part of the direct employment impact analysis, DOE attempted to quantify the number of domestic workers involved in UPS production. Manufacturer interviews and DOE’s research indicate that all UPS components that would be modified to improve the efficiency of UPSs are manufactured abroad. DOE was able to identify a handful of UPS manufacturers that do assemble these UPS components domestically. However, based on manufacturer interviews, DOE does not believe that there would be an impact on the amount of domestic workers involved in the assembly of UPSs due to new energy conservation standards. While the components of UPS configurations may change, DOE estimates that the same amount of labor would be needed to assemble these products. Therefore, DOE did not conduct a quantitative domestic manufacturing employment impact analysis on UPS manufacturers for this rulemaking.

DOE also recognizes there are several UPS and UPS component manufacturers that have employees in the U.S. that work on design, technical support, sales, training, testing, certification, and other requirements. However, in interviews, manufacturers generally did not expect any negative changes in the domestic employment of the design, technical support, or other departments of UPS and UPS component manufacturers located in the U.S. in response to new energy conservation standards.

DOE seeks comment on its determination that all UPS manufacturing takes place abroad. Additionally, DOE seeks comment on the presence of any domestic UPS manufacturing beyond assembly, R&D, testing, and certification, and if there are any potential negative impacts to domestic employment that could arise due to energy conservation standards on UPSs that are not fully captured by the direct employment impact analysis (see section VII.E).

c. Impacts on Manufacturing Capacity

UPS manufacturers stated that they did not anticipate any capacity constraints at any of the analyzed ELs, given a three-year timeframe from the publication of a final rule and the compliance year.

DOE seeks comment on any potential UPS and UPS component manufacturer capacity constraints caused by the proposed standards in this NOPR (see section VII.E).

d. Impacts on Subgroups of Manufacturers

Using average cost assumptions to develop an industry cash-flow estimate may not be adequate for assessing differential impacts among manufacturer subgroups. Small manufacturers, niche product manufacturers, and manufacturers exhibiting cost structures substantially different from the industry average could be affected disproportionately. DOE identified one manufacturer subgroup that it believes could be disproportionally impacted by energy conservation standards and would require a separate analysis in the MIA, small businesses. DOE analyzes the impacts on small businesses in a separate analysis in section VI.B of this NOPR as part of the Regulatory Flexibility Analysis. DOE did not identify any other adversely impacted manufacturer subgroups for this rulemaking based on the results of the industry characterization.

DOE seeks comment on any other manufacturer subgroups that DOE should analyze and/or types of UPS manufacturers for the manufacturer subgroup analysis, including the identification of UPS manufacturer subgroups that should be analyzed separately (see section VII.E).

e. Cumulative Regulatory Burden

One aspect of assessing manufacturer burden involves considering the cumulative impact of multiple DOE standards and the regulatory actions of other Federal agencies and States that affect the manufacturers of a covered product. A standard level is not economically justified if it contributes to an unacceptable cumulative regulatory burden. 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.

Some UPS manufacturers could also make other products that could be subject to energy conservation standards set by DOE. DOE looks at these regulations that could affect UPS manufacturers that will take effect approximately 3 years before or after the estimated 2019 compliance date of any amended energy conservation standards for UPSs.

These energy conservation standards include external power supplies that have a compliance date in 2016[54] and battery chargers that have a compliance date in 2018.[55]

The compliance dates and expected industry conversion costs of relevant energy conservation standards are indicated in Table V.17. DOE notes that very few of the products listed in Table V.17 are manufactured domestically.

Table V.17 Compliance Dates and Expected Conversion Expenses of Federal Energy Conservation Standards Affecting Uninterruptible Power Supply Manufacturers

Federal Energy Conservation Standards	Number of Manufacturers*	Compliance Date	Estimated INPV (No New Standards Case	Estimated Total Industry Conversion Expense	Number of Manufacturers from Today's Rule Affected**
External Power Supplies 79 FR 7846 (February 10, 2014)	679	2016	$274 million (2012$)	$43.3 million (2012$)	7
Battery Chargers XX FR XXX (Month, Day, 2016)	107	2018†	$79,904 million (2013$)	$19.5 million (2013$)	3

* The number of manufacturers listed in the final rule for the energy conservation standard that is contributing to cumulative regulatory burden.
** The number of manufacturers producing UPSs that are affected by the listed energy conservation standards.
†The final rule for this energy conservation standard has not been published. The data points in the table are estimates from the pre-publication stage.

DOE discusses these and other requirements and includes the full details of the cumulative regulatory burden analysis in chapter 12 of the NOPR TSD. DOE will continue to evaluate its approach to assessing cumulative regulatory burden for use in

[54] Energy conservation standards for external power supplies that become effective on February 10, 2016. 79 FR 7846 [Docket Number EERE–2008–BT–STD–0005-0219]
[55] Energy conservation standards for battery chargers will become effective on June 13, 2018. 81 FR 38266. [Docket Number EERE–2008–BT–STD–0005]

future rulemakings to ensure that it is effectively capturing the overlapping impacts of its regulations. In particular, DOE will assess whether looking at rules where any portion of the compliance period potentially overlaps with the compliance period for the subject rulemaking would yield a more accurate reflection of cumulative regulatory burden.

DOE seeks comment on the compliance costs of any other regulations on products that UPS manufacturers also manufacture, especially if compliance with those regulations is required within three years before or after the estimated compliance date of this proposed standard (2019) (see section VII.E). Additionally, DOE welcomes comment on how it analyzes and considers cumulative regulatory burden.

3. National Impact Analysis

a. Significance of Energy Savings

To estimate the energy savings attributable to potential standards for UPSs, DOE compared their energy consumption under the no-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 of anticipated compliance with amended standards (2019-2048). Table V.18 present DOE's projections of the national energy savings for each TSL considered for UPSs. The savings were calculated using the approach described in section IV.H of this NOPR.

Table V.18 Cumulative National Primary Energy Savings for UPSs Shipped in 2019–2048 (quads)*

Product Class	Description	Trial Standard Level			
		1	2	3	4
10a	VFD UPS	0.24	0.24	0.31	0.36
10b	VI UPS	0.41	0.59	0.59	0.73
10c	VFI UPS	0.31	0.31	0.31	1.44
Total*		0.95	1.13	1.20	2.53

* Numbers may not add to totals, due to rounding.

