DEPARTMENT OF ENERGY

10 CFR Part 430

[Docket Number EERE–2008–BT–STD–0005]

RIN 1904–AB57

Energy Conservation Program: Energy Conservation Standards for Battery Chargers

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

ACTION: Supplemental notice of proposed rulemaking.

SUMMARY: The Energy Policy and Conservation Act of 1975, as amended (''EPCA'' or in context, ''the Act''), prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including battery chargers. EPCA also requires the U.S. Department of Energy (''DOE'' or, in context, ''the Department'') to determine whether Federal energy conservation standards for a particular type of product or equipment would be technologically feasible and economically justified, and save a significant amount of energy. On March 27, 2012, DOE published a notice of proposed rulemaking (''NOPR'') to establish energy conservation standards for battery chargers. DOE received comments suggesting changes to DOE's proposed approach. To this end, this supplemental notice of proposed rulemaking (''SNOPR'') updates and revises DOE's prior analysis by considering, among other things, the impacts attributable to standards issued by the California Energy Commission (CEC), along with accompanying data included in the CEC's compliance database. This notice also announces a public meeting to receive comment on these proposed standards and associated analyses and results.

DATES: 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 October 1, 2015.

DOE will hold a public meeting on September 15, 2015 from 9 a.m. to 4 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.

DOE will accept comments, data, and information regarding this SNOPR before and after the public meeting, but no later than November 2, 2015. See section VII, Public Participation, for details.

ADDRESSES: The public meeting will be held at the U.S. Department of Energy, Forrestal Building, Room 8E–089, 1000 Independence Avenue SW., Washington, DC 20585.

Any comments submitted must identify the SNOPR on Energy Conservation Standards for Battery Chargers, and provide docket number EE–2008–BT–STD–0005 and/or regulatory information number (RIN) 1904–AB57. Comments may be submitted using any of the following methods:

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

2. *Email: BatteryChargersSTD0005@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:* Ms. Brenda Edwards, 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:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza SW., Suite 600, 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.

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 email to *Chad_S_Whiteman@omb.eop.gov*.

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).

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,

A link to the docket Web page can be found at: *http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx?productid=84*. This Web page contains a link to the docket for this notice on the *www.regulations.gov* site. The *www.regulations.gov* Web page contains simple instructions on how to access all documents, including public comments, in the docket. See section VII, ''Public Participation,'' for further information on how to submit comments through *www.regulations.gov*.

EPCA requires the Attorney General to provide DOE a written determination of whether the proposed standard is likely to lessen competition. The U.S. Department of Justice Antitrust Division invites input from market participants and other interested persons with views on the likely competitive impact of the proposed standard. Interested persons may contact the Division at *energy.standards@atr.usdoj.gov* before October 1, 2015. Please indicate in the ''Subject'' line of your email the title and Docket Number of this rulemaking notice.

FOR FURTHER INFORMATION CONTACT: Mr. 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. Email: *battery_chargers_and_external_power_supplies@ee.doe.gov*.

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, GC–33, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–8145. Email: *michael.kido@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 Ms. Brenda Edwards at (202) 586–2945 or by email: *Brenda.Edwards@ee.doe.gov*

SUPPLEMENTARY INFORMATION:

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I. Summary

Title III, Part B [1] of the Energy Policy and Conservation Act of 1975 (''EPCA'' or in context, ''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 document.

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 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. (42 U.S.C. 6295(m)(1))

DOE had previously proposed to establish new energy conservation standards for battery chargers in March 2012. See 77 FR 18478 (March 27, 2012). Since the publication of that proposal, the State of California finalized new energy conservation standards for battery chargers sold within that State. See 45Z Cal. Reg. 1663, 1664 (Nov. 9, 2012) (summarizing proposed regulations and their final effective dates). Those new standards were not factored into DOE's analysis supporting its initial battery charger proposal. To assess whether DOE's proposal would satisfy the requirements under 42 U.S.C. 6295, DOE revisited its analysis in light of these new California standards. As a result, DOE is proposing new energy conservation standards for battery chargers. The revised proposal would provide a set of maximum annual energy consumption levels expressed as a function of battery energy. These proposed standards are shown in Table I–1.

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

[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 American Energy Manufacturing Technical Corrections Act (AEMTCA), Pub. L. 112–210 (Dec. 18, 2012).

TABLE I–1—PROPOSED ENERGY CONSERVATION STANDARDS FOR BATTERY CHARGERS

Product class	Product class description	Proposed standard as a function of battery energy (kWh/yr)
1	Low-Energy, Inductive Connection	3.04
2	Low-Energy, Low-Voltage <4V	0.1440 * E_{batt} + 2.95
3	Low-Energy, Medium-Voltage 4–10 V	For E_{batt} <10Wh, 1.42 kWh/y E_{batt} ≥10 Wh, 0.0255 * E_{batt} + 1.16
4	Low-Energy, High-Voltage >10V	0.11 * E_{batt} + 3.18
5	Medium-Energy, Low-Voltage <20 V	For E_{batt} < 19 Wh, 1.32 kWh/yr For E_{batt} ≥ 19 Wh, 0.0257 * E_{batt} + .815
6	Medium-Energy, High-Voltage ≥20 V	For E_{batt} < 18 Wh 3.88 kWh/yr For E_{batt} ≥ 18 Wh 0.0778 * E_{batt} + 2.4
7	High-Energy	0.0502 * E_{batt} + 4.53

A. Efficiency Distributions

To evaluate the potential impacts of standards, DOE develops a base case efficiency forecast, which represents DOE's estimate of the future state of the market with respect to efficiency if energy conservation standards for the units covered under this rulemaking are not adopted. DOE estimated the efficiency distributions for the base year 2013 in the original battery charger NOPR (published March 27, 2012), and updated the distributions based on new market conditions for the base year 2018 in today's SNOPR.

1. 2012 NOPR Efficiency Distributions

In the battery charger NOPR that was published March 27, 2012, DOE determined the base case efficiency distribution using test data from 224 models, which enabled application-specific efficiency distributions to be developed for most product classes. For some product classes, there were insufficient test data, and the efficiency distributions were based on manufacturer interviews. DOE further assumed that the influence of two battery charger programs active at the time (ENERGY STAR and EU Ecodesign requirements) would shift some of the historical market share away from baseline efficiency to more efficient CSLs. In January 2012, the CEC standards on battery chargers were announced with an effective date of February 1, 2013. To account for this announcement, DOE assumed that the fraction of battery chargers sold in California (assumed to equal California's share of US GDP, or 13%) would shift away from baseline efficiency to CSLs that approximated CEC standard levels. The market change was assumed to be a ''roll-up'', such that the market responds to standards by improving those products that do not meet the standards to the standard level, but no higher, while the products that were already as or more efficient than the standard remain unaffected. No further changes in the base-case efficiency distributions were assumed to occur after the first year of the analysis.

The following table summarizes the efficiency distribution assumptions for each product class in the 2012 NOPR analysis. For reference, the table also includes the Unit Energy Consumption (UEC) of the representative unit defining each CSL from the NOPR engineering analysis (see section IV.C.1 and IV.C.2), and estimated shipments in 2018 from the NOPR shipments analysis.

TABLE I–2—BASE CASE 2012 NOPR ESTIMATED EFFICIENCY DISTRIBUTIONS IN 2013 [a]

Product class		CSL 0	CSL 1	CSL 2	CSL 3	CSL 4	Estimated shipments in 2018
1	Efficiency Distribution	78%	11%	11%	0%	N/A	16,150,369
	UEC	8.73	6.1	3.04	1.29	N/A	
2	Efficiency Distribution	18%	22%	57%	3%	0%	266,339,577
	UEC	8.66	6.47	2.86	1.03	0.81	
3	Efficiency Distribution	17%	62%	21%	0%	N/A	24,664,587
	UEC	11.9	4.68	0.79	0.75	N/A	
4	Efficiency Distribution	9%	39%	52%	0%	N/A	65,163,723
	UEC	37.73	9.91	4.57	3.01	N/A	
5	Efficiency Distribution	28%	52%	7%	13%	N/A	5,204,768
	UEC	84.6	56.09	29.26	15.35	N/A	
6	Efficiency Distribution	36%	29%	22%	13%	N/A	667,039
	UEC	120.6	81.7	38.3	16.79	N/A	
7	Efficiency Distribution	44%	57%	0%	N/A	N/A	225,271
	UEC	255.05	191.74	131.44	N/A	N/A	
8	Efficiency Distribution	50%	40%	10%	0%	N/A	69,745,891
	UEC	0.9	0.66	0.24	0.19	N/A	
9	Efficiency Distribution	25%	50%	25%	N/A	N/A	10,249,869
	UEC	0.79	0.26	0.13	N/A	N/A	
10	Efficiency Distribution	87%	0%	0%	13%	N/A	8,556,487
	UEC	19.27	6.13	4	1.5	N/A	

[a] This information was taken from DOE's NOPR that was issued on March 27, 2012.

2. SNOPR Efficiency Distributions

For the SNOPR analysis considered in today's action, DOE assumed that the CEC standards, effective since February 1, 2013, had moved the market not just in California, but nationally as well. To reach this conclusion, DOE solicited stakeholder comments through a Request for Information published on March 26, 2013, conducted additional manufacturer interviews, and performed its own examination of the efficiency of products sold nationally. In response to the RFI, many commenters indicated that there was evidence that the market had accepted the CEC standards and that technology improvements were made to meet the CEC standards. DOE found products available for sale in physical locations outside of California and available for sale online that met CEC standards, and had the accompanying CEC efficiency mark on them. Finally, additional manufacturer interviews supported the view that the majority of products sold in California (and thus meeting CEC standards) were sold nationally as well.

Therefore, DOE re-developed its efficiency distribution analysis, and based it on the CEC database of certified small battery chargers (downloaded in November 2014 and containing 12652 unique models). Each model was assigned an estimated product class and application based off its battery characteristics. Application-specific efficiency distributions were then developed using the reported energy performance for each model in that application. If an application had less than 20 identified models, it was assigned the efficiency distribution of the overall product class. Due to slight variations between CEC and DOE metrics, products were conservatively assigned to the higher CSL (in order to not overstate savings) when their UECs were within 5% of the next highest CSL compliance line compared to the distance between the compliance lines of the higher and lower CSLs.

The SNOPR analysis acknowledges, however, that units not complying with CEC standards can still be sold outside of California, but assumed the percentage of such units is small. For this analysis, DOE conservatively assumed 5% of units sold nationally do not meet CEC standards. To account for this, each application's efficiency distribution was multiplied by 95%, and then 5% was added to the CSL below the CEC approximate CSL. These became the base case efficiency distributions shown in the table below. No further changes in the base-case efficiency distributions were assumed to occur after the first year of the analysis. It is important to note that the CSLs were redefined in the SNOPR analysis, and do not perfectly match those in the NOPR analysis. This was done based on additional testing conducted for some product classes and to have a CSL that is a closer approximation to the CEC standard levels. For reference, the table below also lists the tested UECs defining each CSL from the SNOPR engineering analysis and the estimated shipments in 2018 from the SNOPR shipments analysis.

TABLE I–3—BASE CASE SNOPR ESTIMATED EFFICIENCY DISTRIBUTIONS IN 2018

Product class		CSL 0	CSL 1	CSL 2	CSL 3	CSL 4	Estimated shipments in 2018
1	Efficiency Distribution	7%	56%	33%	4%	N/A	15,772,035
	UEC	8.73	6.1	3.04	1.29	N/A	
2	Efficiency Distribution	9%	42%	9%	15%	25%	400,052,285
	UEC	5.33	3.09	1.69	1.58	1.11	
3	Efficiency Distribution	6%	35%	2%	58%	N/A	27,088,679
	UEC	3.65	1.42	0.74	0.7	N/A	
4	Efficiency Distribution	6%	8%	12%	74%	N/A	80,146,173
	UEC	12.23	5.38	3.63	3.05	N/A	
5	Efficiency Distribution	0%	5%	95%	0%	N/A	4,717,743
	UEC	88.1	58.3	21.39	9.45	N/A	
6	Efficiency Distribution	0%	5%	95%	0%	N/A	668,489
	UEC	120.71	81.82	33.53	16.8	N/A	
7	Efficiency Distribution	80%	20%	0%	N/A	N/A	238,861
	UEC	255.05	191.74	131.44	N/A	N/A	
8	Efficiency Distribution	No longer in scope					
	UEC						
9	Efficiency Distribution						
	UEC						
10	Efficiency Distribution						
	UEC						

To support the assumption that 95% of the national market meets CEC standard levels, DOE examined the top-selling products for various BC applications at several national online and brick & mortar retailers (with an online portal). These represent products sold not just in California, but available nationally. DOE focused its search on the top-selling 20 products (separately for each retailer) in applications with the highest shipments. DOE also looked at products in a variety of product classes. The applications examined cover over 50% of all battery charger shipments. If the battery charger model number was found in the CEC's database of certified products, or if the product was available for sale or pick-up in a physical store in California, then the product was assumed to meet CEC standard levels. Over 90% of products in each application examined met CEC standard levels (these results are lower bounds since battery charger model numbers were not always available). These results are therefore consistent with DOE's assumption that 95% of the national market for battery chargers meets the CEC standards. The table below summarizes the results of DOE's market examination.

TABLE I–4—SUMMARY OF DOE MARKET EXAMINATION OF CEC UNITS BY APPLICATION

Application	Product class	Percentage of total BC shipments in application (%)	Retailers examined *	Percentage of models examined in cec database or sold in California (%)
Smartphones	2	21	Amazon, Best Buy, Sears	100
Media Tablets	2	8	Amazon, Best Buy, Sears	93
MP3 Players	2	8	Amazon, Best Buy, Sears	93
Notebook Computers	4	8	Amazon, Best Buy, Sears	93
Digital Cameras	2	6	Amazon, Best Buy, Sears	97
Power Tools (includes DIY and professional).	2, 3, 4	2	Amazon, Home Depot, Sears	90
Toy Ride-On Vehicles	3, 5	1	Walmart, Toys R Us	93

B. Benefits and Costs to Consumers

Table I–5 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of battery chargers, as measured by the average life-cycle cost (''LCC'') savings and the simple payback period (''PBP'').[3] The average LCC savings are positive for all product classes, and the PBP is less than the average lifetime of battery chargers, which is estimated to be between 3.5 and 9.7 years, depending on product class (see section IV.F.5). For comparative purposes, Table I–5 also presents the results from the NOPR for battery chargers. See 77 FR 18478 (March 27, 2012).

TABLE I–5—IMPACTS OF PROPOSED ENERGY CONSERVATION STANDARDS ON CONSUMERS OF BATTERY CHARGERS

Product class	Average LCC savings		Simple payback period (*years*)		Average lifetime (*years*)
	NOPR (*2010$*)	SNOPR (*2013$*)	NOPR	SNOPR	
PC1—Low E, Inductive	1.52	0.71	1.7	1.5	5.0
PC2—Low E, Low Voltage	0.16	0.07	0.5	0.6	4.0
PC3—Low E, Medium Voltage	0.35	0.08	3.9	0.8	4.9
PC4—Low E, High Voltage	0.43	0.11	3.0	1.4	3.7
PC5—Medium E, Low Voltage	33.79	0.84	0.0	2.7	4.0
PC6—Medium E, High Voltage	40.78	1.89	0.0	1.1	9.7
PC7—High E	38.26	51.06	0.0	0.0	3.5
PC 8—DC–DC, <9V Input	3.04	....	0.0	....	....

Note: As described in section IV.A.3 of this notice, the standards proposed in this SNOPR no longer consider product classes 8 and 10. Products that were found in product class 8 of the NOPR analysis were redistributed among other product classes for the SNOPR, and product class 10 was removed from consideration. Therefore, for comparison between the NOPR and SNOPR analyses, the results for product class 8 are included in the table above, while results for product class 10 are excluded.

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

C. Impact on Manufacturers

The industry net present value (INPV) is the sum of the discounted cash flows to the industry from the base year through the end of the analysis period (2015 to 2047). Using a real discount rate of 9.1 percent, DOE estimates that the INPV for manufacturers of battery chargers in the base case is $79,904 million in 2013$. Under the proposed standards, DOE expects that manufacturers may lose up to 0.7 percent of the INPV, which is approximately -$529 million. Additionally, based on DOE's interviews with the domestic manufacturers of battery chargers, DOE does not expect any plant closings or significant loss of employment.

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

D. National Benefits and Costs[4]

DOE's analyses indicate that the proposed energy conservation standards would save a significant amount of energy. Relative to the base case without amended standards, the lifetime energy savings for battery chargers purchased in the 30-year period that begins in the anticipated year of compliance with the new standards (2018–2047) amount to 0.170 quadrillion Btu (quads).[5] This represents a savings of 11.2 percent relative to the energy use of these products in the base case (*i.e.* without standards).

The cumulative net present value (NPV) of total consumer costs and savings of the proposed standards ranges from $0.6 billion (at a 7-percent discount rate) to $1.2 billion (at a 3-percent discount rate). This NPV expresses the estimated total value of future operating-cost savings minus the estimated increased product costs for battery chargers purchased in 2018–2047.

In addition, the proposed standards for battery chargers would have significant environmental benefits. DOE estimates that the proposed standards would result in cumulative greenhouse gas (GHG) emission reductions of approximately 10.45 million metric tons

[3] The average LCC savings are measured relative to the base-case efficiency distribution, which depicts the market in the compliance year in the absence of standards (see section IV.F.9). The simple PBP, which is designed to compare specific efficiency levels, is measured relative to the baseline model (see section IV.F.11).

[4] All monetary values in this section are expressed in 2013 dollars and, where appropriate, are discounted to 2015.

[5] A quad is equal to 10^{15} British thermal units (Btu).

[6] A metric ton is equivalent to 1.1 short tons. Results for emissions other than CO_2 are presented

(Mt) [6] of carbon dioxide (CO_2), 8.92 thousand tons of sulfur dioxide (SO_2), 15.41 thousand tons of nitrogen oxides (NO_X), 44.8 thousand tons of methane, 0.137 thousand tons of nitrous oxide (N_2), and 0.027 tons of mercury (Hg).[3] The cumulative reduction in CO_2 emissions through 2030 amounts to 4.3 Mt, which is equivalent to the emissions resulting from the annual electricity use of approximately half a million homes.

The value of the CO_2 reductions is calculated using a range of values per metric ton of CO_2 (otherwise known as the Social Cost of Carbon, or ''SCC'') developed by a Federal interagency process.[7] The derivation of the SCC values is discussed in section IV.M. Using discount rates appropriate for each set of SCC values (see Table I–6), DOE estimates that the net present monetary value of the CO_2 emissions reductions (not including CO_2 equivalent emissions of other gases with global warming potential) is between $0.084 billion and $1.114 billion, with a value of $0.362 billion using the central SCC case represented by $40.5/t in 2015. DOE also estimates the present monetary value of the NO_X emissions reduction is $13.65 million at a 7-percent discount rate, and $24.43 million at a 3-percent discount rate.[8]

Table I–6 summarizes the national economic benefits and costs expected to result from the proposed standards for battery chargers.

TABLE I–6—SUMMARY OF NATIONAL ECONOMIC BENEFITS AND COSTS OF PROPOSED ENERGY CONSERVATION STANDARDS FOR BATTERY CHARGERS (TSL 2) *

Category	Present value (*billion* 2013$)	Discount rate (%)
Benefits		
Consumer Operating Cost Savings	0.7	7
	1.4	3
CO_2 Reduction Monetized Value ($12.0/t case) **	0.1	5
CO_2 Reduction Monetized Value ($40.5/t case) **	0.4	3
CO_2 Reduction Monetized Value ($62.4/t case) **	0.6	2.5
CO_2 Reduction Monetized Value ($119/t case) **	1.1	3
NO_X Reduction Monetized Value (at $2,684/ton) **	0.01	7
	0.02	3
Total Benefits †	1.1	7
	1.8	3
Costs		
Consumer Incremental Installed Costs	0.1	7
	0.2	3
Total Net Benefits		
Including Emissions Reduction Monetized Value†	*1.0	7
	1.6	3

* This table presents the costs and benefits associated with battery chargers shipped in 2018 − 2047. These results include benefits to consumers which accrue after 2047 from the products purchased in 2018 − 2047. 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 CO_2 values represent global monetized values of the SCC, in 2013$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% 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. The value for NOx is the average of high and low values found in the literature.

† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to average SCC with 3-percent discount rate ($40.5/t case).

TABLE I–7—SUMMARY OF NATIONAL ECONOMIC BENEFITS AND COSTS OF ENERGY CONSERVATION STANDARDS PROPOSED IN THE NOPR FOR BATTERY CHARGERS

Category	Present value (*billion 2010$*)	Discount rate (%)
Benefits		
Consumer Operating Cost Savings	3.815	7
	7.007	3
CO_2 Reduction Monetized Value ($4.9/t case) *	0.208	5
CO_2 Reduction Monetized Value (at $22.3/t case) *	1.025	3
CO_2 Reduction Monetized Value (at $36.5/t case) *	1.720	2.5
CO_2 Reduction Monetized Value (at $67.6/t case) *	3.127	3

in short tons. 3 DOE calculated emissions reductions relative to the base case, which reflects key assumptions in the *Annual Energy Outlook 2014* (*AEO2014*) Reference case, which generally represents current legislation and environmental regulations for which implementing regulations were available as of October 31, 2013.

[7] *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866.* Interagency Working Group on Social Cost of Carbon, United States Government. May 2013; revised November 2013. (Available at: *http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf.*)

[8] DOE is currently investigating valuation of avoided SO_2 and Hg emissions.

TABLE I–7—SUMMARY OF NATIONAL ECONOMIC BENEFITS AND COSTS OF ENERGY CONSERVATION STANDARDS PROPOSED IN THE NOPR FOR BATTERY CHARGERS—Continued

Category	Present value (*billion 2010$*)	Discount rate (%)
NO_X Reduction Monetized Value (at $2,537/ton) *	0.036	7
	0.065	3
Total Benefits **	4.876	7
	8.097	3
Costs		
Consumer Incremental Installed Costs ‡	−1.435	7
	−2.402	3
Net Benefits/Costs		
Including Emissions Reduction Monetized Value **	6.311	7
	10.498	3

Note: As described in section IV.A.3 of this notice, the standards proposed in this SNOPR no longer consider product classes 8 and 10. Products that were found in product class 8 of the NOPR analysis were redistributed among other product classes for the SNOPR, and product class 10 was removed from consideration. Therefore, for comparison between the NOPR and SNOPR analyses, the results for product class 8 are included in the table above, while results for product class 10 are excluded.

* These values represent global values (in 2010$) of the social cost of CO_2 emissions in 2010 under several scenarios. The values of $4.9, $22.3 and $36.5 per ton are the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The value of $67.6 per ton represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. The value for NO_X (in 2010$) is the average of the low and high values used in DOE's NOPR analysis.

** Total Benefits and Net Benefits/Costs for both the 3% and 7% cases utilize the central estimate of social cost of CO_2 emissions calculated at a 3% discount rate, which is equal to $22.3/ton in 2010 (in 2010$).

‡ Consumer Incremental Installed Costs represent the total present value (in 2010$) of costs borne by consumers due to increased manufacturing costs from efficiency improvements. The incremental product costs for battery chargers are negative because of an assumed shift in technology from linear power supplies to switch mode power for the larger battery chargers in product classes 5, 6, and 7. For more details, see chapter 5 of the NOPR Technical Support Document.

For comparative purposes, Table I–7 summarizes the national economic benefits and costs for the standards proposed in the March 27, 2012, NOPR for battery chargers shipped in 2013–2042. For the comparison between the NOPR and SNOPR analyses, products that were found in product class 8 of the NOPR analysis were redistributed among other product classes for the SNOPR, and product class 10 was removed from consideration in the SNOPR. As the CEC standards were effective since February 1, 2013, DOE did not specifically consider the NPV of costs and benefits of achieving the CEC efficiency levels in the 2012 NOPR for the California market. For the SNOPR, DOE assumed that the CEC standards had moved the market not just in California, but for the remainder of the country. DOE therefore only considered the NPV of costs and benefits of going beyond the where the market efficiency levels had moved in response to the CEC standards, across the entire U.S. See 77 FR 18478 (March 27, 2012).

The benefits and costs of the today's proposed standards, for products sold in 2018–2047, can also be expressed in terms of annualized values. The annualized monetary values are the sum of (1) the annualized national economic value of the benefits from consumer operation of products that meet the new standards (consisting primarily of operating cost savings from using less energy, minus increases in product purchase prices and installation costs, which is another way of representing consumer NPV), and (2) the annualized monetary value of the benefits of emission reductions, including CO_2 emission reductions.[9]

Although combining the values of operating savings and CO_2 emission reductions provides a useful perspective, two issues should be considered. First, the national operating cost 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 battery chargers shipped in 2018–2047. Because CO_2 emissions have a very long residence time in the atmosphere,[10] the SCC values after 2050 reflect future climate-related impacts resulting from the emission of CO_2 that continue beyond 2100.

Estimates of annualized benefits and costs of the proposed standards are shown in Table I–8. 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 SCC series corresponding to a value of $40.5/ton in 2015, the cost of the standards in this rule is $9 million per year in increased equipment costs, while the estimated annual benefits are $68 million per year in reduced equipment operating costs, $20 million in CO_2 reductions, and $1.26 million in reduced NO_X emissions. In this case, the net benefit amounts to $80 million per year. Using a 3-percent discount rate for all benefits and costs and the SCC series corresponding to a value of $40.5/ton in 2015, the estimated cost of the proposed standards is $10 million per year in increased equipment costs, while the

[9] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 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 (*e.g.,* 2020 or 2030), 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, 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, which yields the same present value.

[10] The atmospheric lifetime of CO_2 is estimated of the order of 30–95 years. Jacobson, MZ (2005). ''Correction to 'Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming,''' *J. Geophys. Res.* 110. pp. D14105.

estimated annual benefits are $75 million per year in reduced operating costs, $20 million in CO_2 reductions, and $1.32 million in reduced NO_X emissions. In this case, the net benefit amounts to $86 million per year.

For comparative purposes, Table I–9 presents the annualized results from the March 27, 2012, NOPR for battery chargers shipped in 2013–2042. For the comparison between the NOPR and SNOPR analyses, products that were found in product class 8 of the NOPR analysis were redistributed among other product classes for the SNOPR, and product class 10 was removed from consideration in the SNOPR. As the CEC standards were effective since February 1, 2013, DOE did not specifically consider the annualized costs and benefits of achieving the CEC efficiency levels in the 2012 NOPR for the California market. For the SNOPR, DOE assumed that the CEC standards had moved the market not just in California, but for the remainder of the country. DOE therefore only considered the annualized costs and benefits of going beyond where the market efficiency levels had moved in response to the CEC standards, across the entire U.S. See 77 FR 18478 (March 27, 2012).

TABLE I–8—ANNUALIZED BENEFITS AND COSTS OF PROPOSED ENERGY CONSERVATION STANDARDS FOR BATTERY CHARGERS (TSL 2)

	Discount rate (%)	(Million 2013$/year)		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
Benefits				
Consumer Operating Cost Savings	7	68	68	69
	3	75	74	76
CO_2 Reduction Monetized Value ($12.0/t case) *.	5	6	6	6
CO_2 Reduction Monetized Value ($40.5/t case) *.	3	20	20	20
CO_2 Reduction Monetized Value ($62.4/t case) *.	2.5	28	28	28
CO_2 Reduction Monetized Value ($119/t case) *.	3	60	60	60
NO_X Reduction Monetized Value (at $2,684/ton) **.	7	1.26	1.26	1.26
	3	1.32	1.32	1.32
Total Benefits †	7 plus CO_2 range	76 to 130	75 to 130	76 to 131
	7	89	89	90
	3 plus CO_2 range	82 to 136	82 to 136	83 to 138
	3	96	95	97
Costs				
Consumer Incremental Product Costs.	7	9	9	6
	3	10	10	6
Net Benefits				
Total †	7 plus CO_2 range	66 to 120	66 to 120	70 to 124
	7	80	79	84
	3 plus CO_2 range	73 to 127	72 to 126	77 to 132
	3	86	86	91

* This table presents the annualized costs and benefits associated with battery chargers shipped in 2018 – 2047. These results include benefits to consumers which accrue after 2047 from the products purchased in 2018 – 2047. 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 Benefits, and High Benefits Estimates utilize projections of energy prices from the Annual Energy Outlook for 2014 ("*AEO2014"*) Reference case, Low Economic Growth case, and High Economic Growth case, respectively. Additionally, the High Benefits Estimates include a price trend on the incremental product costs.

** The CO_2 values represent global monetized values of the SCC, in 2013$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% 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. The value for NOx is the average of high and low values found in the literature.

† 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 ($40.5/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.

TABLE I–9—ANNUALIZED BENEFITS AND COSTS OF ENERGY CONSERVATION STANDARDS PROPOSED IN THE NOPR FOR BATTERY CHARGERS

	Discount rate	Monetized (Million 2010$/year)		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
Benefits				
Consumer Operating Cost Savings	7%	352.0	335.4	368.6
	3%	379.2	359.8	399.2

TABLE I–9—ANNUALIZED BENEFITS AND COSTS OF ENERGY CONSERVATION STANDARDS PROPOSED IN THE NOPR FOR BATTERY CHARGERS—Continued

	Discount rate	Monetized (Million 2010$/year)		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
CO_2 Reduction Monetized Value ($4.9/t case) **.	5%	14.9	14.9	14.9
CO_2 Reduction Monetized Value ($22.3/t case) **.	3%	55.5	55.5	55.5
CO_2 Reduction Monetized Value ($36.5/t case) **.	2.5%	86.3	86.3	86.3
CO_2 Reduction Monetized Value ($67.6/t case) **.	3%	169.3	169.3	169.3
NO_X Reduction Monetized Value ($2,537/ton) **.	7%	3.3	3.3	3.3
	3%	3.5	3.5	3.5
Total Benefits ††	7% plus CO_2 range	370.2 to 524.6	353.6 to 508.0	386.9 to 541.2
	7%	410.8	394.2	427.4
	3%	438.2	418.8	458.2
	3% plus CO_2 range	397.7 to 552.1	378.2 to 532.6	417.7 to 572.0
Costs				
Consumer Incremental Product Costs †.	7%	(132.4)	(132.4)	(132.4)
	3%	(130.0)	(130.0)	(130.0)
Net Benefits				
Total ††	7% plus CO_2 range	502.7 to 657.0	486.1 to 640.4	519.3 to 673.6
	7%	543.2	526.6	559.8
	3%	568.2	548.8	588.2
	3% plus CO_2 range	527.7 to 682.0	508.2 to 662.6	547.7 to 702.0

Note: As described in section IV.A.3 of this notice, the standards proposed in this SNOPR no longer consider product classes 8 and 10. Products that were found in product class 8 of the NOPR analysis were redistributed among other product classes for the SNOPR, and product class 10 was removed from consideration. Therefore, for comparison between the NOPR and SNOPR analyses, the results for product class 8 are included in the table above, while results for product class 10 are excluded.

* The results include benefits to consumers which accrue after 2042 from the products purchased from 2013 through 2042. Costs incurred by manufacturers, some of which may be incurred prior to 2013 in preparation for the rule, are indirectly included as part of incremental equipment costs. The Primary, Low Benefits, and High Benefits Estimates utilize forecasts of energy prices from the *AEO2010* Reference case, Low Estimate, and High Estimate, respectively.

** The CO_2 values represent global monetized values (in 2010$) of the social cost of CO_2 emissions in 2010 under several scenarios. The values of $4.9, $22.3, and $36.5 per ton are the averages of SCC distributions calculated using 5-percent, 3-percent, and 2.5-percent discount rates, respectively. The value of $67.6 per ton represents the 95th percentile of the SCC distribution calculated using a 3-percent discount rate. The value for NO_X (in 2010$) is the average of the low and high values used in DOE's NOPR analysis.

† The incremental product costs for battery chargers are negative because of an assumed shift in technology from linear power supplies to switch mode power for the larger battery chargers in product classes 5, 6, and 7. For more details, see chapter 5 of the NOPR Technical Support Document.

†† Total Benefits for both the 3-percent and 7-percent cases are derived using the SCC value calculated at a 3-percent discount rate, which is $22.3/ton in 2010 (in 2010$). In the rows labeled as "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 SNOPR.

E. 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 products 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 trial standard levels, 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. Generally, battery chargers are power conversion devices that transform input voltage to a suitable voltage for the battery they are powering. A portion of the energy that flows into a battery charger flows out to a battery and, thus, cannot be considered to be consumed by the battery charger.

A. Authority

Title III, Part B of the Energy Policy and Conservation Act of 1975, as amended (''EPCA'' or in context ''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,[11] a program covering most major household appliances (collectively referred to as ''covered products'').

Section 309 of the Energy Independence and Security Act (''EISA 2007'') amended EPCA by directing DOE to prescribe, by rule, definitions and test procedures 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 to 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 procedures for battery chargers appear at title 10 of the Code of Federal Regulations (CFR) part 430, subpart B, appendix X.

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

DOE must follow specific statutory criteria for prescribing new and amended standards for covered products. 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 new or amended 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))

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 a new or amended 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 of 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))

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. See 42 U.S.C. 6295(o)(2)(B)(iii).

Additionally, 42 U.S.C. 6295(q)(1) 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 products that has the same function or intended use, if DOE determines that products within such group: (A) Consume a different kind of energy from that consumed by other covered products within such type (or class); or (B) have a capacity or other performance-related feature 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 such a 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)) DOE's current test procedures and proposed standards for battery chargers address standby mode and off mode energy use.

B. Background

1. Current Standards

Currently, there are no Federal energy conservation standards that apply to battery chargers.

2. History of Standards Rulemaking for Battery Chargers

Section 135 of the Energy Policy Act of 2005, Public Law 109–58 (Aug. 8, 2005), amended sections 321 and 325 of EPCA by defining the term ''battery charger.'' That provision also directed DOE to prescribe definitions and test procedures related to the energy consumption of battery chargers and to issue a final rule that determines whether to set energy conservation standards for battery chargers or classes of battery chargers. (42 U.S.C. 6295(u)(1)(A) and (E))

On December 8, 2006, DOE complied with the first of these requirements by publishing a final rule that prescribed test procedures for a variety of products. 71 FR 71340, 71365–71375. That rule, which was codified in multiple sections of the Code of Federal Regulations (CFR), included a definition and test procedure for battery chargers. The test procedure for these products is found in 10 CFR part 430, subpart B, Appendix Y (''Uniform Test Method for Measuring the Energy Consumption of Battery Chargers'').

On December 19, 2007, Congress enacted the Energy Independence and Security Act of 2007 (''EISA 2007''). Public Law 110–140 (Dec. 19, 2007). Section 309 of EISA 2007 amended section 325(u)(1)(E) of EPCA by directing DOE to issue a final rule that prescribes energy conservation standards for battery chargers or classes of battery chargers or to determine that no energy conservation standard is technologically feasible and economically justified. (42 U.S.C. 6295(u)(1)(E))

Finally, section 310 of EISA 2007 established definitions for active, standby, and off modes, and directed DOE to amend its test procedures for battery chargers to include a means to measure the energy consumed in standby mode and off mode. (42 U.S.C. 6295(gg)(2)(B)(i)) Consequently, DOE published a final rule incorporating standby- and off-mode measurements into the DOE test procedure. 74 FR 13318, 13334–13336 (March 27, 2009) Additionally, DOE amended the test procedure for battery chargers to include an active mode measurement. 76 FR 31750 (June 1, 2011).

DOE initiated its current rulemaking effort for these products by issuing the Energy Conservation Standards Rulemaking Framework Document for Battery Chargers and External Power Supplies (the Framework Document). See *http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0005*. The Framework Document explained the issues, analyses, and process DOE anticipated using to develop energy conservation standards for those products. DOE also published a notice announcing the availability of the Framework Document, announcing a public meeting to discuss the proposed analytical framework, and inviting written comments concerning the development of standards for battery chargers and external power supplies (EPSs). 74 FR 26816 (June 4, 2009). DOE held the Framework Document public meeting on July 16, 2009. Manufacturers, trade associations, environmental advocates, regulators, and other interested parties attended the meeting and submitted comments.

On September 15, 2010, having considered comments from interested parties, gathered additional information, and performed preliminary analyses for the purpose of developing potential amended energy conservation standards for Class A EPSs and new energy conservation standards for battery chargers and non-Class A EPSs, DOE announced a public meeting and the availability on its Web site of a preliminary technical support document (preliminary TSD). 75 FR 56021. The preliminary TSD is available at: *http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0031*. The preliminary TSD discussed the comments DOE received at the framework stage of this rulemaking and described the actions DOE took in response to those comments. That document also described in detail the analytical framework DOE used, and the content and results of DOE's preliminary analyses. *Id.* at 56023–56024. DOE convened the public meeting to discuss and receive comments on: (1) The product classes DOE analyzed, (2) the analytical framework, models, and tools that DOE was using to evaluate potential standards, (3) the results of the preliminary analyses performed by DOE, (4) potential standard levels that DOE might consider, and (5) other issues participants believed were relevant to the rulemaking. *Id.* at 56021, 56024. DOE also invited written comments on these matters. The public meeting took place on October 13, 2010. Many interested parties participated, twelve of whom submitted written comments during the comment period; two additional parties filed comments following the close of the formal comment period.

After considering all of these comments, DOE published its notice of proposed rulemaking (''NOPR''). 77 FR 18478 (March 27, 2012). DOE also released the NOPR TSD, which incorporated the analyses DOE conducted and accompanying technical documentation. The TSD included the LCC spreadsheet, the national impact analysis (NIA) spreadsheet, and the manufacturer impact analysis (MIA) spreadsheet—all of which are available at: *http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0070*. In the March 2012 NOPR, DOE proposed new energy conservation standards for battery chargers as follows:

TABLE II–1—NOPR PROPOSED ENERGY CONSERVATION STANDARDS FOR BATTERY CHARGERS

Product class	Product class description	Proposed standard as a function of battery energy (kWh/yr)
1	Low-Energy, Inductive	3.04
2	Low-Energy, Low-Voltage	0.2095 * (E_{batt}) + 5.87
3	Low-Energy, Medium-Voltage	For E_{batt} < 9.74 Wh, 4.68; For E_{batt} ≥ 9.74 Wh, = 0.0933 * (E_{batt}) + 3.77
4	Low-Energy, High-Voltage	For E_{batt} < 9.71 Wh, 9.03; For E_{batt} ≥ 9.71 Wh, = 0.2411 * (E_{batt}) + 6.69
5	Medium-Energy, Low-Voltage	For E_{batt} < 355.18 Wh, 20.06; For E_{batt} ≥ 355.18 Wh, = 0.0219 * (E_{batt}) + 12.28
6	Medium-Energy, High-Voltage	For E_{batt} < 239.48 Wh, 30.37; For E_{batt} ≥ 239.48 Wh, = 0.0495 * (E_{batt}) + 18.51
7	High-Energy	0.0502 * (E_{batt}) + 4.53
8	Low-Voltage DC Input	0.1140 * (E_{batt}) + 0.42; For E_{batt} < 1.17 Wh, 0.55 kWh/yr

TABLE II–1—NOPR PROPOSED ENERGY CONSERVATION STANDARDS FOR BATTERY CHARGERS—Continued

Product class	Product class description	Proposed standard as a function of battery energy (kWh/yr)
9	High-Voltage DC Input	No Standard.
10a	AC Output, VFD (Voltage and Frequency Dependent).	For Ebatt < 37.2 Wh, 2.54; For Ebatt ≥ 37.2 Wh, 0.0733 * (E_{batt})—0.18
10b	AC Output, VI (Voltage Independent)	For Ebatt < 37.2 Wh, 6.18; For Ebatt ≥ 37.2 Wh, 0.0733 * (E_{batt}) + 3.45

In the March 2012 NOPR, DOE identified 24 specific issues on which it sought the comments and views of interested parties. *Id.* at 18642–18644. In addition, DOE also specifically requested comments and data that would allow DOE to clarify certain issues and potential solutions to address them. DOE also held a public meeting in Washington, DC, on May 2, 2012, to receive public comments on its proposal. DOE also received many written comments responding to the March 2012 NOPR, which are further presented and addressed throughout this notice. All commenters, along with their corresponding abbreviations and organization type, are listed in Table II–2 below.