Table V.19 Cumulative National Energy Savings including Full-Full-Cycle for UPSs Shipped in 2019–2048 (quads)*

Product Class	Description	Trial Standard Level			
		1	2	3	4
10a	VFD UPS	0.25	0.25	0.32	0.38
10b	VI UPS	0.42	0.61	0.61	0.76
10c	VFI UPS	0.33	0.33	0.33	1.51
Total*		1.00	1.18	1.26	2.65

* Numbers may not add to totals, due to rounding.

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 nine, 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

[56] U.S. Office of Management and Budget. Circular A-4: Regulatory Analysis. September 17, 2003. www.whitehouse.gov/omb/circulars_a004_a-4/.
[57] Section 325(m) of EPCA requires DOE to review its standards at least once every 6 years, and requires, for certain products, a 3-year period after any new standard is promulgated before compliance is required, except that in no case may any new standards be required within 6 years of the compliance date of the previous standards. While adding a 6-year review to the 3-year compliance period adds up to 9 years, DOE

synchronized with the product lifetime, product manufacturing cycles, or other factors specific to UPSs. 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.20. The impacts are counted over the lifetime of UPSs purchased in 2019–2027.

Table V.20 Cumulative National Primary Energy Savings for UPSs; 9 Years of Shipments (2019–2027) (quads)*

Product Class	Description	Trial Standard Level			
		1	2	3	4
10a	VFD UPS	0.06	0.06	0.07	0.09
10b	VI UPS	0.10	0.14	0.14	0.17
10c	VFI UPS	0.07	0.07	0.07	0.34
Total*		0.23	0.27	0.29	0.60

* Numbers may not add to totals, due to rounding.

Table V.21 Cumulative National Energy Savings including Full-Fuel-Cycle for UPSs; 9 Years of Shipments (2019-2027) (quads)*

Product Class	Description	Trial Standard Level			
		1	2	3	4
10a	VFD UPS	0.06	0.06	0.08	0.09
10b	VI UPS	0.10	0.15	0.15	0.18
10c	VFI UPS	0.08	0.08	0.08	0.35
Total*		0.24	0.28	0.30	0.62

* Numbers may not add to totals, due to rounding.

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.

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 UPSs. 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.22 shows the consumer NPV results with impacts counted over the lifetime of products purchased in 2019–2048.

Table V.22 Cumulative Net Present Value of Consumer Benefits for UPSs Shipped in 2019–2048

Discount Rate	Trial Standard Level			
	1	2	3	4
	billion 2015$			
3 percent	4.8	4.4	2.4	-51
7 percent	2.2	1.9	0.75	-29

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.23. The impacts are counted over the lifetime of products purchased in 2019–2027. 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.

[58] U.S. Office of Management and Budget, "Circular A-4: Regulatory Analysis," section E, (Sept. 17, 2003) (Available at: http://www.whitehouse.gov/omb/circulars_a004_a-4/).

Table V.23 Cumulative Net Present Value of Consumer Benefits for [UPSs]; 9 Years of Shipments (2019–2027)

Discount rate	Trial Standard Level			
	1	**2**	**3**	**4**
	billion 2015$			
3 percent	1.4	1.2	0.61	-16
7 percent	0.89	0.75	0.26	-13

The above results reflect the use of no price trend for UPSs over the analysis period (see section 0 of this document).

c. Indirect Impacts on Employment

DOE expects energy conservation standards for UPSs to reduce energy bills 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 IV.N 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 in this rulemaking. DOE understands that 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 (2016-2048), where these uncertainties are reduced.

The results suggest that the proposed standards are 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

Based on testing conducted in support of this proposed rule, discussed in section IV.C.1.b of this NOPR, DOE has tentatively concluded that the standards proposed in this NOPR would not reduce the utility or performance of the UPSs under consideration in this rulemaking. Manufacturers of these products currently offer units that meet or exceed the proposed standards.

5. Impact of Any Lessening of Competition

As discussed in section III.D.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. As a measure of this reduced demand, chapter 15 in the NOPR TSD presents the estimated reduction in generating capacity, relative to the no-standards case, for the TSLs that DOE considered in this rulemaking.

Energy conservation resulting from new standards for UPSs is expected to yield environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases. Table V.24 provides DOE's estimate of cumulative emissions reductions expected to result from the TSLs considered in this rulemaking. The table includes both power sector emissions and upstream emissions. The emissions were calculated using the multipliers discussed in section IV.K. DOE reports annual emissions reductions for each TSL in chapter 13 of the NOPR TSD.

Table V.24 Cumulative Emissions Reduction for UPSs Shipped in 2019–2048

	Trial Standard Level			
	1	2	3	4
Power Sector Emissions				
CO_2 (million metric tons)	57.4	68.2	72.6	152
SO_2 (thousand tons)	33.8	40.2	42.8	89.2
NO_X (thousand tons)	63.5	75.5	80.4	169
Hg (tons)	0.126	0.149	0.159	0.332
CH_4 (thousand tons)	4.84	5.76	6.14	12.8
N_2O (thousand tons)	0.685	0.815	0.868	1.81
Upstream Emissions				
CO_2 (million metric tons)	3.20	3.80	4.04	8.52
SO_2 (thousand tons)	0.595	0.707	0.752	1.58
NO_X (thousand tons)	45.8	54.4	57.9	122
Hg (tons)	0.0013	0.0016	0.0017	0.0035
CH_4 (thousand tons)	253	301	320	674
N_2O (thousand tons)	0.029	0.035	0.037	0.078
Total FFC Emissions				
CO_2 (million metric tons)	60.5	72.0	76.7	160.6
SO_2 (thousand tons)	34.3	40.9	43.5	90.7
NO_X (thousand tons)	109	130	138	291
Hg (tons)	0.127	0.151	0.161	0.335
CH_4 (thousand tons)	258	306	326	686
CH_4 (thousand tons CO_2eq)*	7220	8580	9120	19200
N_2O (thousand tons)	0.714	0.850	0.905	1.89
N_2O (thousand tons CO_2eq)*	189	225	240	500

* CO_2eq is the quantity of CO_2 that would have the same global warming potential (GWP).