TABLE II–2—LIST OF NOPR COMMENTERS

Organization	Abbreviation	Organization type	Comment
Actuant Electric	Actuant Electric	Manufacturer	146
ARRIS Group, Inc	ARRIS Broadband	Manufacturer	90
Appliance Standards Awareness Project	ASAP	Energy Efficiency Advocates	162
ASAP, ASE, ACEEE, CFA, NEEP, and NEEA.	ASAP, *et al.*	Energy Efficiency Advocates	136
Association of Home Appliance Manufacturers.	AHAM	Industry Trade Association	124
Brother International Corporation	Brother International	Manufacturer	111
California Building Industry Association	CBIA	Industry Trade Association	126
California Energy Commission	California Energy Commission	State Entity	117
California Investor-Owned Utilities	CA IOUs	Utilities	138
City of Cambridge, MA	City of Cambridge, MA	Local Government	155
Cobra Electronics Corporation	Cobra Electronics	Manufacturer	130
Consumer Electronics Association	CEA	Industry Trade Association	106
Delta-Q Technologies Corp	Delta-Q Technologies	Manufacturer	113
Duracell	Duracell	Manufacturer	109
Earthjustice	Earthjustice	Energy Efficiency Advocates	118
ECOVA	ECOVA	Private Entity	97
Energizer	Energizer	Manufacturer	123
Flextronics Power	Flextronics	Manufacturer	145
GE Healthcare	GE Healthcare	Manufacturer	142
Information Technology Industry Council	ITI	Industry Trade Association	131
Korean Agency for Technology and Standards.	Republic of Korea	Foreign Government	148
Lester Electrical	Lester	Manufacturer	87, 139
Microsoft Corporation	Microsoft	Manufacturer	110
Motorola Mobility, Inc	Motorola Mobility	Manufacturer	121
National Electrical Manufacturers Association.	NEMA	Industry Trade Association	134
Natural Resources Defense Council	NRDC	Energy Efficiency Advocate	114
Nebraska Energy Office	Nebraska Energy Office	State Government	98
Nintendo of America Inc	Nintendo of America	Manufacturer	135
Nokia Inc	Nokia	Manufacturer	132
Northeast Energy Efficiency Partnerships.	NEEP	Energy Efficiency Advocate	144, 160
Panasonic Corporation of North America.	Panasonic	Manufacturer	120
PG&E	PG&E	Utility	16
PG&E and SDG&E	PG&E and SDG&E	Utilities	163
Philips Electronics	Philips	Manufacturer	128
Power Sources Manufacturers Association.	PSMA	Industry Trade Association	147
Power Tool Institute, Inc.	PTI	Industry Trade Association	133
Power Tool Institute, Inc., Association of Home Appliance Manufacturers, Consumer Electronics Association.	PTI, AHAM, CEA	Industry Trade Association	161
NOPR Public Meeting Transcript, various parties.	Pub. Mtg. Tr	Public Meeting	104
Representatives of Various State Legislatures.	States	State Government	159
Salcomp Plc	Salcomp Plc	Manufacturer	73
Schneider Electric	Schneider Electric	Manufacturer	119
Schumacher Electric	Schumacher Electric	Manufacturer	143

TABLE II–2—LIST OF NOPR COMMENTERS—Continued

Organization	Abbreviation	Organization type	Comment
Southern California Edison	SCE	Utility	164
Telecommunications Industry Association.	TIA	Industry Trade Association	127
Wahl Clipper Corporation	Wahl Clipper	Manufacturer	153

Of particular interest to commenters was the potential interplay between DOE's proposal and a competing proposal to establish battery charger energy conservation standards published by the California Energy Commission ("the CEC") on January 12, 2012. (The CEC is California's primary energy policy and planning agency.) The CEC standards, which eventually took effect on February 1, 2013,[12] created an overlap between the classes of battery chargers covered by the CEC rule and those classes of battery chargers DOE proposed to regulate in the March 2012 NOPR. Additionally, the standards proposed by DOE differed when compared to the ones issued by the CEC, with some being more stringent and others being less stringent than the CEC standards. To better understand the impact of these standards on the battery charger market in the U.S., DOE published a request for information (RFI) on March 26, 2013 that sought stakeholder comment on a variety of issues related to the CEC standards. 78 FR 18253.

TABLE II–3—LIST OF RFI COMMENTERS

Organization	Abbreviation	Organization type	Comment
AHAM, CEA, PTI, TIA Joint Comments	AHAM, et al	Industry Trade Association	203
Alliance for Wireless Power	ASAP	Energy Efficiency Advocates	196
ASAP, NRDC, ACEEE, CFA, NCLC, NEEA, NPCC Joint Comments.	ASAP, NRDC, ACEEE, CFA, NCLC, NEEA, NPCC.	Energy Efficiency Advocates	206
Association of Home Appliance Manufacturers.	AHAM	Industry Trade Association	202
Brother International Corporation	Brother International	Manufacturer	204
California Energy Commission	California Energy Commission	State Entity	199
California IOUs	CA IOUs	Utilities	197
Consumer Electronics Association	CEA	Industry Trade Association	208
Dual-Lite, a division of Hubbell Lighting	Dual-Lite	Manufacturer	189
Energizer Holdings	Energizer	Manufacturer	213
Garmin International	Garmin	Manufacturer	194
Information Technology Industry Council	ITI	Industry Trade Association	201
Ingersoll Rand (Club Car)	Ingersoll Rand	Manufacturer	195
Jerome Industries, a subsidiary of Astrodyne.	Jerome	Manufacturer	191
Mercury Marine	Mercury	Manufacturer	212
National Marine Manufacturers Association.	NMMA	Industry Trade Association	190
NEEA and NPCC	NEEA and NPCC	Industry Trade Association	200
P&G (Duracell)	Duracell	Manufacturer	193
Panasonic	Panasonic	Manufacturer	210
Philips	Philips	Manufacturer	198
Power Tool Institute	PTI	Industry Trade Association	207
Schneider Electric	Schneider Electric	Manufacturer	211
Schumacher Electric	Schumacher Electric	Manufacturer	192
Telecommunications Industry Association.	TIA	Industry Trade Association	205

Many of these RFI comments reiterated the points that commenters made in response to the NOPR. Additionally, many commenters listed in the table above indicated that there was evidence that the market had accepted the CEC standards and that technology improvements were made to meet the CEC standards at costs aligned with DOE's estimates in the March 2012 NOPR. (See AHAM et al., No. 203 at p. 5) Some manufacturers argued that while some of their units are CEC-compliant, they continue to sell non-compliant units in other parts of the U.S. for various reasons associated with cost. (See Schumacher Electric, No. 192 at p. 2) DOE has addressed these comments by updating and revising its analysis in today's SNOPR by considering, among other things, the impacts attributable to the standards issued by CEC. Specifically, based on the responses to the RFI, DOE collected additional data on new battery chargers identified in the CEC database as being compliant with the CEC standards. These data supplemented DOE's earlier analysis from the March 2012 NOPR. DOE's analysis and testing of units within the CEC database showed that many battery chargers are CEC-compliant. The teardown and economic analysis incorporating these units has also shown that technically equivalent levels to the CEC standards are now

[12] *http://www.energy.ca.gov/appliances/battery_chargers.*

technologically feasible and economically justified for the U.S. as a whole. Therefore, this proposal outlines standards that are technically equivalent, or where justified, more stringent than the CEC standards. The revisions to the analysis, which address the comments received from stakeholders in response to DOE's RFI, are explained in the analysis sections below and summarized in Table II–4.

In addition to updating the proposed standards to account for the impact of the CEC standards, several other significant changes were made while updating the proposed standards presented in the SNOPR. While much of the analysis has been updated, the significant changes since the NOPR are presented in Table II–4.

TABLE II–4—SUMMARY OF SIGNIFICANT CHANGES

Item	NOPR	Changes for SNOPR
Proposed Standard Levels		
Proposed Standard for PC1	= 3.04	No Change.
Proposed Standard for PC2	= 0.2095(E_{batt}) + 5.87	0.1440(E_{batt}) + 2.95.
Proposed Standard for PC3	For E_{batt} < 9.74 Wh, = 4.68 For E_{batt} ≥ 9.74 Wh, = 0.0933(E_{batt}) + 3.77.	For E_{batt} < 10Wh, = 1.42; E_{batt} ≥ 10 Wh, 0.0255(E_{batt}) + 1.16.
Proposed Standard for PC4	For E_{batt} < 9.71 Wh, = 9.03 For E_{batt} ≥ 9.71 Wh, = 0.2411(E_{batt}) + 6.69.	0.11(E_{batt}) + 3.18.
Proposed Standard for PC5	For E_{batt} < 355.18 Wh, = 20.06 For E_{batt} ≥ 355.18 Wh, = 0.0219(E_{batt}) + 12.28.	For E_{batt} < 19 Wh, 1.32 kWh/yr; For E_{batt} ≥ 19 Wh, 0.0257(E_{batt}) + .815.
Proposed Standard for PC6	For E_{batt} < 239.48 Wh, = 30.37 For E_{batt} ≥ 239.48 Wh, = 0.0495(E_{batt}) + 18.51.	For E_{batt} < 18 Wh, 3.88 kWh/yr; For E_{batt} ≥ 18 Wh, 0.0778(E_{batt}) + 2.4.
Proposed Standard for PC7	= 0.0502(E_{batt}) + 4.53	No Change.
Proposed Standard for PC8	= 0.1140(E_{batt})+ 0.42 For Ebatt < 1.17 Wh, = 0.55 kWh/yr.	Removed, covered under PC2 proposed standards.
Proposed Standard for PC9	No Standard	No Change.
Proposed Standard for PC10a	For Ebatt < 37.2 Wh, = 2.54 For Ebatt ≥ 37.2 Wh, = 0.0733(Ebatt)—0.18.	Deferred to Future Rulemaking.
Proposed Standard for PC10b	For Ebatt < 37.2 Wh, = 6.18 For Ebatt ≥ 37.2 Wh, = 0.0733(Ebatt) + 3.45.	Deferred to Future Rulemaking.
Changes in Analysis		
Engineering Analysis—Representative Units	Combination of test data and manufacturer inputs.	Used new or updated units in PC 2, PC 3, PC 4, and PC 5, while keeping the same representative units for PC 1, PC 6, and PC 7 and same Max Tech units for all PCs.
Usage Profiles	Weighted average of application specific usage.	PC 2, PC 3, PC 4, PC 5, and PC 6 usage profiles updated based on new shipment data (See Section IV.F.3).
Efficiency Distributions	From Market Assessment	Obtained from the CEC's database of Small Battery Chargers.

Lastly, DOE announced that it will investigate the potential benefits and burdens of Federal efficiency standards for Computers and Battery Backup Systems in a Framework Document[13] published on July 11, 2014. DOE will be including uninterruptible power supplies (UPSs) that meet the definition of a consumer product within the scope of coverage of that rulemaking effort. Therefore, DOE will no longer consider these products within the scope of the battery chargers rulemaking.

III. General Discussion

A. Test Procedure

In analyzing the products covered under this rulemaking, DOE applied the battery charger test procedure in Appendix Y to 10 CFR part 430 subpart B. Concurrently with the publication of this SNOPR, DOE is also publishing a Notice of Proposed Rulemaking to propose several revisions to the battery charger test procedure. A link to the test procedure NOPR is available at: *http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx?productid=84.* DOE advises stakeholders to review the proposed changes to the test procedure and provide comments to DOE as part of that separate rulemaking.

B. Product Classes and Scope of Coverage

When evaluating and establishing energy conservation standards, DOE divides covered products into product classes by the type of energy used or by capacity or other performance-related features that justifies a different standard. In making a determination whether a performance-related feature justifies a different standard, DOE must consider such factors as the utility of the feature to the consumer and other factors DOE determines are appropriate. (42 U.S.C. 6295(q))Further discussion of products covered under this proposed rule and product classes can be found in Section IV.

C. Technological Feasibility

The following sections address the manner in which DOE assessed the technological feasibility of the new and amended standards. Energy conservation standards promulgated by DOE must be technologically feasible.

1. General

In each 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

[13] *http://www.regulations.gov/#!documentDetail;D=EERE-2014-BT-STD-0025-0001*

means for improving efficiency are technologically feasible. DOE generally considers technologies incorporated in commercially available products or in working prototypes to be technologically feasible. See, *e.g.* 10 CFR 430, subpart C, appendix A, section 4(a)(4)(i) (providing that ''technologies incorporated in commercially available products or in working prototypes will be considered technologically feasible.'').

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, or service; (2) adverse impacts on product utility or availability; and (3) adverse impacts on health or safety. See10 CFR part 430, subpart C, appendix A, section 4(a)(4). 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 battery chargers, particularly the designs DOE considered, those it screened out, and those that are the basis for the trial standard levels (TSLs) analyzed in this rulemaking. For further details on the screening analysis for this rulemaking, see chapter 4 of the SNOPR technical support document (TSD).

Additionally, DOE notes that it has received no comments from interested parties regarding patented technologies and proprietary designs that would inhibit manufacturers from achieving the energy conservation standards contained in this proposal. At this time, DOE believes that the proposed standard for the products covered as part of this rulemaking will not mandate the use of any such technologies.

2. Maximum Technologically Feasible Levels

When proposing an amended standard for a type or class of covered product, DOE must ''determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible'' for such product. (42 U.S.C. 6295(p)(1)). DOE determined the maximum technologically feasible (''max-tech'') efficiency levels by interviewing manufacturers, vetting their data with subject matter experts, and presenting the results for public comment.

In preparing this proposed rule, which includes max-tech levels for the seven product classes initially addressed in DOE's preliminary analysis, DOE developed a means to create max-tech levels for those classes that were previously not assigned max-tech levels. For the product classes that DOE was previously unable to generate max-tech efficiency levels, DOE used multiple approaches to develop levels for these classes. During the NOPR phase, DOE solicited manufacturers for information and extrapolated performance parameters from its best-in-market efficiency levels. Extrapolating from the best-in-market performance efficiency levels required an examination of the devices. From this examination, DOE determined which design options could be applied and what effects they would likely have on the various battery charger performance parameters. (See Chapter 5, Section 5.4 of the accompanying SNOPR TSD) Table III–1 below shows the reduction in energy consumption when increasing efficiency from the baseline to the max-tech efficiency level.

TABLE III–1—REDUCTION IN ENERGY CONSUMPTION AT MAX-TECH FOR BATTERY CHARGERS

Product class	Max-tech unit energy consumption (kWh/yr)	Reduction of energy consumption relative to the baseline (percentage)
1 (Low-Energy, Inductive)	1.29	85
2 (Low-Energy, Low-Voltage)	1.11	79
3 (Low-Energy, Medium-Voltage)	0.70	80
4 (Low-Energy, High-Voltage)	3.05	75
5 (Medium-Energy, Low-Voltage)	9.45	89
6 (Medium-Energy, High-Voltage)	16.79	86
7 (High-Energy)	131.44	48

Additional discussion of DOE's max-tech efficiency levels and comments received in response to the NOPR analysis can be found in the discussion of candidate standard levels (CSLs) in section IV.C.4. Specific details regarding which design options were considered for the max-tech efficiency levels (and all other CSLs) can be found in Chapter 5, Section 5.4 of the accompanying SNOPR TSD, which has been developed as a stand-alone document for this SNOPR and supports all of the standard levels proposed in this SNOPR.

D. Energy Savings

1. Determination of Savings

For each TSL, DOE projected energy savings from the products that are the subject of this rulemaking purchased in the 30-year period that begins in the year of compliance with any new standards (2018–2047). The savings are measured over the entire lifetime of products purchased in the 30-year period.[14] DOE quantified the energy savings attributable to each TSL as the difference in energy consumption between each standards case and the base case. The base case represents a projection of energy consumption in the absence of new energy conservation standards, and considers market forces and policies that may affect future demand for more efficient products.

DOE used its NIA spreadsheet model to estimate energy savings from potential new standards for battery chargers. The NIA spreadsheet model (described in section IV.H of this notice) calculates energy savings in site energy, which is the energy directly consumed by products at the locations where they are used. For electricity, DOE calculates national energy savings on an annual basis in terms of primary energy savings, which is the savings in the energy that is used to generate and transmit electricity to the site. To

[14] In the past DOE presented energy savings results for only the 30-year period that begins in the year of compliance. In the calculation of economic impacts, however, DOE considered operating cost savings measured over the entire lifetime of products purchased in the 30-year period. DOE has chosen to modify its presentation of national energy savings to be consistent with the approach used for its national economic analysis.

calculate primary energy savings from site electricity savings, DOE derives annual conversion factors from data provided in the Energy Information Administration's (EIA) most recent *Annual Energy Outlook* (*AEO*).

In addition to primary energy savings, DOE also calculates full-fuel-cycle (FFC) energy savings. As discussed in DOE's statement of policy, the FFC metric includes the energy consumed in extracting, processing, and transporting primary fuels (*i.e.,* coal, natural gas, petroleum fuels), and presents a more complete picture of the impacts of energy conservation standards. 76 FR 51282 (August 18, 2011), as amended by 77 FR 49701 (August 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, see section IV.H.6.

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

E. Economic Justification

1. Specific Criteria

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)) 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 new 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 life-cycle cost (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 economic impacts applicable to a particular rulemaking. DOE also evaluates the impacts of potential standards on identifiable subgroups of consumers that may be affected disproportionately by a standard.

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

EPCA requires DOE to consider the savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered product that are likely to result from a standard. (42 U.S.C. 6295(o)(2)(B)(i)(II)) DOE conducts this comparison in its LCC and PBP analysis.

The LCC is the sum of the purchase price of a product (including its installation) and the operating expense (including energy, maintenance, and repair expenditures) discounted over the lifetime of the product. The LCC analysis requires a variety of inputs, such as product prices, product energy consumption, energy prices, maintenance and repair costs, product lifetime, and consumer discount rates. 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. For its LCC and PBP analysis, DOE assumes that consumers will purchase the covered products in the first year of compliance with amended standards. The LCC savings for the considered efficiency levels are calculated relative to a base case that reflects projected market trends in the absence of amended standards. DOE's LCC and PBP analysis is discussed in further detail in section IV.F.

c. Energy Savings

Although significant conservation of energy is a separate statutory requirement for imposing 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 IV.H, DOE uses the NIA spreadsheet 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 notice would not reduce the utility or performance of the products under consideration in this rulemaking. DOE received no comments that the proposed standards for battery chargers would increase their size and reduce their convenience, increase the length of time to charge a product, shorten the intervals between chargers, or cause any other significant adverse impacts on consumer utility.

e. Impact of Any Lessening of Competition

EPCA directs DOE to consider any lessening of competition, as determined in writing by the Attorney General, that is likely to result from proposed standards. (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 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 followed this requirement after publication of the March 2012 NOPR. Although the Department of Justice had no comments regarding the proposal, DOE will transmit a courtesy copy of the supplemental notice and accompanying TSD to the Attorney General. DOE will make public any comments or determination provided by DOJ.

f. Need for National Energy Conservation

The energy savings from new standards are likely to provide improvements to the security and reliability of the nation's energy system. (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 new standards also are likely to result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with energy production and use. DOE 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.6of this notice. DOE also estimates the economic value of emissions reductions resulting from the considered TSLs, as discussed in section IV.L.

g. Other Factors

EPCA allows the Secretary of Energy, in determining whether a standard is economically justified, to consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6295(o)(2)(B)(i)(VII))

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 effect potential new energy conservation standards would have on the payback period for consumers. These analyses include, but are not limited to, the 3-year payback period contemplated under the rebuttable-presumption test. In addition, DOE routinely conducts an economic analysis that considers the full range of impacts to consumers, manufacturers, the nation, and the environment, as required under 42 U.S.C. 6295(o)(2)(B)(i). The results of this analysis serve as the basis for DOE's evaluation of the economic justification for a potential standard level (thereby supporting or rebutting the results of any preliminary determination of economic justification). The rebuttable presumption payback calculation is discussed in section V.B.1.c of this proposed rule.

IV. Methodology and Discussion

This section addresses the analyses DOE performed for this rulemaking with regard to battery chargers. Separate subsections address each component of DOE's analyses.

DOE used several analytical tools to estimate the impact of the standards proposed in this document. First, DOE used a spreadsheet that calculates the LCC and PBP of potential amended or new energy conservation standards. Second, the national impacts analysis uses a spreadsheet that provides shipments forecasts and calculates national energy savings and net present value resulting from potential energy conservation standards. Third, DOE uses the Government Regulatory Impact Model (GRIM) to assess manufacturer impacts of potential standards. These three spreadsheet tools are available on the docket: *http://www.regulations.gov/#!docketDetail;D=EERE-2008-BT-STD-0005.* 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

When beginning an energy conservation standards rulemaking, DOE develops information that provides an overall picture of the market for the products concerned, including the purpose of the products, the industry structure, and market characteristics. 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 a determination of the scope of this rulemaking; product classes and manufacturers; quantities and types of products sold and offered for sale; retail market trends; regulatory and non-regulatory programs; and technologies or design options that could improve the energy efficiency of the product(s) under examination. See Chapter 3 of the SNOPR TSD for further detail.

1. Products Included in this Rulemaking

This section addresses the scope of coverage for this proposed rule and details which products would be subject to the standards proposed in this notice. The numerous comments DOE received on the scope of these standards are also summarized and addressed in this section.

A battery charger is a device that charges batteries for consumer products, including battery chargers embedded in other consumer products. (42 U.S.C. 6291(32)) Functionally, a battery charger is a power conversion device used to transform input voltage to a suitable voltage for the battery the charger is powering. Battery chargers are used in conjunction with other end-use consumer products, such as cell phones and digital cameras. However, the battery charger definition prescribed by Congress is not limited solely to products powered from AC mains—*i.e.* products that plug into a wall outlet. Further, the statutory definition encompasses battery chargers that may be wholly embedded in another consumer product, wholly separate from another consumer product, or partially inside and partially outside another consumer product. While devices that meet the statutory definition are within the scope of this rulemaking, DOE is not proposing to set standards for all battery chargers.

With respect to the different kinds of battery chargers that are available, DOE received a number of comments. DOE received three comments related to battery chargers for backup batteries. ARRIS Broadband described a broadband modem/VoIP device that contains a backup battery that provides power to the telephone system, a primary function, in the event of power loss and sought guidance on whether this product would be required to comply with DOE's proposed standards. (ARRIS Broadband, No. 90 at p.1) Brother urged DOE to exclude from its scope those battery chargers that are used to charge batteries that power only secondary functions of the end-use product in the event of a power loss. Brother noted by way of example that some multifunction devices (MFD) contain a rechargeable battery that enables the MFD to maintain its memory and power an internal clock in the event of power loss. Brother added that regulating battery chargers of this type would ''create significant regulatory burdens and produce insignificant energy savings.'' (Brother International, No. 111 at p.2) Motorola Mobility urged DOE to exclude continuous use products such as answering machines, home security systems, modems, and LAN/WAN adapters from battery standards because battery charging represents a small fraction of the total energy use of the products. ARRIS Broadband and Motorola Mobility also claimed that the test procedure does not provide an adequate way to distinguish energy from battery charging from other functions. (ARRIS Broadband, No. 90 at p.1; Motorola Mobility, No. 121 at pp. 5–6)

After evaluating these comments and examining these devices further, particularly with respect to their test results, DOE has tentatively decided to refrain from proposing standards for battery chargers that are intended to charge batteries that provide backup power, or battery chargers considered to be continuous use devices at this time. DOE outlined several issues with testing these devices. Since battery chargers that are typically embedded within continuous use devices do not charge batteries as their primary function, it is often difficult, if not impossible, to use current techniques and technologies to consistently and reliably isolate the tested battery charger's energy use during testing. As a result, the test procedure cannot be applied to these products to accurately measure the energy use of a battery charger embedded within the product. Because of these technical limitations, DOE has proposed that battery chargers that provide power from the battery to a continuous use device solely during a loss of main power would not be required to be tested under DOE's test procedure. Because the DOE procedure cannot adequately account for the energy usage of these kinds of devices, and DOE has been unable at this time to develop appropriate modifications that would remedy this limitation, battery chargers that fall into these categories cannot be evaluated using the procedure detailed in Appendix Y. See the Test Procedure NOPR at *http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx?productid=84.*

Ultimately, DOE recognizes that such battery chargers may be used in a different manner from other battery chargers, spending nearly all of their time in maintenance mode. Additionally, DOE believes that testing and regulating these devices as a system, which is being addressed in DOE's Computer and Battery Backup Systems rulemaking, is a more appropriate venue to aaddress these devices. See 79 FR 41656 (July 17, 2014).

Motorola Mobility also commented that in-vehicle battery chargers should not be included in the scope of this rulemaking because they do not consume energy from the utility grid. (Motorola Mobility, No. 121 at p. 7) In examining the products identified by Motorola Mobility, DOE observed that these devices were designed to work not only as in-vehicle devices, but could also be plugged into AC mains. Accordingly, in DOE's view, these devices are designed to use mains power. DOE further notes that 42 U.S.C 6292(a) provides in part, that covered consumer products exclude consumer products designed solely for use in recreational vehicles and other mobile equipment. Thus, a product designed to be exclusively used in recreational vehicles or other mobile equipment would be excluded from being considered a covered product while a device that is designed to be used in vehicles and on AC mains, may be considered a covered consumer product. As discussed in section V.B.2.f in the March 2012 NOPR, a battery charger is in Product Class 9 if it operates using a DC input source greater than 9V, it is unable to operate from a universal serial bus (USB) connector, and a manufacturer does not package, recommend, or sell a wall adapter for the device. If an in-vehicle battery charger is also capable of operating on AC mains (via a USB or a wall adapter), then it would be subject to the AC–DC standards based on its characteristics when charging a battery using AC mains. DOE found that new standards for battery charger Product Class 9 (those with DC input of greater than 9V, including all in-vehicle battery chargers) were not cost effective for any of the evaluated standard levels. Because standards are not economically justified, DOE is not proposing standards for such products at this time.

a. Definition of Consumer Product

DOE received comments from a number of stakeholders seeking clarification on the definition of a consumer product. Schneider Electric commented that the definition of consumer product is ''virtually unbounded'' and ''provides no definitive methods to distinguish commercial or industrial products from consumer products.'' (Schneider Electric, No. 119 at p. 2) ITI commented that a narrower definition of a consumer product is needed to determine which state regulations are preempted by Federal standards. (ITI, No. 131 at p. 2) NEMA commented that the FAQ on the DOE Web site is insufficient to resolve its members' questions. See *https://www1.eere.energy.gov/buildings/appliance_standards/pdfs/cce_faq.pdf.* (NEMA, No. 134 at p. 2) These stakeholders suggested ways that DOE could clarify the definition of a consumer product:

- Adopt the ENERGY STAR battery charger definition.
- Limit the scope to products marketed as compliant with the FCC's Class B emissions limits.
- Define consumer products as ''pluggable Type A Equipment (as defined by IEC 60950–1), with an input rating of less than or equal to 16A.''

EPCA defines a consumer product as any article of a type that consumes or is designed to consume energy and which, to any significant extent, is distributed in commerce for personal use or consumption by individuals without regard to whether such article of such type is in fact distributed in commerce for personal use or consumption by an individual. See 42 U.S.C. 6291(1). Manufacturers are advised to use this definition (in conjunction with the battery charger definition) to determine whether a given device shall be subject to battery charger standards. Consistent with these definitions, any battery charger that is of a type that is capable of charging batteries for a consumer product would be considered a covered product and possibly subject to DOE's energy conservation standards, without regard to whether that battery charger was in fact distributed in U.S. commerce to operate a consumer product. Only battery chargers that have identifiable design characteristics that would make them incapable of charging batteries of a consumer product would be considered to not meet EPCA's definition of a battery charger. DOE would consider the ability of a battery charger to operate using residential mains power—Standard 110–120 VAC, 60 Hz input—as an identifiable design characteristic when considering whether a battery charger is capable of charging the batteries of a consumer product.

b. Medical Products

In the NOPR, DOE stated that standards for battery chargers used to power medical devices had the potential to yield energy savings. GE Healthcare, a manufacturer of battery chargers used in medical devices, responded to the NOPR. It gave several reasons why DOE should not apply standards to these products. It noted that the design, manufacture, maintenance, and post-market monitoring of medical devices are already highly regulated by the Food and Drug Administration, and requiring these devices to comply with energy efficiency standards would only add to these existing requirements. GE added that there are a large number of individual medical device models, each of which must be tested along with its component battery charger to ensure compliance with applicable standards; redesign of the battery charger to meet DOE standards would require that all of these models be retested and reapproved, at a significant per-unit cost, especially for those devices that are produced in limited quantities. (GE Healthcare, No. 142 at p. 2)

Given these concerns, DOE has reevaluated its proposal to set energy conservation standards for medical device battery chargers. While setting standards for these devices may yield energy savings, DOE also wishes to avoid any action that could potentially impact their reliability and safety. In the absence of sufficient data on this issue, and consistent with DOE's obligation to consider such adverse impacts when identifying and screening design options for improving the efficiency of a product, DOE has decided to refrain from setting standards for medical device battery chargers at this time. Similar to the limitation already statutorily-prescribed for Class A EPSs, DOE is proposing at this time to refrain from setting standards for those device that require Federal Food and Drug Administration (FDA) listing and approval as a life-sustaining or life-supporting device in accordance with section 513 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360(c)). See 42 U.S.C. 6295(o)(2)(b)(i)(VII). See also 10 CFR part 430, subpart C, appendix A, (4)(a)(4) and (5)(b)(4) (collectively setting out DOE's policy in evaluating potential energy conservation standards for a product).

2. Market Assessment

To characterize the market for battery chargers, DOE gathered information on the products that use them. DOE refers to these products as end-use consumer products or battery charger ''applications.'' This method was chosen for two reasons. First, battery chargers are nearly always bundled with or otherwise intended to be used with a given application; therefore, the demand for applications drives the demand for battery chargers. Second, because most battery chargers are not stand-alone products, their shipments, lifetimes, usage profiles, and power requirements are all determined by the associated application.

DOE analyzed the products offered by online and brick-and-mortar retail outlets to determine which applications use battery chargers and which battery charger technologies are most prevalent. The list of applications analyzed and a full explanation of the market assessment methodology can be found in chapter 3 of the accompanying SNOPR TSD.

While DOE identified the majority of battery charger applications, some may not have been included in the NOPR analysis. This is due in part because the battery chargers market is dynamic and constantly evolving. As a result, some applications that use a battery charger were not initially found because they either made up an insignificant market share or were introduced to the market after the NOPR analysis was conducted. The battery chargers for any other applications not explicitly analyzed in the market assessment would still be subject to the proposed standards as long as they fall into one of the battery charger classes outlined in Section IV.A.1. That is, DOE's omission of any particular battery charger application from its analysis is not, by itself, an indication that the battery charger that powers that application would not be subject to the battery chargers standards.

DOE relied on published market research to estimate base-year shipments for all applications. In the NOPR, DOE estimated that in 2009, a total of 437 million battery chargers were shipped for final sale in the United States. For this SNOPR, DOE conducted additional research and updated its shipments estimates to provide shipments data for 2011. Where more recent data were available, DOE updated the shipments data based on the more recent shipments data collected. Where more recent information could not be found, DOE derived the 2011 shipments value based on the 2009 estimates, and used its shipments model as described in section IV.G.1 to project the 2009 shipments to 2011. In 2011, DOE estimated that a total of 506 million battery chargers units were shipped.

DOE received comments from several stakeholders on the accuracy of its shipment estimates for certain applications in the NOPR. NRDC commented that DOE's estimate of 8 million units for toy ride-on vehicles seemed too high, citing the fact that it was four times higher than the estimate for remote control toy shipments. (NRDC, No. 114 at p. 7) DOE estimated toy ride-on vehicle shipments by dividing annual sales dollars ($1.8 billion) by the average retail price of surveyed toy ride-on vehicles ($222.50). DOE could not find data on remote control toys, but assumed in the NOPR that annual shipments would be roughly equivalent to its estimate for ride-on toys (see chapter 3 of the NOPR TSD). However, when conducting product surveys, DOE found that a large share of remote control toys used disposable batteries. Therefore, DOE altered its analysis and assumed that only 30% of remote control toys utilized a battery charger compared to 100% of ride-on toys. For the SNOPR, DOE retained the same approach and updated its shipment estimates for remote control toys and ride-on toys to approximately 2.2 million and 3.7 million units, respectively.

Schumacher Electric commented that DOE's estimate of 500,000 annual auto/marine/RV battery charger shipments in 2009 was too low, stating that they alone shipped 2.6 million units in 2011. (Schumacher Electric, No. 143 at p. 6) DOE's estimate of 500,000 units was based on a PG&E study (PG&E, No. 16 at p.3). Schumacher's comment did not specify whether its 2.6 million shipments were global or domestic, or what their market share is for auto/marine/RV battery chargers. For the SNOPR, DOE retained the 2009 estimate based on PG&E study and used its shipments model to estimate shipments in 2011. DOE determined that a total of 507,427 units shipped in 2011.

Delta-Q Technologies commented that the lifetime of a golf cart (or ''golf car'') is typically 10–12 years and explained that the majority of new golf carts are sold to commercial customers for a 3- to 4-year lease and then sold to consumers. (Delta-Q Technologies, No. 113 at p. 1) DOE believes the lifetime estimates for these products are similar to the 3.5 years and 6.5 years that DOE assumes for commercial and residential users, respectively. Therefore, DOE retained the same lifetime estimates as in NOPR.

3. Product Classes

When necessary, DOE divides covered products into classes by the type of energy used, the capacity of the product, and any other performance-related feature that could justify 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 created 11 product classes for battery chargers based on various electrical characteristics shared by particular groups of products. As these electrical characteristics change, so does the utility and efficiency of the devices.

a. Battery Charger Product Classes

As described in the NOPR analysis, DOE used five electrical characteristics to disaggregate battery charger product classes—battery voltage, battery energy, input and output characteristics (*e.g.*, inductive charging capabilities),[15] input voltage type (line AC or low-voltage DC), and AC output. Further details on DOE's reasoning are outlined in Chapter 3 of the SNOPR TSD.

TABLE IV–1—BATTERY CHARGER PRODUCT CLASSES

Product class No.	Input/output type	Battery energy (Wh)	Special characteristic or battery voltage
1	AC In, DC Out	<100	Inductive Connection.
2			<4 V.
3			4 – 10 V.
4			>10 V.
5		100–3000	<20 V.
6			≥20 V.
7		>3000	—
8	DC In, DC Out		<9 V Input.
9			≥9 V Input.
10a	AC In, AC Out		Voltage and Frequency Dependent.
10b			Voltage Independent.

In response to the NOPR analysis, Energizer and Philips argued that the wide variety of battery charger usage patterns in Product Class 2 warranted the creation of subcategories of battery chargers based on usage. (Energizer, No. 123 at p. 2; Philips, No. 128 at p. 5) Philips claimed that infrequently used products would not be able to save a significant amount of energy from improved efficiency measures. It argued that infrequent use is a performance-related feature that required DOE to set different standards. Neither party provided additional data in support of its respective views. Despite these claims, DOE has not received evidence that infrequently-used battery chargers have any technical differences from battery chargers that are used more often. Because there are no technical differences between these battery chargers and the units used to represent this product class, there is no rationale for establishing separate product classes based on frequency of use.

DOE also received comments from Delta-Q Technologies, who observed that there has been a shift towards high-frequency switch-mode battery chargers in the golf cart segment, due to rising raw materials cost of older technology and some cost reductions available due to new high frequency switch-mode technologies. In the absence of standards, it asserted that this trend would continue and in the next few years all golf cart chargers would meet the proposed standards. (Delta-Q Technologies, No. 113 at p. 1) DOE's research suggests, and public comments submitted by Club Car responding to the March 2013 RFI express similar concerns, that while there is a clear trend in the direction of more efficient high-frequency switch-mode technologies, some manufacturers are holding back on adopting this technology due to reliability concerns. (Ingersoll Rand, No. 195 at p. 2) However, DOE has also found that U.S. manufacturers are now offering both linear and high-frequency switch-mode battery chargers. As a result, DOE believes its efficiency distribution estimate and representative units for Product Class 7 are accurate, reflecting that a portion of the market would be based on less efficient and legacy linear technology and the remainder would rely on switch-mode technology in 2015.

DOE also received several comments regarding Product Class 9 in response to the NOPR analysis. NRDC and CEC argued that DOE should regulate Product Class 9 products using the proposed Product Class 8 standards. (NRDC, No. 114 at p. 8; California Energy Commission, No. 117 at p. 28) Cobra and the Power Tool Institute (PTI) supported DOE's proposal not to regulate products intended only for in-vehicle use (*i.e.*, Product Class 9). (Cobra Electronics, No. 130 at p. 9: PTI, No. 133 at p. 6) See the March 2012 NOPR TSD, Chapter 5, Sec. 5.7.15, (explaining that Product Class 9 devices are overwhelmingly charged by 12V DC output of an automotive cigarette lighter receptacle). These products are decidedly different than those in Product Class 2 and Product Class 8 because they can only be used in vehicles, which is a unique utility, and input voltage can impact battery charger performance. However, as described in the March 2012 NOPR LCC analysis, DOE determined that the legal requirements necessary for setting standards for product class 9 were not met, and thus, DOE is not proposing to regulating this product class under this proposed rule.

Finally, DOE also received comments regarding Product Classes 10a and 10b, which are no longer within scope of this proposed rulemaking. See section IV.A.1 above. However, NEMA, Schneider, and ITI responded to the NOPR by suggesting that the definitions of 10a and 10b be harmonized with the IEC 62040–3 standard definitions for universal power supplies (''UPSs''). In this case, Product Class 10a would be reclassified from ''non-automatic voltage regulator'' (''non-AVR'') to ''Voltage and Frequency Dependent'' (VFD) and Product Class 10a would be reclassified as ''Voltage Independent'' (VI). Stakeholders stated that these definitions are accepted industry wide. By making such changes, manufacturers asserted that the scope of those battery chargers defined as basic and AVR in the NOPR would be clarified and concerns over scope, particularly what determines consumer grade UPSs, would be eliminated. (NEMA, No. 134 at p. 7, 8: Schneider. Pub. Mtg. Tr, No. 104 at p. 253: Schneider, No. 119 at p. 2: ITI, No. 131 at p. 3, 7) Schneider suggested that DOE define additional product classes 10c and 10d, where Product Class 10c should be defined as Voltage Independent with Sinusoidal output (VI–SS) and Product Class 10d should be defined as Voltage and Frequency Independent (VFI). (Schneider, No. 119 at p. 3)

DOE has recently proposed to remove battery chargers that provide power

[15] Inductive charging is a utility-related characteristic designed to promote cleanliness and guarantee uninterrupted operation of the battery charger in a wet environment. In wet environments, such as a bathroom where an electric toothbrush is used, these chargers ensure that the user is isolated from mains current by transferring power to the battery through magnetic induction rather than using a galvanic (*i.e.*, current carrying) connection.

from a battery to a continuous use device solely during a loss of main power from the testing requirements for battery chargers. This would include battery chargers within Product Class 10 for which DOE had previously proposed standards in the NOPR. As discussed below in Section IV.A.3.b.ii., DOE is no longer proposing standards or definitions for these battery chargers.

b. Elimination of Product Classes 8, 9,10a, and 10b

Since publishing the NOPR, DOE has conducted further market analysis, technical analysis, and testing. As a result, DOE has chosen to move forward with proposed standards for a smaller number of products classes. Specifically, DOE is no longer proposing standards for battery chargers falling into Product Classes 8, 9, 10a, and 10b in this SNOPR. As stated above and in the NOPR, DOE determined that no standards were warranted for Product Class 9 products and DOE received no additional information that would alter this determination.

i. Product Class 8

DOE has determined that there are no products falling into Product Class 8 that do not also fall into Product Class 2. DOE has also determined that the battery chargers previously analyzed in Product Class 8 do not technically differ from those found in Product Class 2. Specifically, DOE analyzed battery chargers used with end use applications such as MP3 players and mobile phones. DOE found that these products can be used with AC to DC power supplies and are functionally identical products found in Product Class 2. For these reasons, DOE has combined all previously analyzed products, and related shipments in Product Class 8 into Product Class 2. Therefore, these products will be subject to Product Class 2 proposed standards.

ii. Product Classes 10a and 10b

DOE is considering energy conservation standards for battery backup systems (including UPSs) and other continuous use products as part of the Computer and Backup Battery Systems rulemaking. 79 FR 41656 By including UPSs in the new rulemaking and analysis, DOE will no longer be considering standards for battery chargers embedded in UPSs as part of this rule and is not proposing standards for Product Classes 10a and 10b in this SNOPR.

DOE requests stakeholder comment on the elimination of Product Classes 8, 9, 10a, and 10b from this SNOPR.