As part of the analysis for this proposed rule, DOE estimated monetary benefits likely to result from the reduced emissions of CO_2 and NO_X that DOE estimated for each of the considered TSLs for UPSs. As discussed in section IV.L of this document, for CO_2, DOE used the most recent values for the SCC developed by an interagency process. The four sets of SCC values for CO_2 emissions reductions in 2015 resulting from that process (expressed in 2015$) are represented by $12.4/metric ton (the average value from a distribution that uses a 5-percent discount rate), $40.6/metric ton (the average value from a distribution that uses a 3-percent discount rate), $63.2/metric ton (the average value from a distribution that uses a 2.5-percent discount rate), and $118/metric ton (the 95th-percentile value from a distribution that uses a 3-percent discount rate). The values for later years are higher due to increasing damages (public health, economic and environmental) as the projected magnitude of climate change increases.

Table V.25 presents the global value of CO_2 emissions reductions at each TSL. For each of the four cases, DOE calculated a present value of the stream of annual values using the same discount rate as was used in the studies upon which the dollar-per-ton values are based. DOE calculated domestic values as a range from 7 percent to 23 percent of the global values; these results are presented in chapter 14 of the NOPR TSD.

Table V.25 Estimates of Global Present Value of CO_2 Emissions Reduction for UPSs Shipped in 2019–2048

TSL	SCC Case*			
	5% Discount Rate, Average	3% Discount Rate, Average	2.5% Discount Rate, Average	3% Discount Rate, 95th Percentile
	Million 2015$			
Power Sector Emissions				
1	445	1960	3080	5960
2	530	2330	3670	7100
3	565	2480	3910	7560
4	1170	5160	8130	15700
Upstream Emissions				
1	24.3	108	170	329
2	29.0	129	203	392
3	30.9	137	216	417
4	64.0	286	451	871
Total FFC Emissions				
1	469	2070	3250	6290
2	559	2460	3870	7490
3	596	2620	4120	7980
4	1230	5440	8580	16600

* For each of the four cases, the corresponding SCC value for emissions in 2015 is $12.4, $40.6, $63.2, and $118 per metric ton (2014$). The values are for CO_2 only (*i.e.*, not CO_{2eq} of other greenhouse gases).

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 world economy continues to evolve rapidly. Thus, any value placed on reduced CO_2 emissions in this rulemaking is subject to change. DOE, together with other Federal agencies, will continue to review various 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. However, consistent with DOE's legal obligations, and taking into account the uncertainty involved with this particular issue, DOE has included in this proposed rule the most recent values and analyses resulting from the interagency review process.

DOE also estimated the cumulative monetary value of the economic benefits associated with NO_X emissions reductions anticipated to result from the considered TSLs for UPSs. The dollar-per-ton values that DOE used are discussed in section IV.L of this document. Table V.26 presents the cumulative present values for NO_X emissions for each TSL calculated using 7-percent and 3-percent discount rates. . This table presents values that use the low dollar-per-ton values, which reflect DOE's primary estimate. Results that reflect the range of NO_X dollar-per-ton values are presented in Table V.28.

Table V.26 Estimates of Present Value of NO_X Emissions Reduction for UPSs Shipped in 2019–2048*

TSL	3% Discount Rate	7% Discount Rate
	Million 2015$	
Power Sector Emissions		
1	136	62.6
2	162	74.8
3	172	79.9
4	355	161
Upstream Emissions		
1	94.6	42.5
2	113	50.8
3	120	54.2
4	249	109.9
Total FFC Emissions		
1	230	105
2	274	126
3	292	134
4	603	271

* Results are based on the low benefit-per-ton values.

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 National Economic Impacts

The NPV of the monetized benefits associated with emissions reductions can be viewed as a complement to the NPV of the consumer savings calculated for each TSL considered in this rulemaking. Table V.27 presents the NPV values that result from adding the estimates of the potential economic benefits resulting from reduced CO_2 and

NO_X emissions in each of four valuation scenarios to the NPV of consumer savings calculated for each TSL considered in this rulemaking, at both a 7-percent and 3-percent discount rate. The CO_2 values used in the columns of each table correspond to the 2015 values in the four sets of SCC values discussed above.

Table V.27 Net Present Value of Consumer Savings Combined with Present Value of Monetized Benefits from CO_2 and NO_X Emissions Reductions

TSL	Consumer NPV at 3% Discount Rate added with:			
	SCC Case \$12.4/t and 3% Low NO_X Values	SCC Case \$40.6/tand 3% Low NO_X Values	SCC Case \$63.2/t and 3% Low NO_X Values	SCC Case \$118/t and 3% Low NO_X Values
	billion 2015$			
1	5.51	7.11	8.30	11.3
2	5.23	7.14	8.55	12.2
3	3.29	5.32	6.82	10.7
4	(49.4)	(45.2)	(42.0)	(34.0)
TSL	Consumer NPV at 7% Discount Rate Added with:			
	SCC Case \$12.4/t and 7% Low NO_X Values	SCC Case \$40.6/t and 7% Low NO_X Values	SCC Case \$63.2/t and 7% Low NO_X Values	SCC Case \$118/t and 7% Low NO_X Values
	billion 2015$			
1	2.75	4.35	5.53	8.57
2	2.55	4.46	5.87	9.48
3	1.48	3.50	5.01	8.86
4	(28.0)	(23.7)	(20.6)	(12.6)

Parentheses indicate negative (-) values.

Note: The SCC case values represent the global SCC in 2015, in [2015]$ per metric ton (t), for each case.

In considering the above results, two issues are relevant. First, the national operating cost savings are domestic U.S. monetary savings that occur as a result of market transactions, while the value of CO_2 reductions is based on a global value.

Second, the assessments of operating cost savings and the SCC are performed with different methods that use different time frames for analysis. The national operating cost savings is measured for the lifetime of products shipped in 2019–2048. Because CO_2 emissions have a very long residence time in the atmosphere,[59] the SCC values in future years reflect future CO_2-emissions impacts that continue beyond 2100.

C. Conclusion

When considering proposed standards, the new or amended energy conservation 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 new standards for UPSs 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

[59] The atmospheric lifetime of CO_2 is estimated of the order of 30–95 years. Jacobson, M. Z. Correction to "Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming." J. Geophys. Res. 2005. 110: D14105. doi:10.1029/2005JD005888.

reached the highest efficiency level that is both technologically feasible and economically justified and saves a significant amount of energy.