4. Technology Assessment

In the technology assessment, DOE identifies technology options that appear to be feasible to improve product efficiency. This assessment provides the technical background and structure on which DOE bases its screening and engineering analyses. The following discussion provides an overview of the technology assessment for battery chargers. Chapter 3 of the SNOPR TSD provides additional detail and descriptions of the basic construction and operation of battery chargers, followed by a discussion of technology options to improve their efficiency and power consumption in various modes.

a. Battery Charger Modes of Operation and Performance Parameters

DOE found that there are five modes of operation in which a battery charger can operate at any given time—active (or charge) mode, maintenance mode, no-battery (or standby) mode, off mode, and unplugged mode. During active mode, a battery charger is charging a depleted battery, equalizing its cells, or performing functions necessary for bringing the battery to the fully charged state. In maintenance mode, the battery is plugged into the charger, has reached full charge, and the charger is performing functions intended to keep the battery fully charged while protecting it from overcharge. No-battery mode involves a battery charger plugged into AC mains but without a battery connected to the charger. Off mode is similar to no-battery mode but with all manual on-off switches turned off. Finally, during unplugged mode, the battery charger is disconnected from mains and not consuming any electrical power.[16]

For each battery charger mode of operation, DOE's battery charger test procedure has a corresponding test that is performed that outputs a metric for energy consumption in that mode. The tests to obtain these metrics are described in greater detail in DOE's battery charger test procedure. When performing a test in accordance with this procedure, certain items play a key role in evaluating the efficiency performance of a given battery charger—24-hour energy, maintenance mode power, no-battery mode power, off-mode power, and unplugged mode power . (10 CFR part 430 Appendix Y to Subpart B)

First, there is the measured 24-hour energy of a given charger. This quantity is defined as the power consumption integrated with respect to time of a fully metered charge test that starts with a fully depleted battery. In other words, this is the energy consumed to fully charge and maintain at full charge a depleted battery over a period that lasts 24 hours or the length of time needed to charge the tested battery plus 5 hours, whichever is longer. Next, is maintenance mode power, which is a measurement of the average power consumed while a battery charger is known to be in maintenance mode. *No-battery (or standby) mode power is* the average power consumed while a battery charger is in no-battery or standby mode (only if applicable). [17] Off-mode power is the average power consumed while an on-off switch-equipped battery charger is in off mode (*i.e.*, with the on-off switch set to the ''off'' position). Finally, unplugged mode power consists of the average power consumed while the battery charger is not physically connected to a power source. (This quantity is always 0.)

Additional discussion on how these parameters are derived and subsequently combined with assumptions about usage in each mode of operation to obtain a value for the UEC is discussed below in section IV.C.2.

b. Battery Charger Technology Options

Since most consumer battery chargers contain an AC to DC power conversion stage, similar to that found in an EPS, DOE examined many of the same technology options for battery chargers as it did for EPSs in the EPS final rule. See 79 FR 7845 (Feb. 10, 2014). The technology options used to decrease EPS no-load power affect battery charger energy consumption in no-battery and maintenance modes (and off mode, if applicable), while those options used to increase EPS conversion efficiency will affect energy consumption in active and maintenance modes.

DOE considered many technology options for improving the active-mode charging efficiency as well as the no-battery and maintenance modes of battery chargers. The following list, organized by charger type, provides technology options that DOE evaluated

[16] Active mode, maintenance mode, standby mode, and off mode are all explicitly defined by DOE in Appendix Y to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Battery chargers.

[17] If the product contains integrated power conversion and charging circuitry, but is powered through a non-detachable AC power cord or plug blades, then no part of the system will remain connected to mains, and standby mode measurement is not applicable. (Section 5.11.d ''Standby Mode Energy Consumption Measurement, CFR part 430 Appendix Y to Subpart B).

during the NOPR and again in today's SNOPR. Although many of these technology options could be used in both fast and slow chargers, doing so may be impractical due to the cost and benefits of each option for the two types of chargers. Therefore, in the list below, the options are grouped with the charger type where they would be most practical.

Slow charger technology options include:

• *Improved Cores:* The efficiency of line-frequency transformers, which are a component of the power conversion circuitry of many slow chargers, can be improved by replacing their cores with ones made of lower-loss steel.

• *Termination:* Substantially decreasing the charge current to the battery after it has reached full charge, either by using a timer or sensor, can significantly decrease maintenance-mode power consumption.

• *Elimination/Limitation of Maintenance Current:* Constant maintenance current is not required to keep a battery fully charged. Instead, the battery charger can provide current pulses to ''top off'' the battery as needed.

• *Elimination of No-Battery Current:* A mechanical AC line switch inside the battery charger ''cup'' automatically disconnects the battery charger from the mains supply when the battery is removed from the charger.

• *Switched-Mode Power Supply:* To increase efficiency, line-frequency (or linear) power supplies can be replaced with switched-mode EPSs, which greatly reduce the biggest sources of loss in a line-frequency EPS: the transformer.

Fast charger technology options include:

• *Low-Power Integrated Circuits:* The efficiency of the battery charger's switched-mode power supply can be further improved by substituting low-power integrated circuit (''IC'') controllers.

• *Elimination/Limitation of Maintenance Current:* See above.

• *Schottky Diodes and Synchronous Rectification:* Both line-frequency and switched-mode EPSs use diodes to rectify output voltage. Schottky diodes and synchronous rectification can replace standard diodes to reduce rectification losses, which are increasingly significant at low voltage.

• *Elimination of No-Battery Current:* See above.

• *Phase Control To Limit Input Power:* Even when a typical battery charger is not delivering its maximum output current to the battery, its power conversion circuitry continues to draw significant power. A phase control circuit, like the one present in most common light dimmers, can be added to the primary side of the battery charger power supply circuitry to limit input current in lower-power modes.

An in-depth discussion of these technology options can be found in Chapter 3 of the accompanying SNOPR TSD.

B. Screening Analysis

DOE uses the following four screening criteria to determine which design options are suitable for further consideration in a standards rulemaking:

1. *Technological feasibility.* DOE considers technologies incorporated in commercial products or in working prototypes to be technologically feasible.

2. *Practicability to manufacture, install, and service.* If mass production and reliable installation and servicing of a technology in commercial products could be achieved on the scale necessary to serve the relevant market at the time the standard comes into effect, then DOE considers that technology practicable to manufacture, install, and service.

3. *Adverse impacts on product utility or product availability.* If DOE determines a technology would have a significantly 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 consider this technology further.

4. *Adverse impacts on health or safety.* If DOE determines that a technology will have significant adverse impacts on health or safety, it will not consider this technology further.

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

For battery chargers, after considering the four criteria, DOE screened out:

1. Non-inductive chargers for use in wet environments because of potential adverse impacts on safety;

2. Capacitive reactance because of potential adverse impacts on safety; and

3. Lowering charging current or increasing battery voltage because of potential adverse impacts on product utility to consumers.

For additional details, please see Chapter 4 of the SNOPR TSD.

C. Engineering Analysis

In the engineering analysis (detailed in Chapter 5 of the SNOPR TSD), DOE presents a relationship between the manufacturer selling price (MSP) and increases in battery charger efficiency. The efficiency values range from that of an inefficient battery charger sold today (*i.e.,* the baseline) to the maximum technologically feasible efficiency level. For each efficiency level examined, DOE determines the MSP; this relationship is referred to as a cost-efficiency curve.

DOE structured its engineering analysis around two methodologies: (1) A ''test and teardown'' approach, which involves testing products for efficiency and determining cost from a detailed bill of materials (''BOM'') derived from tear-downs and (2) the efficiency-level approach, where the cost of achieving increases in energy efficiency at discrete levels of efficiency are estimated using information gathered in manufacturer interviews that was supplemented and verified through technology reviews and subject matter experts (''SMEs''). When analyzing the cost of each CSL—whether based on existing or theoretical designs—DOE differentiates the cost of the battery charger from the cost of the associated end-use product.

When developing the engineering analysis for battery chargers, DOE selected representative units for each product class. For each representative unit, DOE tested a number of different products. After examining the test results, DOE selected CSLs that set discrete levels of improved battery charger performance in terms of energy consumption. Subsequently, for each CSL, DOE used either teardown data or information gained from manufacturer interviews to generate costs corresponding to each CSL for each representative unit. Finally, for each product class, DOE developed scaling relationships using additional test results and generated UEC equations based on battery energy.

1. Representative Units

For each product class, DOE selected a representative unit upon which it conducted its engineering analysis and developed a cost-efficiency curve. The representative unit is meant to be an idealized battery charger typical of those used with high-volume applications in its product class. Because results from the analysis of these representative units would later be extended, or applied to other units in each respective product class, DOE selected high-volume and/or high-energy-consumption applications that use batteries that are typically found across battery chargers in the given product class. The analysis of these battery chargers is pertinent to all the applications in the product class under the assumption that all battery chargers with the same battery voltage and energy provide similar utility to the user, regardless of the actual end-use product with which they work. Table IV–2 shows the representative units for each product class that DOE analyzed.

TABLE IV–2—BATTERY CHARGER REPRESENTATIVE UNITS FOR EACH PRODUCT CLASS

Product class No.	Input/Output type	Battery energy (Wh)	Special characteristic or battery voltage	Rep. unit battery voltage (V)	Rep. unit battery energy (Wh)
1	AC In, DC Out	<100	Inductive Connection	3.6	1.5
2			<4 V	2.4	1
3			4–10 V	7.2	10
4			>10 V	12	20
5		100–3000	<20 V	12	800
6			≥20 V	24	400
7		>3000		48	3,750

Additional details on the battery charger representative units can be found in Chapter 5 of the accompanying SNOPR TSD.

2. Battery Charger Efficiency Metrics

In the NOPR and this SNOPR, DOE used a single metric (*i.e.*, UEC) to illustrate the improved performance of battery chargers. DOE designed the calculation of UEC to represent an annualized amount of the non-useful energy consumed by a battery charger in all modes of operation. Non-useful energy is the total amount of energy consumed by a battery charger that is not transferred and stored in a battery as a result of charging (*i.e.*, losses). In order to calculate UEC, DOE must have the performance data, which comes directly from its battery charger test procedure (see section III.A). DOE must also make assumptions about the amount of time spent in each mode of operation. The collective assumption about the amount of time spent in each mode of operation is referred to as a usage profile and is addressed in section IV.E and further detail in Chapter 7 of the accompanying SNOPR TSD. DOE recognizes that a wide range of consumers may use the same product in different ways, which may cause some uncertainty about usage profiles. Notwithstanding that possibility, DOE used the weighted average of usage profiles based on a distribution of user types and believes that its assumptions are appropriate gauges of product use to represent each product class. These assumptions also rely on a variety of sources including information from manufacturers and utilities. Details on DOE's usage profile assumptions can be found in section IV.E of this notice and Chapter 7 of the accompanying SNOPR TSD.

Finally, DOE believes that by aggregating the performance parameters of battery chargers into one metric and applying a usage profile, it will allow manufacturers more flexibility to improve performance in the modes of operation that will be the most beneficial to their consumers rather than being required to improve the performance in each mode of operation, some of which may not provide any appreciable benefit. For example, a battery charger used with a mobile phone is likely to spend more time per day in no-battery mode than a battery charger used for a house phone, which is likely to spend a significant portion of every day in maintenance mode. Consequently, it would be more beneficial to consumers if mobile phone battery charger manufacturers improved no-battery mode and home phone battery charger manufacturers improved maintenance mode. Therefore, DOE is using the UEC as the single metric for battery chargers.

DOE's proposed use of a single metric generated several comments. CEC, Arris, and the Republic of Korea stated that they believe DOE should alter the single metric compliance approach in favor of the approaches followed by the CEC or ENERGY STAR. (California Energy Commission, No. 117 at p. 17, 24; ARRIS Broadband 1, No. 90 at p. 2; Republic of Korea, No. 148 at p. 2) Conversely, PTI supported the use of a single metric based upon the usage factors associated with each product class. (PTI, No. 133 at p. 4) DOE's compliance equation and metrics give manufacturers the flexibility to re-design their products in any way that they choose. In this way, manufacturers can pursue improvements in any modes of operation, which would benefit their users in the manner that matters most to them. Furthermore, DOE cannot issue a standard with the two separate metrics found in the CEC rule. That rule uses two separate metrics, both of which incorporate maintenance mode as defined in the battery charger test procedure[18] and used in this SNOPR.

EPCA requires that DOE regulate standby and off mode into a single metric unless it is technically infeasible to do so. See 42 U.S.C. 6295(gg)(3). Standby mode, as defined by 42 U.S.C. 6295(gg)(3), occurs when the energy-consuming product is connected to the mains and offers a user-oriented or protective function such as facilitating the activation or deactivation of other functions (including active mode) by remote switch (including remote control), internal sensor, or timer. See 42 U.S.C. 6295(gg)(1)(A)(iii). Because maintenance mode, as used in this SNOPR, meets the statutory definition of standby mode, DOE must incorporate maintenance mode into a single metric.

3. Calculation of Unit Energy Consumption

UEC is based on a calculation designed to give the total annual amount of energy lost by a battery charger from the time spent in each mode of operation. For the preliminary analysis, the various performance parameters were combined with the usage profile parameters and used to calculate UEC with the following equation:

$$UEC = 365(n(E_{24} - P_m(24 - t_c) - E_{batt}) + (P_m(t_{a\&m} - (t_c n))) + (P_{sb}t_{sb}) + (P_{off}t_{off}))$$

Where

E_{24} = 24-hour energy
E_{batt} = Measured battery energy
P_m = Maintenance mode power
P_{sb} = Standby mode power
P_{off} = Off mode power
t_c = Time to completely charge a fully discharged battery
n = Number of charges per day
$t_{a\&m}$ = Time per day spent in active and maintenance mode
t_{sb} = Time per day spent in standby mode
t_{off} = Time per day spent in off mode[19]

[18] CFR part 430 Appendix Y to Subpart B, Section 2.8 ''Battery maintenance mode or maintenance mode is the mode of operation when the battery charger is connected to the main electricity supply and the battery is fully charged, but is still connected to the charger.''

[19] Those values shown in italics are parameters assumed in the usage profile and change for each product class. Further discussion of them and their derivation is found in section IV.E. The other values

When separated and examined in segments, it becomes evident how this equation gives a value for energy consumed in each mode of operation per day and ultimately, energy consumption per year. These segments are discussed individually below.

Active (or Charge) Mode Energy per Day

$n(E_{24} - P_m(24 - t_c) - E_{batt}) = E_{Active\ Mode}/day$

In the first portion of the above equation, DOE combines the assumed number of charges per day, 24-hour energy, maintenance mode power, charge time, and measured battery energy to calculate the active mode energy losses per day. To calculate this value, 24-hour energy (E_{24}) is reduced by the measured battery energy (*i.e.*, the useful energy inherently included in a 24-hour energy measurement) and the product of the value of the maintenance mode power multiplied by the quantity of 24 minus charge time. This latter value (24 minus charge time) corresponds to the amount of time spent in maintenance mode, which, when multiplied by maintenance mode power, yields the amount of maintenance mode energy consumed by the tested product. Thus, maintenance mode energy and the value of the energy transferred to the battery during charging are both subtracted from 24-hour energy, leaving a quantity theoretically equivalent to the amount of energy required to fully charge a depleted battery. This number is then multiplied by the assumed number of charges per day (n) resulting in a value for the active mode energy per day. Details on DOE's usage profile assumptions can be found in section IV.E of this notice and SNOPR TSD Chapter 7.

Maintenance Mode Energy per Day

$(P_m(t_{a\&m} - (t_c n))) = E_{Maintenance\ Mode}/day$

In the second segment of DOE's equation, shown above, maintenance mode power, time spent in active and maintenance mode per day ($t_{a\&m}$), charge time, and the assumed number of charges per day are combined to obtain maintenance mode energy per day. Time spent in active and maintenance mode is subtracted from the product of the charge time multiplied by the number of charges per day. The resulting quantity is an estimate of time spent in maintenance mode per day, which, when multiplied by the measured value of maintenance mode power, yields the energy consumed per day in maintenance mode.

The use of $t_{a\&m}$ generated several comments from the CEC, who stated that the general use of assumptions for this metric would introduce errors into the calculation. (California Energy Commission, No. 117 at p. 17, 18, 20, 26) Though the energy usage tables disaggregate active and maintenance mode time assumptions (t_a and t_m) for each application, these values should not be used alone for determining compliance. DOE believes that it is inappropriate to use the individual assumptions for t_a and t_m for all the products within a single product class because of the variability in charge time. Variation in charge time has a direct effect on any product and how much time it spends in both active and maintenance mode. These variations are accounted for in the test procedure, by virtue of the charge and maintenance mode test and the output, E_{24}. Therefore, DOE did not disaggregate active and maintenance mode in its compliance calculation of UEC; instead, the outputs of the test procedure would dictate that balance for each product. Therefore, DOE has determined that the usage profile assumptions outlined in Section E below are critical in determined real world energy use of battery chargers.

Standby (or No-Battery) Mode Energy per Day

$(P_{sb}t_{sb}) = E_{Standby\ Mode}/day$

In the third part of DOE's UEC equation, the measured value of standby mode power is multiplied by the estimated time in standby mode per day, which results in a value of energy consumed per day in standby mode.

Off-Mode Energy per Day

$(P_{off}t_{off}) = E_{No\_Battery\ Mode}/day$

In the final part of DOE's UEC equation, the measured value of off-mode power is multiplied by the estimated time in off-mode per day, which results in a value of energy consumed per day in off-mode.

To obtain UEC, the values found through the above calculations are added together. The resulting sum is equivalent to an estimate of the average amount of energy consumed by a battery charger per day. That value is then multiplied by 365, the number of days in a year, and the end result is a value of energy consumed per year.

Modifications to Equation for Unit Energy Consumption

On April 2, 2010, DOE published a proposal to revise its test procedures for battery chargers and EPSs. (75 FR 16958) In that notice, DOE proposed to use a shorter version of the active mode test procedure in scenarios where a technician could determine that a battery charger had entered maintenance mode, 75 FR 16970. However, during its testing of battery chargers, DOE observed complications arising when attempting to determine the charge time for some devices, which, in turn, could affect the accuracy of the UEC calculation. DOE ultimately decided that the duration of the charge test must not be shortened and be a minimum of 24 hours. See 10 CFR part 430, subpart B, Appendix Y (''Uniform Test Method for Measuring the Energy Consumption of Battery Chargers''). The test that DOE adopted has a longer duration if it is known (*e.g.*, because of an indicator light on the battery charger) or it can be determined from manufacturer information that fully charging the associated battery will take longer than 19 hours.[20]

This revision to the test procedure is important because it underscores the potential issues with trying to determine exactly when a battery charger has entered maintenance mode, which creates difficulty in determining charge time. To address this situation, DOE modified its initial UEC equation. The new equation, which was presented to manufacturers during interviews, is mathematically equivalent to the equation presented in the preliminary analysis. When the terms in the preliminary analysis UEC equation are multiplied, those terms containing a factor of charge time cancel each other out and drop out of the equation. What is left can be factored and rewritten as done below. This means that even though the new equation looks different from the equation presented for the preliminary analysis, the value that is obtained is the same and represents the same value of unit energy consumption.

New Base UEC Equation

$$UEC = 365(n(E_{24} - E_{batt}) + (P_m(t_{a\&m} - (24n))) + (P_{sb}t_{sb}) + (P_{off}t_{off}))$$

In addition to initially considering a shortened battery charger active mode test procedure, DOE considered capping the measurement of 24-hour energy at the 24-hour mark of the test. However, following this approach could result in inaccuracies because that measurement would exclude the full amount of

should be determined according to section 5 of Appendix Y to Subpart B of Part 430.

[20] The charge mode test must include at least a five-hour period where the unit being tested is known to be in maintenance mode. Thus, if a device takes longer than 19 hours to charge, or is expected to take longer than 19 hours to charge, the entire duration of the charge mode test will exceed 24 hours in total time after the five-hour period of maintenance mode time is added. 76 FR 31750, 31766–67, and 31780.

energy used to charge a battery if the charge time is longer than 24 hours in duration. To account for this possibility, DOE altered this initial approach in its test procedure final rule by requiring the measurement of energy for the entire duration of the charge and maintenance mode test, which includes a minimum of 5 hours in maintenance mode. See 10 CFR part 430, subpart B, appendix Y, Sec. 5.2.

The modifications to the UEC calculation do not alter the value obtained when the charge and maintenance mode test is completed within 24 hours. However, if the test exceeds 24 hours, the energy lost during charging is scaled back to a 24-hour, or per day, cycle by multiplying that energy by the ratio of 24 to the duration of the charge and maintenance mode test. In the equation below, t_{cd}, represents the duration of the charge and maintenance mode test and is a value that the test procedure requires technicians to determine. DOE also modified the equation from the NOPR by inserting a provision to subtract 5 hours of maintenance mode energy from the 24-hour energy measurement. This change was made because the charge and maintenance mode test includes a minimum of 5 hours of maintenance mode time. Consequently, in the second portion of the equation below, DOE would reduce the amount of time subtracted from the assumed time in active and maintenance mode time per day.

In other words, the second portion of the equation, which is an approximation of maintenance mode energy, is reduced by 5 hours. This alteration was needed to address instances when the charge and maintenance mode test exceeds 24 hours, because the duration of the test minus 5 hours is an approximation of charge time. This information, t_{cd}, can then be used to approximate the portion of time that a device is assumed to spend in active and maintenance mode per day ($t_{a\&m}$) and is solely dedicated to maintenance mode.[21] The primary equation (i) that manufacturers will use to determine their product's unit energy consumption and whether their device complies with DOE's standards is below.

Primary Equation (i)

$$UEC = 365\left(n(E_{24} - 5P_m - E_{batt})\frac{24}{t_{cd}} + \left(P_m(t_{a\&m} - (t_{cd} - 5)n)\right) + (P_{sb}t_{sb}) + (P_{off}t_{off})\right)$$

Secondary Calculation of UEC

For some battery chargers, the equation described above is not appropriate and an alternative calculation is necessary. Specifically, in those cases where the charge test duration (as determined according to section 5.2 of Appendix Y to Subpart B of Part 430) minus 5 hours is multiplied by the number of charges per day (n) is greater than the time assumed in active and maintenance mode ($t_{a\&m}$), an alternative equation must be used. A different equation must be used because if the number of charges per day multiplied by the time it takes to charge (charge test duration minus 5 hours—or the charge time per day) is longer than the assumption for the amount of time spent in charge mode and maintenance mode per day, that difference creates an inconsistency between the measurements for the test product and DOE's assumptions. This problem can be corrected by using an alternative equation, which is shown below.

Secondary Equation (ii)

$$UEC = 365\left(n(E_{24} - 5P_m - E_{batt})\frac{24}{(t_{cd} - 5)} + (P_{sb}t_{sb}) + (P_{off}t_{off})\right)$$

This alternative equation (ii) resolves this inconsistency by prorating the energy used for charging the battery.

The final UEC equations generated several comments from the CEC. It asserted that the UEC equation fails to incentivize manufacturers to improve maintenance mode power in their products (California Energy Commission, No. 117 at p. 17). Specifically, in its view, UEC equation (i) would reward manufacturers of battery chargers with higher maintenance mode power, since maintenance mode power is subtracted from the estimated annual energy consumption (California Energy Commission, No. 117 at p. 22). Additionally, it stated that UEC equation (ii) is also flawed, as it does not account for the energy consumed by the maintenance mode of a product (California Energy Commission, No. 117 at p. 21). The CEC also concluded that the usage assumptions contain flaws, thereby introducing errors into the UEC calculation (California Energy Commission, No. 117 at p. 18). The CEC requested that DOE combine the alternative UEC equation with the main UEC equation, resulting in a single equation for calculating UEC. (California Energy Commission, No. 117 at p. 27).

While the CEC accurately noted there is a negative term related to maintenance mode power in the UEC equation when combined with the Product Class 2 usage profile, the primary and secondary UEC equations are not flawed and are both necessary. The usage profile for this product class simply reflects that the consumer benefits more greatly from improved charge efficiency rather than improved maintenance mode. The CEC concluded that manufacturers are incentivized to increase their maintenance mode power to reduce their UEC, but the CEC's conclusion neglects the fact that if maintenance mode power is increased, so would the 24-hour energy consumption. The value of 24-hour energy will increase by an amount equivalent to the maintenance mode power increase, multiplied by the difference between 24 and the time to charge the battery. Furthermore, if two units have all of the same performance parameters except for maintenance mode power consumption (*i.e.,* 24-hour

[21] For a test exceeding 24 hours, the duration of the test less 5 hours is equal to the time it took the battery being tested to become fully charged (t_{cd} − 5). That value, multiplied by the assumed number of charges per day, gives an estimate of charge (or active) time per day, which can then be subtracted from DOE's other assumption for $t_{a\&m}$. That difference is an approximation for maintenance mode time per day.

energy, standby mode power, and off mode power), it follows that the device with the higher maintenance mode power consumption is more efficient during charging. As mentioned, the usage profile for Product Class 2 suggests that, on average, users of these products will benefit more from an efficient charge rather than an efficient maintenance mode and, therefore, the unit with the higher maintenance mode power will have a lower UEC. More details on DOE's analysis for this conclusion can be found in Chapter 5 of the accompanying SNOPR TSD.

4. Battery Charger Candidate Standard Levels

After selecting its representative units for battery chargers, DOE examined the impacts on the cost of improving the efficiency of each of the representative units to evaluate the impact and assess the viability of potential energy efficiency standards. As described in the technology assessment and screening analysis, there are numerous design options available for improving efficiency and each incremental technology improvement increases the battery charger efficiency along a continuum. The engineering analysis develops cost estimates for several CSLs along that continuum.

CSLs are often based on (1) efficiencies available in the market; (2) voluntary specifications or mandatory standards that cause manufacturers to develop products at particular efficiency levels; and (3) the maximum technologically feasible level.[22]

Currently, there are no energy conservation standards for battery chargers. Therefore, DOE based the CSLs for its battery charger engineering analysis on the efficiencies obtainable through the design options presented previously (see section IV.A). These options are readily seen in various commercially available units. DOE selected commercially available battery chargers at the representative-unit battery voltage and energy levels from the high-volume applications identified in the market survey. DOE then tested these units in accordance with the DOE battery charger test procedure. For each representative unit, DOE then selected CSLs to correspond to the efficiency of battery charger models that were comparable to each other in most respects, but differed significantly in UEC (*i.e.* efficiency).

In general, for each representative unit, DOE chose the baseline (CSL 0) unit to be the one with the highest calculated unit energy consumption, and the best-in-market (CSL 2) to be the one with the lowest. Where possible, the energy consumption of an intermediate model was selected as the basis for CSL 1 to provide additional resolution to the analysis.

Unlike the previous three CSLs, CSL 3 was not based on an evaluation of the efficiency of individual battery charger units in the market, since battery chargers with maximum technologically feasible efficiency levels are not commercially available due to their high cost. Where possible, DOE analyzed manufacturer estimates of max-tech costs and efficiencies. In some cases, manufacturers were unable to offer any insight into efficiency level beyond the best ones currently available in the market. Therefore, DOE projected the efficiency of a max-tech unit by estimating the impacts of adding any remaining energy efficiency design options to the CSL unit analyzed.

On January 12, 2012, California proposed standards for small battery chargers, which the State eventually adopted.[23] The California standards are based on two metrics, one for 24-hour energy use, and one for the combined maintenance mode and standby mode power usage. DOE, using the usage profiles it developed to translate these standards into a value of UEC, compared its CSLs with the levels adopted by California. DOE found that, in most cases, the California proposed standards generally corresponded closely with one of DOE's CSLs for each product class when the standards were converted into a value of UEC (using DOE's usage profile assumptions). However, since the adoption of the CEC standards, DOE has attempted to adjust its CSLs to align with the CEC standards to the extent possible. For example if DOE's test and teardown approach resulted in a representative unit used to create CSL1 and the resulting CSL1 was slightly more stringent than DOE's translation of the CEC level, then DOE would shift CSL1 to be more stringent and to more closely align with the CEC's standard. This methodology is outlined in more detail in Chapter 5 of the accompanying SNOPR TSD. DOE seeks comment from stakeholders on this approach.

Table IV–3 below shows which CSL aligns most closely with the California standards for each product class.

TABLE IV–3—CSLS APPROXIMATE TO CALIFORNIA STANDARDS

Product class	CSL approximate to CEC standard
1 (Low-Energy, Inductive)	CSL 0
2 (Low-Energy, Low-Voltage)	CSL 1
3 (Low-Energy, Medium-Voltage).	CSL 1
4 (Low-Energy, High-Voltage)	CSL 1
5 (Medium-Energy, Low-Voltage).	CSL 2
6 (Medium-Energy, High-Voltage).	CSL 2
7 (High-Energy)	CSL 1

In addition, DOE received comments on specific CSLs for specific product classes. For Product Class 2 (low-energy, low-voltage) and Product Class 3 (low-energy, medium voltage) since stakeholders believed that intermediate CSLs that more closely align with the CEC's levels could be shown to be cost effective based on specific units in the marketplace that meet intermediate levels. Specifically, these stakeholders suggested modifying Product Class 2 to include a ''CSL 2.5'' and Product Class 3 to include a CSL ''1.8.'' (CA IOUs, No. 138 at p. 5–8; ASAP, No. 162 at p. 4, 6; NRDC, No. 114 at p. 5) NRDC and the CEC also both urged DOE to reconsider the analysis for Product Class 3 and develop an intermediate CSL between CSL 1 and CSL 2. (NRDC, No. 114 at p. 6; California Energy Commission, No. 117 at p. 12) Concerning Product Class 4, ARRIS asserted that setting the standard at TSL 1 (CSL 1) will have no major effect on energy savings since the majority of products already meet this level. (ARRIS Broadband 1, No. 90 at p. 3)

DOE also received comments regarding the specific limits chosen for Product Class 10. Schneider requested that DOE reconsider the proposed level set for CSL 2 and CSL 3, noting in particular that the product relied on by DOE to develop CSL2 was no longer on the market (Schneider, No. 119 at p. 4) Furthermore, Schneider requested that CSL 0 or CSL 1 be selected, stating that CSL 3 is speculative, if not impossible, in terms of feasibility. (Schneider, No. 119 at p. 4) Schneider requested that if CSL 2 is chosen, a 3-year compliance window from the date of the published final rule be set. (Schneider, No. 119 at p. 4) Regarding Product Class 10B,

[22] The ''max-tech'' level represents the most efficient design that is commercialized or has been demonstrated in a prototype with materials or technologies available today. ''Max-tech'' is not constrained by economic justification, and is typically the most expensive design option considered in the engineering analysis.

[23] The term ''small battery charger system'' is defined by the CEC as a battery charger system ''with a rated input power of 2 kW or less, and includes golf cart battery charger systems regardless of the output power.'' 20 Cal. Code 1602(w) (2014).

Schneider requested that DOE recalculate higher levels for CSL 0 and CSL 1 and that one of these levels be chosen with a 5-year compliance window from the date of the published final rule. (Schneider, No. 119 at p. 5, 6) NEMA argued that if the standards proposed in the NOPR were adopted, manufacturers would likely petition DOE for hardship exemptions. (NEMA, No. 134 at p. 5)

With the exception of the max tech level, the CSLs presented in the March 2012 NOPR for all product classes (including CSLs 2, 3, and 4), were based on commercially available products and the costs to reach these levels were independently verified by manufacturers and subject matter experts. For the SNOPR, DOE attempted to align at least one CSL in each product class subject to this proposed rule as closely as possible to the CEC standards to address comments to the NOPR suggesting that DOE create a new CSL that more closely aligns with the CEC levels. Additionally, as previously stated, DOE is no longer proposing standards for product class 10 because these products are now being considered as part of the Computer and Backup Battery Systems rulemaking. See 79 FR 41656. As such, comments related to product class 10 are no longer relevant to this rulemaking and DOE will not be addressing comments submitted in response to the NOPR for Product Class 10 in this SNOPR.

5. Test and Teardowns

The CSLs used in the battery charger engineering analysis were based on the efficiencies of battery chargers available in the market. Following testing, the units corresponding to each commercially available CSL were disassembled to (1) evaluate the presence of energy efficiency design options and (2) estimate the materials cost. The teardowns included an examination of the general design of the battery charger and helped confirm the presence of any of the technology options discussed in section IV.A

After the battery charger units corresponding to the CSLs were evaluated, they were torn down by IHS Technology (formerly iSuppli), a DOE contractor and industry expert. An in-depth teardown and cost analysis was performed for each of these units. For some products, like camcorders and notebook computers, the battery charger constitutes a small portion of the circuitry. In evaluating the related costs, IHS Technology identified the subset of components in each product enclosure responsible for battery charging. The results of these teardowns were then used as the primary source for the MSPs.

For this SNOPR engineering analysis, DOE continued to rely on its test and teardown data. Consequently, the test and teardown results reflected the current technologies on the market and did not attempt to predict which technological designs may become available in the future. Multiple interested parties criticized the test and teardown approach to the battery charger engineering because the market does not naturally push products to become just more efficient. Instead, improved efficiency is often a byproduct of other added utilities, such as making products smaller and lighter. These parties believed that DOE over-estimated its costs to achieve certain CSLs. (NRDC, No. 114 at p. 1: ASAP, No. 162 at p. 1: CA IOUs, No. 138 at p. 4)

Additionally, responding to the NOPR analyses, NRDC, the CA IOUs, NEEP, and ASAP suggested that DOE's engineering analysis for battery chargers should reflect a baseline in which the EPS that accompanies the battery charger is compliant with DOE's (then) future regulations for EPSs. (NRDC, No. 114 at p. 4; CA IOUs, No. 138 at pp. 7, 8; ASAP, et al., No. 136 at p. 7; ASAP, No. 162 at p. 1, 5) One interested party also stated that DOE should ensure that the units it uses to represent higher battery charger CSLs should incorporate EPSs that meet future standards because those EPSs are cost-effective. (NEEP, No. 144 at p. 2) Finally, one interested party suggested that DOE overstated the costs of complying with higher efficiency standards because it tore down units rather than explicitly making modifications to the EPSs of less efficient battery chargers, thereby failing to capture potentially cost-effective savings of EPS improvements. (ASAP, et al., No. 136 at p. 4)

The first two points made by interested parties are similar and both points suggest that DOE modify CSLs to account for future EPS regulations. However, DOE notes that not all battery chargers will incorporate an EPS that is, or will be, subject to efficiency regulations. For that reason, the baseline efficiency and all higher efficiency levels that DOE analyzes are not required to reflect a combination of technologies that includes an EPS that meets the higher efficiency levels that will apply to certain classes of EPSs in 2016. Regarding the assertions that DOE has overstated its costs by using a test and teardown approach, as mentioned above, not all battery chargers will necessarily have to incorporate a more efficient EPS as a result of any new standards for those products. In fact, such an assumption would have the effect of steepening a cost-efficiency curve. If DOE were to assume that the EPS must be improved in all battery charger systems, then DOE would be removing a design path that battery charger manufacturers could potentially take. This would have the effect of making incremental improvements to performance more costly because it removes a degree of freedom from battery charger manufacturers. The test and teardown approach has the benefit of not eliminating any practicable design options from the analysis. This approach is technology neutral, and although DOE does provide an analysis of the technologies that were used in the products that it tore down, that does not mean that is the only design path to achieve that performance level. Instead, it is a reflection of the choices that various battery charger manufacturers are currently making to improve the performance of their products.

Finally, DOE verified the accuracy of the IHS Technology results by reviewing aggregated results with individual manufacturers during interviews and subject matter experts. As discussed later, DOE performed additional manufacturer interviews for the NOPR and during these interviews, the initial IHS Technology results were again aggregated and reviewed with manufacturers. DOE believes that it has sufficiently verified the accuracy of its teardown results and believes that all of the engineering costs gleaned from IHS Technology are appropriate.

6. Manufacturer Interviews

The engineering analysis also relies in part on information obtained through interviews with several battery charger manufacturers. These manufacturers consisted of companies that manufacture battery chargers and original equipment manufacturers (OEMs) of battery-operated products who package (and sometimes design, manufacture, and package) battery chargers with their end-use products. DOE followed this interview approach to obtain data on the possible efficiencies and resultant costs of consumer battery chargers. Aggregated information from these interviews is provided in Chapter 5 of the SNOPR TSD. The interviews also provided manufacturer inputs and comments in preparing the manufacturer impact analysis, which is discussed in detail in section IV.J.

DOE attempted to obtain teardown results for all of its product classes, but encountered difficulties in obtaining useful and accurate teardown results for one of its products classes—namely, Product Class 1 (*e.g.,* electric toothbrushes). For this product class, DOE relied heavily on information obtained from manufacturer interviews. DOE found that when it attempted to teardown Product Class 1 devices, most contained potting (*i.e.,* material used to waterproof internal electronics). Removal of the potting also removed the identifying markings that IHS Technology needed to estimate a cost for the components. As a result, manufacturer interview data helped furnish the necessary information to assist DOE in estimating these costs.

7. Design Options

Design options are technology options that remain viable for use in the engineering analysis after applying the screening criteria as discussed above in section IV.B. DOE notes that all technology options that are not eliminated in the screening analysis, section IV.B, become design options that are considered in the engineering analysis. Most CSLs, except for those related to max-tech units and chargers falling in Product Class 1 and Product Class 6, where DOE did not tear down units, are based on actual teardowns of units manufactured and sold in today's battery charger market. Consequently, DOE did not control which design options were used at each CSL. No technology options were preemptively eliminated from use with a particular product class. Similarly, if products are being manufactured and sold, DOE believes that fact indicates the absence of any significant loss in utility, such as an extremely limited operating temperature range or shortened cycle-life. Therefore, DOE believes that all CSLs can be met with technologies that are feasible and that fit the intended application. Details on the technology associated with each CSL can be found in Chapter 5 of the accompanying SNOPR TSD.

For the max-tech designs, which are not commercially available, DOE developed these levels in part with a focus on maintaining product utility as projected energy efficiency improved. Although some features, such as decreased charge time, were considered as added utilities, DOE did not assign any monetary value to such features. Additionally, DOE did not assume that such features were undesirable, particularly if the incremental improvement in performance causes a significant savings in energy costs. Finally, to the extent possible DOE considered durability, reliability, and other performance and utility-related features that affect consumer behavior. See SNOPR TSD, Chapter 5 for additional details.

In response to the NOPR engineering analysis, DOE received multiple comments on design options that were not mentioned in DOE's analysis. ECOVAECOVA argued that more efficient nickel-based charger designs exist and should be considered for determining costs of standards. Its comments also noted, however, that no commercially available products use these more efficient designs. (ECOVAECOVA, No. 97 at p. 1) The CEC and ASAP suggested that DOE consider designs presented by ECOVAECOVA that demonstrated the higher efficiency levels that are possible when compared to what is currently available in the marketplace for nickel-based designs. (California Energy Commission, No. 117 at p. 2; Transcript, No. 104 at p. 256; ASAP, *et al.*, No. 136 at p. 8) The California Investor-Owned Utilities (''CA IOUs'') made a similar comment, stating that a teardown and redesign of Product Class 4 shows the previously proposed CSL 2 to be cost effective. (CA IOUs, No. 138 at p. 9) NRDC and NEEP also argued that DOE overestimated the costs to improve efficiency in Product Classes 2–6, stating that DOE's representative units do not use the most cost-effective designs to achieve proposed and that the previously proposed CSL 2 in Product Class 3 could be achieved with a battery chemistry other than lithium. (NRDC, No. 114 at p. 3; NEEP, No. 144 at pp. 1–2) Southern California Edison (SCE) similarly stated that the reason no nickel-based chargers that meet the previously proposed CSL 2 for Product Classes 2–4 have been found is that strong market forces discourage the development of efficient nickel chargers and, therefore, the current market is an ineffective place to identify high efficiency designs. (SCE, No. 164 at p. 1) Finally, SCE stated that current charge rates seen in the previously proposed CSL 1 for Product Classes 2–4 can be 3–12 times lower while still maintaining a full charge. (SCE, No. 164 at p. 2)

In response to public comments made by ECOVAECOVA at the NOPR public meeting, PTI, AHAM and CEA, challenged the idea that lower maintenance mode power levels could be achieved. PTI noted that the CEC standards are not achievable for battery chargers that charge nickel-cadmium (Ni-Cd) or nickel-metal-hydride (Ni-MH) cells and that ECOVAECOVA's claims fail to meet any possible criteria for technical feasibility. (PTI, No. 133 at p. 2) AHAM similarly noted that ECOVAECOVA's claims neglect the requirement of nickel-based chemistries that they be maintained at a high charge due to the secondary recombination reaction that occurs in sealed cells, which affects state of charge and the life of the battery cells. (AHAM, No. 124 at p. 3) However, SCE separately noted that the recombination reaction is important to account for during the charge cycle (or active mode charging) but accounting for this reaction does not need to persist in maintenance mode. It added that the current calculated for the CEC standard level is sufficient. (SCE, No. 164 at p. 2) Finally, PTI, AHAM, and CEA jointly stated that ECOVA's suggested design modifications are technically infeasible, resulting in reduced battery lifetimes, and that adopting efficiency levels at the stringency suggested by ECOVA would effectively eliminate Ni-Cd products with battery energies above 20Wh. (PTI, AHAM, CEA, No. 161 at p. 3)

DOE based its analysis on commercially available products when establishing candidate standard levels for Product Classes 2–6. Through extensive testing, discussion with SMEs, and market research, DOE found that manufacturers have already moved away from nickel-based systems, to lithium-based systems, partly as a means of improving efficiency (lithium also offers other benefits to consumers, such as higher energy density and cycle life). This shift away from nickel-based systems is due, in part, to the fact that these systems have to counteract secondary reactions within the battery cells, which result in self-discharge—which, in turn, shortens battery life. To counteract this, nickel-based chargers must have a certain level of maintenance mode power to preserve a full (100%) charge and maintain consumer utility. (Lithium-based systems experience similar reactions, but with much lower levels of self-discharge and can reach much lower power levels in maintenance mode.) DOE has updated this analysis to focus on improved nickel-based battery chargers and through further testing and teardowns conducted as part of this SNOPR, found that designs similar to ECOVA's proposed design are being implemented and sold into the market. These already-available designs suggest that improvements to nickel-based designs may be a feasible option in certain cases for manufacturers to employ to meet their utility requirements and improve the energy efficiency of their battery chargers. Accordingly, DOE has updated the proposed CSLs and found that deploying solely lithium-based systems would not necessarily be required to meet the proposed levels.