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.

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 regulatory option 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.[60]

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

---

[60] P.C. Reiss and M.W. White. Household Electricity Demand, Revisited. Review of Economic Studies. 2005. 72(3): pp., 853–883. doi: http://restud.oxfordjournals.org/content/72/3/853

enhancements to the methodology by which these impacts are defined and estimated in the regulatory process.[61] 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 UPS Standards

Table V.28 and Table V.29 summarize the quantitative impacts estimated for each TSL for UPSs. The national impacts are measured over the lifetime of UPSs purchased in the 30-year period that begins in the anticipated year of compliance with amended standards (2019-2048). 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 NOPR.

[61] Sanstad, A. H. Notes on the Economics of Household Energy Consumption and Technology Choice. 2010. Lawrence Berkeley National Laboratory. https://www1.eere.energy.gov/buildings/appliance_standards/pdfs/consumer_ee_theory.pdf

Table V.28 Summary of Analytical Results for UPS TSLs: National Impacts

Category	TSL 1	TSL 2	TSL 3	TSL 4
Cumulative FFC National Energy Savings (quads)				
	1.00	1.18	1.26	2.65
NPV of Consumer Costs and Benefits (billion 2015$)				
3% discount rate	4.81	4.40	2.41	(51.2)
7% discount rate	2.17	1.87	0.749	(29.5)
Cumulative FFC Emissions Reduction (Total FFC Emissions)				
CO_2 (million metric tons)	60.5	72.0	76.7	161
SO_2 (thousand tons)	34.3	40.9	43.5	90.7
NO_X (thousand tons)	109	130	138	291
Hg (tons)	0.127	0.151	0.161	0.335
CH_4 (thousand tons)	258	306	326	686
CH_4 (thousand tons CO_2eq)*	7220	8580	9120	19200
N_2O (thousand tons)	0.714	0.850	0.905	1.89
N_2O (thousand tons CO_2eq)*	189	225	240	500
Value of Emissions Reduction (Total FFC Emissions)				
CO_2 (billion 2015$)**	0.469 to 6.29	0.559 to 7.49	0.596 to 7.98	1.229 to 16.6
NO_X – 3% discount rate (million 2015$)	230 to 525	274 to 625	292 to 667	603 to 1380
NO_X – 7% discount rate (million 2015$)	105 to 237	126 to 283	134 to 302	271 to 611

Parentheses indicate negative (-) values.
* CO_2eq is the quantity of CO_2 that would have the same global warming potential (GWP).
** Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

Table V.29 Summary of Analytical Results for UPS TSLs: Manufacturer and Consumer Impacts

Category		TSL 1*	TSL 2*	TSL 3*	TSL 4*
Manufacturer Impacts					
Industry NPV (2015$ millions) (No-standards case INPV = 2,555)		2,166 - 2,746	1,957 - 2,849	1,619 - 2,983	(667) - 7,400
Industry NPV Change	(2015$ millions)	(389) - 191	(598) - 295	(936) - 428	(3,222) - 4,845
	(%)	(0.2) - 0.1	(0.2) - 0.1	(0.4) - 0.2	(1.3) - 1.9
Consumer Average LCC Savings (2015$)					
10a (VFD UPSs)		33	33	(0.08)	(13)
10b (VI UPSs)		14	6.1	6.1	(400)
10c (VFI UPSs)		35	35	35	(380)
Consumer Simple PBP (years)					
10a (VFD UPSs)		0.0	0.0	2.7	4.4
10b (VI UPSs)		3.5	4.6	4.6	39
10c (VFI UPSs)		4.7	4.7	4.7	18
Percent of Consumers that Experience a Net Cost					
10a (VFD UPSs)		0%	0%	38%	79%
10b (VI UPSs)		7.6%	44%	44%	100%
10c (VFI UPSs)		2.3%	2.3%	2.3%	99%

* Parentheses indicate negative (-) values.

DOE first considered TSL 4, which represents the max-tech efficiency levels. TSL 4 would save an estimated 2.65 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be -$29.5 billion using a discount rate of 7 percent, and -$51.2 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 161 Mt of CO_2, 90.7 thousand tons of SO_2, 291 thousand tons of NO_X, 0.335 ton of Hg, 686 thousand tons of CH_4, and 1.89 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 4 ranges from $1.23 billion to $16.6 billion.

At TSL 4, the average LCC impact is a savings of -$13 for VFD UPSs, -$400 for VI UPSs, and -$380 for VFI UPSs. The simple payback period is 4.4 years for VFD UPSs, 39 years for VI UPSs, and 18 years for VFI UPSs. The fraction of consumers experiencing a net LCC cost is 79 percent for VFD UPSs, 100 percent for VI UPSs, and 99 percent for VFI UPSs.

At TSL 4, the projected change in INPV ranges from a decrease of $3,222 million to an increase of $4,845 million, which represents a decrease of 126.1 percent to an increase of 189.7 percent, respectively.

The Secretary tentatively concludes that at TSL 4 for UPSs, the benefits of energy savings,, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the negative NPV of consumer benefits, economic burden on most consumers, and the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV. Consequently, the Secretary has tentatively concluded that TSL 4 is not economically justified.

DOE then considered TSL 3, which would save an estimated 1.26 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be $749 million using a discount rate of 7 percent, and $2.41 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 76.7 Mt of CO_2, 43.5 thousand tons of SO_2, 138 thousand tons of NO_X, 0.161 tons of Hg, 326 thousand tons of CH_4, and 0.905 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 3 ranges from $0.596 billion to $7.98 billion.

At TSL 3, the average LCC impact is a savings of -$0.08 for VFD UPSs, $6.1 for VI UPSs, and $35 for VFI UPSs. The simple payback period is 2.7 years for VFD UPSs, 4.6 years for VI UPSs, and 4.7 years for VFI UPSs. The fraction of consumers experiencing a net LCC cost is 38 percent for VFD UPSs, 44 percent for VI UPSs, and 2.3 percent for VFI UPSs.

At TSL 3, the projected change in INPV ranges from a decrease of $936 million to an increase of $428 million, which represents a decrease of 36.6 percent to an increase of 16.8 percent, respectively.