DOE received further comments from stakeholders concerning the costs associated with moving from nickel to lithium designs rather than to more efficient nickel designs. NRDC and CEC commented that by using lithium designs, the actual costs of moving from the previously proposed CSL 1 to CSL 2 in Product Class 3 are over stated. (NRDC, Pub. Mtg. Tr., No. 104 at p. 57: NRDC, No. 114 at p. 5) NRDC and CEC claimed that this same argument applies to Product Classes 2–6 and that the costs for all of these product classes are overstated and inaccurate. (California Energy Commission, No. 117 at p. 7, 12, 13: NRDC, No. 114 at p. 5) When considering design solutions and paths, DOE relied heavily on information provided by manufacturers during interviews. However, DOE has conducted additional testing and market research in response to these comments. DOE found that while many lithium-based systems have been introduced into the market, there are also many products deploying nickel-based battery charging systems with minor updates that reduce maintenance mode and overall energy use at a lower cost than some lithium designs. The costs used in this SNOPR reasonably reflect real world design changes and the feasibility and cost of such changes have been corroborated by manufacturers and subject matter experts.

Finally, DOE received comments from GE Healthcare and Schumacher noting that outside elements may prevent them from pursuing certain design pathways for their respective products. GE Healthcare commented that there are medical devices which are deployed in adverse conditions, extreme temperatures, or gaseous environments which may prevent certain types of battery chemistries from being used. (GE Healthcare, No. 142 at p. 2) Schumacher commented that certain design patents held by their competition prevent them from deploying switch mode designs in their engine-start automotive battery chargers. (Schumacher, No. 143 at p. 4) As noted earlier, DOE is not proposing to set standards that would affect medical battery chargers. More generally in response to both comments, DOE notes that if a manufacturer finds that meeting the standard for battery chargers would cause special hardship, inequity, or unfair distribution of burdens, the manufacturer may petition the Office of Hearings and Appeals (OHA) for exception relief or exemption from the standard pursuant to OHA's authority under section 504 of the DOE Organization Act (42 U.S.C. 7194), as implemented at subpart B of 10 CFR part 1003. OHA has the authority to grant such relief on a case-by-case basis if it determines that a manufacturer has demonstrated that meeting the standard would cause hardship, inequity, or unfair distribution of burdens.

8. Cost Model

This proposed rule continues to apply the same approach used in the NOPR and preliminary analysis to generate the manufacturer selling prices (MSPs) for the engineering analysis. For those product classes other than Product Class 1, DOE's MSPs rely on the teardown results obtained from IHS Technology. The bills of materials provided by IHS Technology were multiplied by a markup based on product class. For those product classes for which DOE could not estimate MSPs using the IHS Technology teardowns–Product Class 1–DOE relied on aggregate manufacturer interview data. Additional details regarding the cost model and the markups assumed for each product class are presented in Chapter 5 of the SNOPR TSD.

DOE's cost estimates reflect real world costs and have been updated where necessary for this SNOPR. The CA IOUs asserted that the methodology used to derive costs was fundamentally flawed and overestimated BOM costs. (CA IOUs, No. 138 at p. 11) DOE disagrees. The primary benefit to the teardown approach is that it relies on real-world designs and reflects practices and approaches that manufacturers are currently using to improve product performance. As a result, DOE's estimates are based on actual pricing and cost data for the various components and manufacturing technologies employed by industry. Additionally, by applying this method, DOE can examine battery chargers used in multiple applications, which allows its estimated costs to reflect various constraints and manufacturer choices. All of these factors weigh in favor of the teardown approach, which is more likely to provide a reasonable approximation of the costs involved to produce a given battery charger with a particular set of features and efficiency level than other methods that do not account for these factors.

DOE also received comments during the NOPR public meeting regarding the possible decline in the cost of lithium batteries and the effects that this decline could have on the cost model. NRDC asserted that DOE had not factored in the rapid decline in the cost of lithium batteries that DOE itself has shown in its own cost projections. (NRDC, Pub. Mtg. Tr, No. 104 at p. 58) DOE understands that commodity prices fluctuate for emerging technologies and they can decrease over time, perhaps even during the course of the analysis period. However, lithium-based battery chargers in consumer products have not experienced as sharp a decline as the cost for lithium batteries in other applications, such as those used for electric vehicles, mainly because of the scale and size of those systems. Without more substantive data that specifically addresses lithium batteries and lithium-based battery chargers for the consumer market, DOE chose to base its analysis on stable indicators rather than data prone to market fluctuations, such as lithium prices are. Furthermore, commodity prices can fluctuate for any number of reasons, potentially resulting in adverse effects on consumers.

9. Battery Charger Engineering Results

The results of the engineering analysis are reported as cost-efficiency data (or ''curves'') in the form of MSP (in dollars) versus unit energy consumption (in kWh/yr). These data form the basis for this SNOPR analyses. This section illustrates the results that DOE obtained for all seven product classes in its engineering analysis.

DOE received several comments supporting the Product Class 1 engineering results in the NOPR. (NRDC. No. 114 at p. 8; California Energy Commission, No. 117 at p. 28) No changes were made to the engineering results for Product Class 1 and the results are shown below in Table IV–4.

TABLE IV–4—PRODUCT CLASS 1 (INDUCTIVE CHARGERS) ENGINEERING ANALYSIS RESULTS

	CSL 0	CSL 1	CSL 2	CSL 3
CSL Description	Baseline	Intermediate	Best in Market	Max Tech
24-Hour Energy (Wh)	26.7	19.3	10.8	5.9
Maintenance Mode Power (W)	1.2	0.8	0.4	0.2
No-Battery Mode Power (W)	0.5	0.4	0.2	0.1

TABLE IV–4—PRODUCT CLASS 1 (INDUCTIVE CHARGERS) ENGINEERING ANALYSIS RESULTS—Continued

	CSL 0	CSL 1	CSL 2	CSL 3
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	8.73	6.10	3.04	1.29
MSP [$]	$2.05	$2.30	$2.80	$6.80

DOE received several comments regarding costs for Product Class 2 in response to the NOPR. NRDC, CEC, and the CA IOUs all claimed that the projected costs for Product Class 2 were incorrect and did not reflect real world costs. (NRDC, No. 114 at p. 5; California Energy Commission, No. 117 at p. 10, 11; CA IOUs, No. 138 at p. 4) DOE has updated its analysis and discussion for this product class. See Chapter 5 of the accompanying Chapter 5 of the SNOPR TSD.

DOE also received specific comments about how it derived its costs for Product Classes 2, 3, and 4. ASAP and NEEP requested that DOE explain how these costs were derived and identify which units were used. (ASAP, No. 162 at p. 2–7; NEEP, No. 160 at p. 1) For the SNOPR analysis, DOE used the representative unit cost associated with a single unit with a BOM that can be found in Appendix 5B of the SNOPR TSD. For the instances where a representative unit was created to be approximate to the CEC standard, BOM costs were used as well. Further detail on these costs and representative units can be found in Chapter 5 and Appendix 5B of the accompanying SNOPR TSD.

Based on further analysis, DOE adjusted the results for Product Class 2. These adjusted results are shown in the Table IV–5. More details on these updates can be found in Chapter 5 of the accompanying SNOPR TSD.

TABLE IV–5—PRODUCT CLASS 2 (LOW-ENERGY, LOW-VOLTAGE) ENGINEERING ANALYSIS RESULTS

	CSL 0	CSL 1	CSL 2	CSL 3	CSL 4
CSL Description	Baseline	Intermediate	2nd Intermediate	Best in Market	Max Tech
24-Hour Energy (Wh)	25.79	13.6	8.33	8.94	6.90
Maintenance Mode Power (W)	1.1	0.5	0.13	0.1	0.04
No-Battery Mode Power (W)	0.3	0.3	0.03	0.02	0.10
Off-Mode Power (W)	0.0	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	5.33	3.09	1.69	1.58	1.11
MSP [$]	$1.16	$1.20	$1.49	$2.43	$4.31

DOE also received several comments regarding costs used in the engineering analysis for Product Class 3. The CA IOUs noted that DOE may have omitted a component in one of the BOMs used to derive this CSL that may have led to the projected increase in cost between nickel and lithium battery chargers in Product Class 3. They also noted that this projected cost increase could have been part of the reason why costs were overestimated. (CA IOUs, No. 138 at p. 7) DOE revisited the IHS Technology data for these units and updated the cost data to include the missing component. However, this unit is no longer being used in the analysis. Additional testing and teardowns were completed for Product Class 3 to replace the analysis that previously relied on this no longer produced unit. Representative units and updated results for Product Class 3 are shown in the Table IV–6.

TABLE IV–6—PRODUCT CLASS 3 (LOW-ENERGY, MEDIUM-VOLTAGE) ENGINEERING ANALYSIS RESULTS

	CSL 0	CSL 1	CSL 2	CSL 3
CSL Description	Baseline	Intermediate	Best in Market	Max Tech
24-Hour Energy (Wh)	42.60	28.00	17.0	15.9
Maintenance Mode Power (W)	1.70	0.50	0.26	0.26
No-Battery Mode Power (W)	0.30	0.30	0.20	0.20
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	3.65	1.42	0.74	0.70
MSP [$]	$1.12	$1.20	$4.11	$5.51

Regarding Product Class 4, NRDC, the CEC, ASAP, and the CA IOUs argued that DOE overestimated the costs for some CSLs. (NRDC, No. 114 at p. 6; California Energy Commission, No. 117 at p. 14; ASAP, No. 162 at p. 7; CA IOUs, No. 138 at p. 8–9) ASAP urged DOE to remove the results for the handheld vacuum unit from the test results, since the costs for that unit are higher than the other products in that product class and may not reflect the lowest cost design. (ASAP Et Al., No. 136 at p. 8)

DOE has conducted more tests and teardowns since the NOPR analysis and has chosen single units as representative units for this product class. DOE believes each CSL is representative of technology that can be widely applied to all applications in this product class. The updated costs can be seen in Table IV–7.

TABLE IV—7 PRODUCT CLASS 4 (LOW-ENERGY, HIGH-VOLTAGE) ENGINEERING ANALYSIS RESULTS

	CSL 0	CSL 1	CSL 2	CSL 3
CSL Description	Baseline	Intermediate	Best in Market	Max
24-Hour Energy (Wh)	60.75	44.00	29.30	27.2
Maintenance Mode Power (W)	2.40	0.50	0.50	0.4
No-Battery Mode Power (W)	0.30	0.30	0.50	0.3
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	12.23	5.38	3.63	3.05
MSP [$]	$1.79	$2.60	$5.72	$18.34

For Product Class 6, DOE performed additional product testing during the NOPR stage, but did not obtain a complete data set upon which to base its engineering analysis. This situation was due in large part to DOE's inability to locate products with sufficiently similar battery energies and the fact that the products tested did not span a significant range of performance. DOE's test data for this product class are available in Chapter 5 of the accompanying SNOPR TSD. To develop an engineering analysis for this product class, DOE relied on, among other things, the results gleaned from Product Class 5, interviews with manufacturers, and its limited test data from Product Class 6.

The difference between Product Class 5 and Product Class 6 is the range of voltages that are covered. Product Class 5 covers low-voltage (less than 20 V) and medium energy (100 Wh to 3,000 Wh) products, while Product Class 6 covers high-voltage (greater than or equal to 20 V) and medium energy (100 Wh to 3,000 Wh) products. The representative unit examined for Product Class 5 is a 12 V, 800 Wh battery charger, while the representative unit analyzed for Product Class 6 is a 24 V, 400 Wh battery charger. Despite the change in voltage, DOE believes that similar technology options and battery charging strategies are available in both classes. Both chargers are used with relatively large sealed, lead-acid batteries in products like electric scooters and electric lawn mowers. However, since the battery chargers in Product Class 6 work with higher voltages, current can be reduced for the same output power, which creates the potential for making these devices slightly more efficient because I^2R losses[24] will be reduced.

DOE examined as part of its NOPR and this SNOPR its Product Class 5 results and analyzed how the performance may be impacted if similar technologies are used. The resulting performance parameters are shown in Table IV–8. To account for the projected variation in energy consumption, DOE used information on charge time and maintenance mode power to adjust the corresponding values for 24-hour energy use. Additionally, DOE discussed with manufacturers how costs may differ in manufacturing a 12 V (Product Class 5) charger versus a 24 V (Product Class 6) charger. Manufacturers indicated during manufacturer interviews that, holding constant all other factors, there would likely be minimal change, if any, in the cost. Therefore, because DOE scaled performance assuming that the designs for corresponding CSLs in each product class used the same design options and only differed in voltage, DOE did not scale costs from Product Class 5. Rather than scaling the Product Class 5 costs, DOE used the same MSPs for Product Class 6 that were developed from IHS Technology teardown data for Product Class 5. CEC and NRDC commented that while Product Classes 5 and 6 share the same costs, DOE should use lower cost estimates for units that are less powerful. (California Energy Commission, No. 117 at p. 16; NRDC, No. 114 at p. 7) DOE is not persuaded that lower cost estimates for less powerful units would accurately reflect costs for Product Classes 5 and 6 because this assertion is contrary to statements made during interviews with manufacturers during the NOPR stage of this analysis. Additionally, many of the battery chargers in Product Classes 5 and 6 are multi-voltage, multi-capacity chargers, therefore, costs typically reflecting component costs required to achieve the higher power range. Consequently, varying cost by power levels in the manner suggested by these commenters would be inappropriate. DOE believes these costs are an accurate representation of the MSPs, but seeks comment on its methodology in scaling the results of Product Class 5 to Product Class 6, including the decision to hold MSPs constant.

DOE received several comments in response to the NOPR regarding the engineering results for Product Classes 5 and 6. The CEC argued that manufacturers could meet CSL 3 without including a shut-off relay into the charger design and therefore the costs associated with CSL 3 are too high in DOE's analysis. (California Energy Commission, No. 117 at p. 16) CEC also commented that for these product classes, DOE's results show that units at the max tech levels, or CSL 3, perform worse in active mode efficiency levels in units lower than CSL 2. (California Energy Commission, No. 117 at p. 16)

For Product Classes 5 and 6, CSL 3 is the maximum technologically feasible level analyzed by DOE. By definition, these products were not found to be present in the market. The NOPR and Chapter 5 of the accompanying SNOPR TSD both indicate that manufacturers support non-novel improvements in improving the efficiency of the SCR (semiconductor rectifier) and switch mode topologies. However, these improvements would not result in compliance with CSL 3 and that only by introducing a relay to bring the non-active and maintenance mode energy use to zero could this level be met. Manufacturers and subject matter experts were consulted to verify the costs with making these changes. Concerning the drop in active mode efficiency identified by CEC, DOE found a calculation error in E24 use for these products that caused this error in the representative UEC values. The errors have been corrected and updated results can be seen in Table IV–8 and Table IV–9.

[24] At a basic level, I^2R losses are the power losses caused by the flow of an electrical current through a component's electrical resistance. In electrical circuits, I^2R losses manifest themselves as heat and are the result of high levels of current flow through a device.

TABLE IV–8—PRODUCT CLASS 5 (MEDIUM-ENERGY, LOW-VOLTAGE) ENGINEERING ANALYSIS RESULTS

	CSL 0	CSL 1	CSL 2	CSL 3
CSL Description	Baseline	Intermediate	Best in Market	Max Tech
24-Hour Energy (Wh)	2036.9	1647.3	1292.00	1025.64
Maintenance Mode Power (W)	21.2	11.9	0.50	0.0
No-Battery Mode Power (W)	20.1	11.6	0.30	0.0
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	84.60	56.09	21.39	9.11
Incremental MSP [$]	$18.48	$21.71	$26.81	$127.00

TABLE IV–9—PRODUCT CLASS 6 (MEDIUM-ENERGY, HIGH-VOLTAGE) ENGINEERING ANALYSIS RESULTS

	CSL 0	CSL 1	CSL 2	CSL 3
CSL Description	Baseline	Intermediate	Best in Market	Max Tech
24-Hour Energy (Wh)	891.6	786.1	652.00	466.20
Maintenance Mode Power (W)	10.6	6.0	0.50	0.0
No-Battery Mode Power (W)	10.0	5.8	0.30	0.0
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	120.60	81.72	33.53	8.15
Incremental MSP [$]	$18.48	$21.71	$26.81	$127.00

DOE received a comment from NRDC supporting the proposed standards for Product Class 7. (NRDC, No. 114 at p. 8) No other comments specific to DOE's costs for Product Class 7 were received and no changes were made to its results, which are presented in Table IV–10.

TABLE IV–10—PRODUCT CLASS 7 (HIGH-ENERGY) ENGINEERING ANALYSIS RESULTS

	CSL 0	CSL 1	CSL 2
CSL Description	Baseline	Intermediate	Max Tech
24-Hour Energy (Wh)	5884.2	5311.1	4860.0
Maintenance Mode Power (W)	10.0	3.3	2.6
No-Battery Mode Power (W)	0.0	1.5	0.0
Off-Mode Power (W)	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	255.05	191.74	131.44
Incremental MSP [$]	$88.07	$60.86	$164.14

DOE requests stakeholder comments on the updated engineering analysis results presented in this analysis for Products Classes 2–6.

10. Scaling of Battery Charger Candidate Standard Levels

In preparing its proposed standards for products within a product class (which would address all battery energies and voltages falling within that class), DOE used a UEC scaling approach. After developing the engineering analysis results for the representative units, DOE had to determine a methodology for extending the UEC at each CSL to all other ratings not directly analyzed for a given product class. In the NOPR, DOE proposed making UEC a function of battery energy. DOE also indicated that it based this proposed UEC function on the test data that had been obtained up through the NOPR.

For Product Classes 2–7, DOE created equations for UEC that scale with battery energy. In contrast, for Product Class 1, each CSL was represented by one flat, nominal standard. For this product class, test data showed that battery energy appeared to have little impact on UEC. In response to these data, DOE received comment from several interested parties, ITI, CEA, and NRDC, who requested that Product Class 1 be scaled similarly to the other product classes by battery energy. (ITI, No. 134 at p. 6, 7; ITI. Pub. Mtg. Tr., No. 104 at p. 46; CEA, No. 106 at p. 5; NRDC, No. 114 at p. 8) Similarly, Duracell suggested that if DOE declined to update its usage profile assumptions, discussed later in section IV.F, then DOE should maintain its current use assumptions and adopt the formula for determining the maximum UEC limit that was proposed for Product Class 2. (Duracell, No. 109 at p. 1) DOE found in testing that UEC for Product Class 1 did not vary with battery energy or voltage, so DOE opted to maintain its approach proposed in the NOPR to adopt a constant standard across all battery energies. No changes were made to the updated SNOPR TSD for the reasons stated above regarding the impact of battery energy on UECs that were calculated for Product Class 1.

Finally, when DOE was developing its CSL equations for UEC, it found during testing that the correlation between points at low battery energies was much worse than for the rest of the range of battery energy, which indicated that the initial equations DOE had initially planned to use did not match the test results. To address this situation, DOE generated a boundary condition for its CSL equations, which essentially flattens the UEC below a certain threshold of battery energy to recognize that below certain values, fixed power components of UEC, such as maintenance mode power, dominate UEC. Making this change helped DOE to create a better-fitting equation to account for these types of conditions to ensure that any standards that are set better reflect the particular characteristics of a given product.