After considering the analysis and weighing the benefits and burdens, the Secretary has tentatively concluded that at TSL 3 for UPSs, the benefits of energy savings, overall positive NPV of consumer benefits, emissions reductions, and the estimated monetary value of the emissions reductions would be outweighed by the negative impacts on some consumers and potential negative impacts on manufacturers, including the conversion costs that could result in a reduction in INPV for manufacturers.

In particular, the average LCC is negative for the VFD UPS product class. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2, which would save an estimated 1.18 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefit would be $1.87 billion using a discount rate of 7 percent, and $4.40 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 72.0 Mt of CO_2, 40.9 thousand tons of SO_2, 130 thousand tons of NO_X, 0.151 tons of Hg, 306 thousand tons of CH_4, and 0.850 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 2 ranges from $0.559 billion to $7.49 billion.

At TSL 2, the average LCC impact is a savings of $33 for VFD UPSs, $6.1 for VI UPSs, and $35 for VFI UPSs. The simple payback period is immediate for VFD UPSs, 4.6 years for VI UPSs, and 4.7 years for VFI UPSs. The fraction of consumers experiencing a net LCC cost is 0 percent for VFD UPSs, 44 percent for VI UPSs, and 2.3 percent for VFI UPSs.

At TSL 2, the projected change in INPV ranges from a decrease of $598 million to an increase of $295 million, which represents a decrease of 23.4 percent to an increase of 11.5 percent, respectively.

After considering the analysis and weighing the benefits and burdens, the Secretary has tentatively concluded that at TSL 2 for UPSs, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, the estimated monetary value of the emissions reductions, and positive average LCC savings would outweigh the negative impacts on some consumers and on manufacturers, including the conversion costs that could result in a reduction in INPV for manufacturers. Accordingly, the Secretary has tentatively concluded that TSL 2 would offer the maximum improvement in efficiency that is technologically feasible and economically justified, and would result in the significant conservation of energy.

Therefore, based on the above considerations, DOE proposes to adopt the energy conservation standards for UPSs at TSL 2. The proposed amended energy conservation standards for UPSs are shown in Table V.30.

Table V.30 Proposed Energy Conservation Standards for UPSs

Product Class		Rated Output Power	Minimum Efficiency
10a	VFD UPS	$0\ W < P_{rated} \leq 300\ W$	-1.09E-06 * P_{rated}^2 + 6.50E-04 * P_{rated} + 0.876
		$300\ W < P_{rated} \leq 700\ W$	-5.63E-08 * P_{rated}^2 + 7.61E-05 * P_{rated} + 0.955
		$P_{rated} > 700\ W$	-6.22E-09 * P_{rated}^2 + 3.91E-06 * P_{rated} + 0.981
10b	VI UPS	$0\ W < P_{rated} \leq 300\ W$	-6.45E-07 * P_{rated}^2 + 3.80E-04 * P_{rated} + 0.929
		$300\ W < P_{rated} \leq 700\ W$	-3.94E-08 * P_{rated}^2 + 4.87E-05 * P_{rated} + 0.974
		$P_{rated} > 700\ W$	-2.28E-09 * P_{rated}^2 – 7.40E-07 * P_{rated} + 0.990
10c	VFI UPS	$0\ W < P_{rated} \leq 300\ W$	-3.13E-06 * P_{rated}^2 + 1.96E-03 * P_{rated} + 0.544
		$300\ W < P_{rated} \leq 700\ W$	-2.60E-07 * P_{rated}^2 + 3.65E-04 * P_{rated} + 0.765
		$P_{rated} > 700\ W$	-1.70E-08 * P_{rated}^2 + 3.85E-05 * P_{rated} + 0.877

2. Summary of 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 the sum of (1) the annualized national economic value (expressed in 2015$) 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 benefits of CO_2 and NO_X emission reductions.[62]

Table V.31 shows the annualized values for UPSs under TSL 2, expressed in 2015$. The results under the primary estimate are as follows.

Using a 7-percent discount rate for benefits and costs other than CO_2 reduction (for which DOE used a 3-percent discount rate along with the average SCC series corresponding to a value of $40.6/t in 2015 (2015$)), the estimated cost of the proposed standards for UPSs is $234 million per year in increased equipment costs, while the estimated annual benefits are $406 million in reduced equipment operating costs, $133 million in CO_2 reductions, and $11.6 million in reduced NO_X emissions. In this case, the net benefit amounts to $317 million per year.

[62] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2014[should this be 2015?], 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 (2020, 2030, etc.), and then discounted the present value from each year to 2015. The calculation uses discount rates of 3 and 7 percent for all costs and benefits except for the value of CO_2 reductions, for which DOE used case-specific discount rates. 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.

Using a 3-percent discount rate for all benefits and costs and the average SCC series corresponding to a value of \$40.6/t in 2015 (2015\$), the estimated cost of the proposed standards for UPSs is \$250 million per year in increased equipment costs, while the estimated annual benefits are \$488 million in reduced operating costs, \$133 million in CO_2 reductions, and \$14.8 million in reduced NO_X emissions. In this case, the net benefit amounts to \$386 million per year.

Table V.31 Annualized Benefits and Costs of Proposed Energy Conservation Standards for UPSs (TSL 2)

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*	High Net Benefits Estimate*
		million 2015$/year		
Benefits				
Consumer Operating Cost Savings	7%	406	348	462
	3%	488	413	565
CO_2 Reduction Monetized Value ($12.4/t case)**	5%	40.1	35.5	44.4
CO_2 Reduction Monetized Value ($40.6/t case)**	3%	133	117	148
CO_2 Reduction Monetized Value ($63.2/t case)**	2.5%	194	171	216
CO_2 Reduction Monetized Value ($118/t case)**	3%	405	357	451
NO_X Reduction Monetized Value†	7%	11.6	10.4	28.6
	3%	14.8	13.1	37.5
Total Benefits‡	7% plus CO_2 range	458 to 823	394 to 716	535 to 941
	7%	551	476	638
	3% plus CO_2 range	543 to 908	462 to 783	647 to 1,050
	3%	636	544	751
Costs				
Consumer Incremental Product Costs	7%	234	209	256
	3%	250	221	277
Net Benefits				
Total‡	7% plus CO_2 range	224 to 589	185 to 507	278 to 685
	7%	317	267	382
	3% plus CO_2 range	293 to 658	241 to 563	369 to 776
	3%	386	323	473

* This table presents the annualized costs and benefits associated with UPSs shipped in 2019−2048. These results include benefits to consumers which accrue after 2048 from the products purchased in 2019−2048. The results account for the incremental variable and fixed costs incurred by manufacturers due to the standard, some of which may be incurred in preparation for the rule. The Primary, Low Net Benefits, and High Net Benefits Estimates utilize projections of energy prices from the AEO 2015 Reference case, Low Economic Growth case, and High Economic Growth case, respectively. Note that the Benefits and Costs may not sum to the Net Benefits due to rounding.

** The CO_2 values represent global monetized values of the SCC, in 2015$ per metric ton (t), in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5-percent, 3-percent, and 2.5-percent discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3-percent discount rate. The SCC time series incorporate an escalation factor.

† DOE estimated the monetized value of NO_X emissions reductions associated with electricity savings using benefit per ton estimates from the "Regulatory Impact Analysis for the Clean Power Plan Final Rule," published in August 2015 by EPA's Office of Air Quality Planning and Standards. (Available at www.epa.gov/cleanpowerplan/clean-power-plan-final-rule-regulatory-impact-analysis.) See section IV.L for further discussion. For DOE's Primary Estimate and Low Net Benefits Estimate, DOE used a national benefit-per-ton estimate for NO_X emitted from the Electric Generating Unit sector based on an estimate of premature mortality derived from the ACS study (Krewski et al. 2009). For DOE's High Net Benefits Estimate, the benefit-per-ton estimates were based on the Six Cities study (Lepuele et al. 2011), which are nearly two-and-a-half times larger than those from the ACS study.

‡ Total Benefits for both the 3% and 7% cases are derived using the series corresponding to the average SCC with a 3-percent discount rate ($40.6/t case). In the rows labeled "7% plus CO_2 range" and "3% plus CO_2 range," the operating cost and NO_X benefits are calculated using the labeled discount rate, and those values are added to the full range of CO_2 values.

VI. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

Section 1(b)(1) of Executive Order 12866, "Regulatory Planning and Review," 58 FR 51735 (Oct. 4, 1993), requires each agency to identify the problem that it intends to address, including, where applicable, the failures of private markets or public institutions that warrant new agency action, as well as to assess the significance of that problem. The problems that the proposed standards set forth in this NOPR are intended to address are as follows:

1) Insufficient information and the high costs of gathering and analyzing relevant information leads some consumers to miss opportunities to make cost-effective investments in energy efficiency.

2) In some cases, the benefits of more-efficient equipment are not realized due to misaligned incentives between purchasers and users. An example of such a case is when the equipment purchase decision is made by a building contractor or building owner who does not pay the energy costs.

3) There are external benefits resulting from improved energy efficiency of appliances and equipment that are not captured by the users of such products. These benefits include externalities related to public health, environmental protection, and national energy security that are not reflected in energy prices, such as reduced emissions of air pollutants and greenhouse gases that impact human health and global warming. DOE attempts to quantify some of the external benefits through use of social cost of carbon values.

The Administrator of the Office of Information and Regulatory Affairs (OIRA) in the OMB has determined that the proposed regulatory action is a significant regulatory action under section (3)(f) of Executive Order 12866. Accordingly, pursuant to section 6(a)(3)(B) of the Order, DOE has provided to OIRA: (i) The text of the draft regulatory action, together with a reasonably detailed description of the need for the regulatory action and an explanation of how the regulatory action will meet that need; and (ii) An assessment of the potential costs and benefits of the regulatory action, including an explanation of the manner in which the regulatory action is consistent with a statutory mandate. DOE has included these documents in the rulemaking record.

In addition, the Administrator of OIRA has determined that the proposed regulatory action is an "economically" significant regulatory action under section (3)(f)(1) of Executive Order 12866. Accordingly, pursuant to section 6(a)(3)(C) of the Order, DOE has provided to OIRA an assessment, including the underlying analysis, of benefits and costs anticipated from the 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 can be found in the technical support document for this rulemaking.

DOE has also reviewed this regulation pursuant to Executive Order 13563, issued on January 18, 2011. 76 FR 3281 (Jan. 21, 2011). Executive Order 13563 is supplemental to and explicitly reaffirms the principles, structures, and definitions governing regulatory review established in Executive Order 12866. To the extent permitted by law, agencies are required by Executive Order 13563 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 Executive Order 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, OIRA 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, DOE believes that this NOPR is consistent with these principles, including the requirement that, to the extent permitted by law, benefits justify costs and that net benefits are maximized.

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 Executive Order 13272, "Proper Consideration of Small Entities in Agency Rulemaking," 67 FR 53461 (Aug. 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website (http://energy.gov/gc/office-general-counsel).

For manufacturers of UPSs, 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 https://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf

UPS manufacturing is classified under NAICS 335999, "All Other Miscellaneous Electrical Equipment and Component Manufacturing." The SBA sets a threshold of 500 employees or less for an entity to be considered as a small business manufacturer of those product classes.

To estimate the number of companies that could be small businesses that manufacture or sell UPSs covered by this rulemaking, DOE conducted a market survey using publicly available information. DOE first attempted to identify all potential UPS manufacturers by researching certification databases (e.g., DOE's Compliance Database and EPA's ENERGY STAR[63]), retailer websites, individual company websites, and the

[63] ENERGY STAR. Energy Star Certified Products. Last accessed May 4, 2015. < http://www.energystar.gov/>.

SBA's database. DOE then attempted to gather information on the location and number of employees to determine if these companies met SBA's definition of a small business for each potential UPS manufacturer by reaching out directly to those potential small businesses and using market research tools (e.g., www.hoovers.com, www.manta.com, www.glassdoor.com, www.linkedin.com, etc.). DOE also asked stakeholders and industry representatives if they were aware of any small businesses during manufacturer interviews. DOE used information from these sources to create a list of companies that potentially manufacture or sell UPSs and would be impacted by this rulemaking. DOE eliminated companies that do not meet the definition of a "small business," or are completely foreign owned and operated.

DOE initially identified a total of 48 potential companies that sell UPSs in the United States. Of these, DOE estimated that 12 are small business. After reviewing publicly available information on these potential small UPS businesses, DOE determined that none of these businesses manufacture the UPSs that they sell in the United States or are subsidiaries of the foreign companies that manufacture UPSs. Additionally it is not thought that DOE's regulation of UPSs will put small businesses in the U.S. that purchase UPSs from foreign manufacturers at a competitive disadvantage in the marketplace, because these companies are not responsible for the conversion costs to comply with standards as these UPS companies do not own the manufacturing facilities and tooling used to produce UPSs. Because there are no domestic small business UPS manufacturers, DOE's UPS regulation will not have a direct effect on U.S. small business in this manufacturing space. As such, DOE certifies that this proposed rulemaking will not have a significant economic impact on a substantial number of small entities, and the preparation of an IRFA is not warranted.

DOE will provide its certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the SBA for review under 5 U.S.C. 605(b). DOE seeks comment on its tentative conclusion that the proposed standard will not have a significant impact on a substantial number of small entities.

C. Review Under the Paperwork Reduction Act

Manufacturers of UPSs must certify to DOE that their products comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their products according to the DOE test procedure for UPSs, including any amendments adopted for that test procedure. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment. 76 FR 12422 (March 7, 2011). The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910-1400. DOE requested OMB approval of an extension of this information collection for three years, specifically including the collection of information for battery chargers, and estimated that the annual number of burden hours under this extension is 30 hours per company. In response to DOE's request, OMB approved DOE's information collection requirements covered under OMB control number 1910-1400 through November 30, 2017. 80 FR 5099 (January 30, 2015).

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

Pursuant to the National Environmental Policy Act (NEPA) of 1969, DOE has determined that the proposed rule fits within the category of actions included in Categorical Exclusion (CX) B5.1 and otherwise meets the requirements for application of a CX. (See 10 CFR Part 1021, App. B, B5.1(b); 1021.410(b) and App. B, B(1) –(5).) The proposed rule fits within this category of actions because it is a rulemaking that establishes energy conservation standards for consumer products or industrial equipment, and for which none of the exceptions identified in CX B5.1(b) apply. Therefore, DOE has made a CX determination for this rulemaking, and DOE does not need to prepare an Environmental Assessment or Environmental Impact Statement for this proposed rule. DOE's CX determination for this proposed rule is available at http://energy.gov/nepa/categorical-exclusion-cx-determinations-cx/.

E. Review Under Executive Order 13132

Executive Order 13132, "Federalism," 64 FR 43255 (Aug. 10, 1999), imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. The Executive

Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have Federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. 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 Executive Order 12988, "Civil Justice Reform," imposes on Federal agencies the general duty to adhere to the following requirements (1) eliminate drafting errors and ambiguity, (2) write regulations to minimize litigation, (3) provide a clear legal standard for affected conduct rather than a general standard, and (4) promote simplification and burden reduction. 61 FR 4729 (Feb. 7, 1996). Regarding the review required by section 3(a), section 3(b) of Executive Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) clearly specifies the preemptive effect, if any, (2) clearly specifies any effect on existing Federal law or regulation, (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction, (4) specifies the retroactive effect, if any, (5) adequately defines key terms, and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this proposed rule meets the relevant standards of Executive Order 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, sec. 201 (codified at 2 U.S.C. 1531). For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed "significant intergovernmental mandate," and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect them. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820. DOE's policy statement is also available at http://energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf.

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 UPS 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 UPS, 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(d), (f), and (o), 6313(e), and 6316(a), this proposed rule would establish new energy conservation standards for UPS that are designed to achieve the maximum improvement in energy efficiency that DOE has determined to be both technologically feasible and economically justified. 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 Executive Order 12630, "Governmental Actions and Interference with Constitutionally Protected Property Rights," 53 FR 8859 (March 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). 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

Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to 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 new energy conservation standards for UPS, 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. Review Under the Information Quality Bulletin for Peer Review

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

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

VII. Public Participation

A. Attendance at the Public Meeting

The time, date, and location of the public meeting are listed in the **DATES** and **ADDRESSES** sections at the beginning of this proposed rule. If you plan to attend the public meeting, please notify the Appliance and Equipment Standards Staff at (202) 586-6636 or Appliance_Standards_Public_Meetings@ee.doe.gov.

Please note that foreign nationals visiting DOE Headquarters are subject to advance security screening procedures which require advance notice prior to attendance at the public meeting. If a foreign national wishes to participate in the public meeting, please inform DOE of this fact as soon as possible by contacting Ms. Regina Washington at (202) 586-1214 or by e-mail (Regina.Washington@ee.doe.gov) so that the necessary procedures can be completed.

DOE requires visitors to have laptops and other devices, such as tablets, checked upon entry into the Forrestal Building. Any person wishing to bring these devices into the building will be required to obtain a property pass. Visitors should avoid bringing these devices, or allow an extra 45 minutes to check in. Please report to the visitor's desk to have devices checked before proceeding through security.

Due to the REAL ID Act implemented by the Department of Homeland Security (DHS), there have been recent changes regarding identification (ID) requirements for individuals wishing to enter Federal buildings from specific States and U.S. territories. As a result, driver's licenses from several States or territory will not be accepted for building entry, and instead, one of the alternate forms of ID listed below will be required. DHS has determined that regular driver's licenses (and ID cards) from the following jurisdictions are not acceptable for entry into DOE facilities: Alaska, American Samoa, Arizona, Louisiana, Maine, Massachusetts, Minnesota, New York, Oklahoma, and Washington. Acceptable alternate forms of Photo-ID include: U.S. Passport or Passport Card; an Enhanced Driver's License or Enhanced ID-Card issued by the States of Minnesota, New York, or Washington (Enhanced licenses issued by these States are clearly marked Enhanced or Enhanced Driver's License); a military ID or other Federal government-issued Photo-ID card.

In addition, you can attend the public meeting via webinar. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website at https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=26. 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 plans to present a prepared general statement may request that copies of his or her statement be made available at the public meeting. Such persons may submit requests, along with an advance electronic copy of their statement in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format, to the appropriate address shown in the **ADDRESSES** section at the beginning of this proposed rule. The request and advance copy of statements must be received at least one week before the public meeting and may be emailed, hand-delivered, or sent by mail. DOE prefers to receive requests and advance copies via email. Please include a telephone number to enable DOE staff to make follow-up contact, if needed.

C. Conduct of the Public Meeting

DOE will designate a DOE official to preside at the 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 public meeting. 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 public meeting, interested parties may submit further comments on the proceedings, as well as on any aspect of the rulemaking, until the end of the comment period.

The public meeting will be conducted in an informal, conference style. DOE will present summaries of comments received before the public meeting, 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 allow, 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 and comment on statements made by others. 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 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 public meeting.

A transcript of the public meeting will be included in the docket, which can be viewed as described in the Docket section at the beginning of this notice and will be accessible on the DOE website. 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 notice.

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 below.

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 mail. Comments and documents submitted via email, hand delivery/courier, or 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 mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies. No telefacsimiles (faxes) will be accepted.

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

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

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

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include (1) a description of the items, (2) whether and why such items are customarily treated as confidential within the industry, (3) whether the information is generally known by or available from other sources, (4) whether the information has previously been made available to others without obligation concerning its confidentiality, (5) an explanation of the competitive injury to the submitting person that would result from public disclosure, (6) when such information might lose its confidential character due to the passage of time, and (7) why disclosure of the information would be contrary to the public interest.

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 comments on the potential technology options identified for improving the efficiency of UPSs. See section IV.A.2 for further detail.

2) DOE requests comment on its screening analysis used to select the most viable options for consideration in setting today's proposed standards. See section IV.B.2 for further detail.

3) DOE requests comment on the ELs selected for each product class for its analysis. See section IV.C.2 for further detail.

4) DOE requests comment on its understanding of why less efficient UPSs continue to exist in the market place at a price higher than more efficient units. See section IV.C.3 for further detail.

5) DOE requests further comment on the average loading conditions for UPS product classes. See section IV.E for further detail.

6) DOE requests additional information on UPS shipment volumes and projections. See section IV.G for further detail.

7) DOE requests comment on commercial and residential price elasticity data for UPS product classes. See section IV.G for further detail.

8) DOE requests comment or data that may inform historical or forecasted efficiency trends for UPSs. See section IV.H for further detail.

9) DOE seeks comment on its use of 6.1 percent as a discount rate for UPS manufacturers. See section IV.J.2 for further detail.

10) DOE seeks comment on its determination that product redesigns necessary to meet the ELs required by the proposed standard would not require investments in equipment and tooling, and on its determination that the majority of product design cycles would either take place before or coincide with the compliance period of the potential standards for UPSs. See section IV.J.2.a for further detail.

11) DOE seeks comment on its methodology used to calculate product conversion costs, including the assumption of no capital conversion costs or stranded assets for UPS manufacturers at analyzed ELs. See section IV.J.2.a for further detail.

12) DOE seeks comment on its methodology used to calculate manufacturer markups, its use of different manufacturer markups for each product class, and the specific manufacturer markups DOE estimated for each UPS product class. See section IV.J.2.d for further detail.

13) DOE seeks comment on its determination that all UPS manufacturing takes place abroad. Additionally, DOE seeks comment on the presence of any domestic UPS manufacturing beyond assembly, R&D, testing, and certification, and if there are any potential negative impacts to domestic employment that could arise due to energy conservation standards on UPSs that are not fully captured by the direct employment impact analysis. See section V.B.2.b for further detail.

14) DOE seeks comment on any potential UPS component manufacturer capacity constraints caused by the proposed standards in this NOPR. See section V.B.2.c for further detail.

15) DOE seeks comment on any other manufacturer subgroups that DOE should analyze and/or types of UPS manufacturers for the manufacturer subgroup analysis, including the identification of UPS manufacturer subgroups that should be analyzed separately. See section V.B.2.d for further detail.

16) DOE seeks comment on the compliance costs that UPS manufacturers must make for any other regulations, especially if compliance with those regulations is

required within three years before or after the estimated compliance year of this proposed standard (2019). See section V.B.2.e for further detail.

17) DOE seeks comment on its tentative conclusion that the proposed standard will not have a significant impact on a substantial number of small entities. See section VI.B.3 for further detail.

18) 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 ADDRESSES section for information to send comments to DOJ. See section V.B.5 for further detail.

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this notice of proposed rulemaking.

List of Subjects in 10 CFR Part 430

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

Issued in Washington, DC, on July 25, 2016.

David Friedman
Acting Assistant Secretary
Energy Efficiency and Renewable 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. Section 430.32 is amended by adding paragraph (z)(3) to read as follows:

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

* * * * *

(z) * * *.

(3) All uninterruptible power supplies (UPS) manufactured on and after [*DATE 2 years after final rule Federal Register publication*], shall have an average load adjusted efficiency that meets or exceeds the values shown in the table below based on the rated output power (P_{rated}) of the UPS.

Battery Charger Product Class	Rated Output Power	Minimum Efficiency
10a	$0\ W < P_{rated} \leq 300\ W$	-1.09E-06 * P_{rated}^2 + 6.50E-04 * P_{rated} + 0.876
	$300\ W < P_{rated} \leq 700\ W$	-5.63E-08 * P_{rated}^2 + 7.61E-05 * P_{rated} + 0.955
	$P_{rated} > 700\ W$	-6.22E-09 * P_{rated}^2 + 3.91E-06 * P_{rated} + 0.981
10b	$0\ W < P_{rated} \leq 300\ W$	-6.45E-07 * P_{rated}^2 + 3.80E-04 * P_{rated} + 0.929
	$300\ W < P_{rated} \leq 700\ W$	-3.94E-08 * P_{rated}^2 + 4.87E-05 * P_{rated} + 0.974
	$P_{rated} > 700\ W$	-2.28E-09 * P_{rated}^2 – 7.40E-07 * P_{rated} + 0.990
10c	$0\ W < P_{rated} \leq 300\ W$	-3.13E-06 * P_{rated}^2 + 1.96E-03 * P_{rated} + 0.544
	$300\ W < P_{rated} \leq 700\ W$	-2.60E-07 * P_{rated}^2 + 3.65E-04 * P_{rated} + 0.765
	$P_{rated} > 700\ W$	-1.70E-08 * P_{rated}^2 + 3.85E-05 * P_{rated} + 0.877