The CEC and the CA IOUs commented on the use of boundary conditions in certain product classes. CEC requested that DOE, where possible, reduce the number of product classes by creating a single product class where the scaling and boundary condition transition seamlessly from one product class to the other. (California Energy Commission, No. 117 at p. 26, 29) While the CA IOUs were concerned that the boundary condition creates a scenario where voltage can be adjusted to exploit the standards for Product Classes 2–4, (CA IOUs, No. 138 at p. 20), DOE's approach separates product classes as described in Chapter 3 of the SNOPR TSD and section IV.A.3 of this SNOPR. When setting standards, this segregation of product classes should adequately address the natural groupings of products in the market. Accordingly, DOE made no changes to its proposed product class distinctions as part of its SNOPR analysis.

Concerning the scaling of specific product classes, DOE received several comments. Duracell commented that the standards for Product Class 1, inductive chargers, seem to underlay stricter standards than comparable products that are galvanic-coupled, such as Product Class 2. (Duracell, No. 109 at p. 1) NRDC and CEC both support DOE's engineering results and proposed standard for Product Class 1. (NRDC, No. 114 at p. 8; California Energy Commission, No. 117 at p. 28) DOE notes that Product Class 1, as stated above, is not scaled, which could give the mistaken impression that Product Class 1 has a stricter standard compared to other product class applications that allow for higher energy consumption as battery energy increased. However, as indicated in the NOPR, DOE determined that the UEC for this product class did not vary with battery energy or voltage, thereby eliminating the need to scale.

For additional details and the exact CSL equations developed for each product class, please see Chapter 5 in the accompanying SNOPR TSD.

D. Markups Analysis

The markups analysis develops appropriate markups in the distribution chain to convert the MSP estimates derived in the engineering analysis to consumer prices. At each step in the distribution channel, companies mark up the price of the product to cover business costs and profit margin. Given the variety of products that use battery chargers, distribution varies depending on the product class and application. As such, similar to the approach used in the NOPR, DOE assumed that the dominant path to market establishes the retail price and, thus, the markup for a given application. The markups applied to end-use products that use battery chargers are approximations of the battery charger markups.

In the case of battery chargers, the dominant path to market typically involves an end-use product manufacturer (*i.e.,* an original equipment manufacturer or ''OEM'') and retailer. DOE developed OEM and retailer markups by examining annual financial filings, such as Securities and Exchange Commission (SEC) 10–K reports, from more than 80 publicly traded OEMs, retailers, and distributors engaged in the manufacturing and/or sales of consumer applications that use battery chargers.

DOE calculated two markups for each product in the markups analysis. A markup applied to the baseline component of a product's cost (referred to as a baseline markup) and a markup applied to the incremental cost increase that would result from energy conservation standards (referred to as an incremental markup). The incremental markup relates the change in the MSP of higher-efficiency models (the incremental cost increase) to the change in the retailer's selling price.

Commenting on retail markups, Phillips, Schumacher, and Wahl Clipper stated that the concept of margins is very significant to retailers, and it is not realistic to predict that retailers will voluntarily reduce their profit margins. (Philips, No. 128 at p. 6; Schumacher, No. 182 at p. 6; Wahl Clipper, No 153 at p. 2) Motorola commented that retailers will not be willing to lower their markups because product efficiency has increased. (Motorola Mobility, No. 121 at p. 4) In contrast, PTI stated that DOE's estimates of markups are sufficient for the purposes of the analysis. (PTI, No. 133 at p. 6)

DOE recognizes that retailers may seek to preserve margins. However, DOE's approach assumes that appliance retail markets are reasonably competitive, so that an increase in the manufacturing cost of appliances is not likely to contribute to a proportionate rise in retail profits, as would be expected to happen if markups remained constant. DOE's methodology for estimating markups is based on a mix of economic theory, consultation with industry experts, and data from appliance retailers.[25] In conducting research, DOE has found that empirical evidence is lacking with respect to appliance retailer markup practices when a product increases in cost (due to increased efficiency or other factors). DOE understands that real-world retailer markup practices vary depending on market conditions and on the magnitude of the change in cost of goods sold (CGS) associated with an increase in appliance efficiency. DOE acknowledges that detailed information on actual retail practices would be helpful in evaluating changes in markups on products after appliance standards take effect. For this rulemaking, DOE requested data from stakeholders in support of alternative approaches to markups, as well as any data that shed light on actual practices by retailers; however, no such data were provided. Thus, DOE's analysis continues using an approach that is consistent with the conventionally-accepted economic theory of firm behavior in competitive markets.

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

E. Energy Use Analysis

The energy use analysis estimates the range of energy use of battery chargers in the field, *i.e.,* as they are actually used by consumers. The energy use analysis provides the basis for the other analyses DOE uses when assessing the costs and benefits of setting standards for a given product. Particularly dependent on the energy analysis are assessments of the energy savings and the savings in consumer operating costs that could result from the adoption of new or amended standards.

Battery chargers are power conversion devices that transform input voltage to a suitable voltage for the battery they are powering. A portion of the energy that flows into a battery charger flows out to a battery and, thus, cannot be considered to be consumed by the battery charger. However, to provide the necessary output power, other factors contribute to the battery charger energy consumption, *e.g.,* internal losses and overhead circuitry.[26] Therefore, the traditional method for calculating energy consumption—by measuring the energy a product draws from mains while performing its intended function(s)—is not appropriate for a battery charger because that method would not factor in the energy delivered

[25] An extensive discussion of the methodology and justification behind DOE's general approach to markups calculation is presented in Larry Dale, et al., ''An Analysis of Price Determination and Markups in the Air-Conditioning and Heating Equipment Industry.'' LBNL–52791 (2004). Available for download at *http://eetd.lbl.gov/sites/all/files/an_analysis_of_price_determiniation_and_markups_in_the_air_conditioning_and_heating_equipment_industry_lbnl-52791.pdf*≤

[26] Internal losses are energy losses that occur during the power conversion process. Overhead circuitry refers to circuits and other components of the battery charger, such as monitoring circuits, logic circuits, and LED indicator lights, that consume power but do not directly contribute power to the end-use application.

by the battery charger to the battery, and thus would overstate the battery charger's energy consumption. Instead, DOE considered energy consumption to be the energy dissipated by the battery chargers (losses) and not delivered to the battery as a more accurate means to determine the energy consumption of these products. Once the energy and power requirements of those batteries were determined, DOE considered them fixed, and DOE focused its analysis on how standards would affect the energy consumption of battery chargers themselves.

Applying a single usage profile to each application, DOE calculated the unit energy consumption for battery chargers. In addition, as a sensitivity analysis, DOE examined the usage profiles of multiple user types for applications where usage varies widely (for example, a light user and a heavy user).

In response to the NOPR, stakeholders suggested alternative usage profiles for two applications. Delta-Q recommended alternate usage profiles for golf cart battery chargers used in the residential and commercial sectors. These suggested usage profiles assumed higher levels of time in active and maintenance modes and no time in unplugged mode. (Delta-Q, No. 113 at p. 1) For the NOPR, DOE based its estimate of the golf cart usage profile on responses from the manufacturer interviews. The usage profile suggested by Delta-Q is consistent with the stakeholder-provided data that currently underlie DOE's golf cart battery charger usage profile. Based on these estimates, the usage profiles developed for the NOPR have accurately described usage for golf cart battery charges and no changes to the updated analysis were required.

Duracell recommended that DOE adopt one of three alternative approaches to capturing usage profiles and energy use for inductive battery chargers. (Duracell, No. 109 at p. 1) First, it requested that DOE allow each inductive battery charger manufacturer to apply use conditions based on the typical use of its products. However, DOE believes this approach to be infeasible, as it would be administratively burdensome for DOE with its limited resources to verify the individual usage profiles applied by each manufacturer for each product to determine compliance with the given standard. DOE notes that its proposed approach relies on usage profiles based on available data and provides a reasonable average usage approximation of the products falling within each proposed class. Second, Duracell asked DOE to adopt a revised usage profile that it believed would be more applicable to toothbrushes and shavers. DOE has based its estimate of the usage profile on responses from the manufacturer interviews and believes that it has accurately described usage for battery chargers in Product Classes 1 and 2, and did not make changes to these usage profiles for the SNOPR.

PTI and AHAM both voiced support for the usage profiles presented by DOE in the NOPR. PTI commented that DOE accurately captured variations in the commercial and residential use of power tools in its product class average usage profiles. (PTI, No. 133 at p. 3) While AHAM commented that DOE could more accurately capture the usage of infrequently used product classes, AHAM supported DOE's efforts to consider the variation in usage for battery chargers and recommended that DOE reevaluate these usage profiles in the future to more accurately quantify the usage profiles for infrequently charged products. (AHAM, No. 124 at p. 7) Based on these comments, DOE saw no need to alter its usage profiles.

Responding to the NOPR, the CEC submitted comments stating that it found inconsistencies between the NOPR TSD, energy use spreadsheet, and the NIA spreadsheet. These errors were with the CSL 0 and CSL 1 24-hour energy assumption and the average unit energy consumption estimates, particularly for battery charger Product Class 2. (California Energy Commission, No. 117 at p. 9)

In light of the CEC's observation, DOE reviewed its spreadsheet and confirmed that the energy use analysis contained an error in the 24-hour energy values for CSLs 0 and 1 for Product Class 2. DOE has since rectified this error, and revised the engineering and energy use analyses in its updated SNOPR TSD. The corrected 24-hour energy values resulted in a small increase in UECs in the energy use analysis.

F. Life-Cycle Cost and Payback Period Analyses

DOE conducted LCC and PBP analyses to evaluate the economic impacts on individual consumers from potential battery charger energy conservation standards. 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 an estimate of the base-case product efficiency distribution. The base case distribution reflects the market in the absence of new or amended energy conservation standards, including market trends for products that exceed the current energy conservation standards. In contrast, the PBP 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 consumers. For each sampled consumer, DOE determined the energy consumption for the battery charger and the appropriate electricity price. By developing a representative sample of consumers, the analysis captured the variability in energy consumption and energy prices associated with the use of battery chargers.

Inputs to the calculation of total installed cost include the cost of the product—which includes MSPs, 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, which incorporates Crystal Ball™ (a commercially-available software program), relies on a Monte Carlo simulation to incorporate uncertainty and variability into the analysis. The Monte Carlo simulations randomly sample input values from the probability distributions and battery charger user samples. The model calculated the LCC and PBP for products at each efficiency level for 10,000 consumers per simulation run.

DOE calculated the LCC and PBP for all consumers as if each were to purchase a new product in the year that compliance with any amended standards is expected to be required. Any national standards would apply to battery chargers manufactured 2 years after the date on which any final amended standard is published. For this SNOPR, DOE estimates publication of a final rule in 2016. Therefore, for purposes of its analysis, DOE used 2018 as the first year of compliance with any amended standards.

Table IV–11 summarizes the approach and data that DOE used to derive the inputs to the LCC and PBP calculations for the NOPR and the changes made for this SNOPR. The subsections that follow provide further discussion on these inputs and the comments DOE received regarding its presentation of the LCC and PBP analyses in the NOPR, as well as DOE's responses. Details of the spreadsheet model, and of all the inputs to the LCC and PBP analyses, are contained in chapter 8 and its appendices of the SNOPR TSD.

TABLE IV–11—SUMMARY OF INPUTS AND METHODS FOR THE NOPR AND SNOPR LCC AND PBP ANALYSES

Inputs	March 2012 NOPR	Changes for the SNOPR
Manufacturer Selling Price.	Derived from the Engineering Analysis through manufacturer interviews and test/teardown results.	Adjusted component breakdowns and prices based on updated cost data from IHS Technology and SME feedback for Product Classes 2 through 6.
Markups	Considered various distribution channel pathways for different applications. Applied a reduced "incremental" markup to the portion of the product price exceeding the baseline price. See Chapter 6 of the SNOPR TSD for details.	No change.
Sales Tax	Derived weighted-average tax values for each Census division and large state from data provided by the Sales Tax Clearinghouse.[1]	Updated the sales tax using the latest information from the Sales Tax Clearinghouse.[2]
Installation Costs	Assumed to be zero	No change.
Annual Energy Use	Determined for each application based on battery characteristics and usage profiles..	No change.
Energy Prices	Price: Based on EIA's 2008 Form EIA–861 data.[3] Variability: Regional energy prices determined for 13 regions. DOE also considered subgroup analyses using electricity prices for low-income consumers and top tier marginal price consumers.	Updated to EIA's 2012 Form EIA–861 data.[4] Separated top tier and peak time-of-use consumers into separate subgroup analyses.
Energy Price Trends	Forecasted with EIA's Annual Energy Outlook 2010[5]	Updated with EIA's Annual Energy Outlook 2014.[6]
Repair and Maintenance Costs.	Assumed to be zero	No change.
Product Lifetime	Determined for each application based on multiple data sources See chapter 3 of the SNOPR TSD for details..	No change.
Discount Rates	Residential: Approach based on the finance cost of raising funds to purchase and operate battery chargers either through the financial cost of any debt incurred (based on the Federal Reserve's Survey of Consumer Finances data[7] for 1989, 1992, 1995, 1998, 2001, 2004, and 2007) or the opportunity cost of any equity used. Time-series data was based on geometric means from 1980–2009. Commercial: Derived discount rates using the cost of capital of publicly-traded firms based on data from Damodaran Online,[8] the Value Line Investment survey,[9] and the Office of Management and Budget (OMB) Circular No. A–94.[10] DOE used a 40-year average return on 10-year treasury notes to derive the risk-free rate. DOE updated the equity risk premium to use the geometric average return on the S&P 500 over a 40-year time period.	Residential: DOE updated the calculations to consider the geometric means for all time-series data from 1984–2013. DOE added data from the Federal Reserve's Survey of Consumer Finances for 2010. Commercial: DOE updated all sources to the most recent version (Damodaran Online and the OMB Circular No. A–94).
Sectors Analyzed	All reference case results represent a weighted average of the residential and commercial sectors.	No change.
Base Case Market Efficiency Distribution.	Where possible, DOE derived market efficiency distributions for specific applications within a product class.	No change.
Compliance Date	2013	2018.

[1] The four large States are New York, California, Texas, and Florida.

[2] Sales Tax Clearinghouse, Aggregate State Tax Rates. Available at: *https://thestc.com/STRates.stm.*

[3] U.S. Department of Energy. Energy Information Administration. Form EIA–861 Final Data File for 2008. May, 2014. Washington, D.C. Available at: *http://www.eia.doe.gov/cneaf/electricity/page/eia861.html.*

[4] U.S. Department of Energy. Energy Information Administration. Form EIA–861 Final Data File for 2012. September, 2012. Washington, D.C. Available at: *http://www.eia.doe.gov/cneaf/electricity/page/eia861.html.*

[5] U.S. Department of Energy. Energy Information Administration. Annual Energy Outlook 2010. November, 2010. Washington, D.C. Available at: *http://www.eia.doe.gov/oiaf/aeo/.*

[6] U.S. Department of Energy. Energy Information Administration. Annual Energy Outlook 2014. April, 2014. Washington, D.C. Available at: *http://www.eia.gov/forecasts/aeo/.*

[7] The Federal Reserve Board, Survey of Consumer Finances. Available at: *http://www.federalreserve.gov/pubs/oss/oss2/scfindex.html.*

[8] Damodaran Online Data Page, *Historical Returns on Stocks, Bonds and Bills—United States, 2010.* Available at: *http://pages.stern.nyu.edu/~adamodar.*

[9] Value Line. Value Line Investment Survey. Available at: *http://www.valueline.com.*

[10] U.S. Office of Management and Budget. Circular No. A–94. Appendix C. 2009. Available at: *http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/.*

1. Product Cost

a. Manufacturer Selling Price

In the preliminary analysis, DOE used a combination of test and teardown results and manufacturer interview results to develop MSPs. DOE conducted tests and teardowns on a large number of additional units and applications for the NOPR, and incorporated these findings into the MSP. For the SNOPR, DOE adjusted component breakdowns and prices based on updated cost data from IHS Technology (formerly i-Suppli) and SME feedback for Product Classes 2, 3, 4, 5 and 6. DOE adjusted its MSPs based on these changes. Further detail on the MSPs can be found in chapter 5 of the SNOPR TSD.

Examination of historical price data 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 (such as battery chargers), DOE would consider these data to forecast future trends.

To forecast a price trend for the NOPR, DOE considered the experience curve approach, in which an experience rate parameter is derived using two historical data series on price and cumulative production. But in the absence of historical shipments of battery chargers and sufficient historical Producer Price Index (PPI) data for small electrical appliance manufacturing from the U.S. Department of Labor's Bureau of Labor Statistics' (BLS),[27] DOE could not use this approach. This situation is partially due to the nature of battery charger designs. Battery chargers are made up of many electrical components whose size, cost, and performance rapidly change, which leads to relatively short design lifetimes. DOE also considered performing an exponential fit on the deflated AEO's Projected Price Indexes that most narrowly include battery chargers. However, DOE believes that these indexes are sufficiently broad that they may not accurately capture the trend for battery chargers. Furthermore, battery chargers are not typical consumer products; they more closely resemble commodities that OEMs purchase.

Given the uncertainty involved with these products, DOE did not incorporate product price changes into the NOPR analysis and is not including them in this SNOPR. For the NIA, DOE also analyzed the sensitivity of results to two alternative battery charger price forecasts. Appendix 10–B of the SNOPR TSD describes the derivation of alternative price forecasts.

b. Markups

DOE applies a series of markups to the MSP to account for the various distribution chain markups applied to the analyzed product. These markups are evaluated for each application individually, depending on its path to market. Additionally, DOE splits its markups into ''baseline'' and ''incremental'' markups. The baseline markup is applied to the entire MSP of the baseline product. The incremental markups are then applied to the marginal increase in MSP over the baseline's MSP. Further detail on the markups can be found in chapter 6 of the SNOPR TSD.

c. Sales Tax

As in the NOPR, DOE obtained State and local sales tax data from the Sales Tax Clearinghouse. The data represented weighted averages that include county and city rates. DOE used the data to compute population-weighted average tax values for each Census division and four large States (New York, California, Texas, and Florida). For the SNOPR, DOE retained this methodology and used updated sales tax data from the Sales Tax Clearinghouse.[28] DOE also obtained updated population estimates from the U.S. Census Bureau for this SNOPR.[29]

d. Product Price Forecast

As noted in section IV.F, to derive its central estimates DOE assumed no change in battery charger prices over the 2018–2047 period. In addition, DOE conducted a sensitivity analysis using two alternative price trends based on AEO price indexes. These price trends, and the NPV results from the associated sensitivity cases, are described in appendix 10–B of the SNOPR TSD.

2. Installation Cost

As detailed in the NOPR, DOE considered installation costs to be zero for battery chargers because installation would typically entail a consumer simply unpacking the battery charger from the box in which it was sold and connecting the device to mains power and its associated battery. Because the cost of this ''installation'' (which may be considered temporary, as intermittently used devices might be unplugged for storage) is not quantifiable in dollar terms, DOE considered the installation cost to be zero.

DOE received comments responding to its installation cost methodology. NEMA asserted that the results of the LCC cost and PBP analysis did not accurately reflect the impact to industry as the cost of implementation was consistently underestimated, resulting in an overestimation of savings. NEMA noted that the LCC and PBP calculations did not include installation costs and the cost of implementation failed to include safety and reliability regression testing. In its view, this testing ensures the long term intended efficiency gains resulting from changes made to address the limits. NEMA criticized the proposed scope as being too broad and the limits too severe, both of which would force manufacturers to withdraw systems from the marketplace until testing is concluded. NEMA asserted that shipping cycle times also impact the availability in the marketplace; some of these products are already sourced from Asia where a 90-day cycle time for shipping by ocean is a necessity due to the low margins associated with consumer products. (NEMA, No. 134 at p. 2) NEEA pointed out that the LCC focuses on incremental costs, rather than overall costs. It noted that it would be very difficult to find data supporting an installation cost that increases with increasing efficiency levels. (NEEA, Pub. Mtg. Transcript, No. 104 at p. 200)

NEMA did not give examples of systems which may be removed from the market as a result of safety and reliability testing. In addition, LCC analysis calculations only take into account the cost to consumers across the lifetime of the product. Safety and reliability regression testing would not be a cost to the consumer, but rather a cost to the manufacturer. The MIA accounts for safety and reliability regression testing as it is already incorporated into their product conversion costs. Adding these costs to the LCC calculations would inaccurately

[27] Series ID PCU33521–33521; *http://www.bls.gov/ppi/*.

[28] Sales Tax Clearinghouse, Aggregate State Tax Rates. *https://thestc.com/STRates.stm*.

[29] The U.S. Census Bureau. Annual Estimates of the Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2013. *http://www.census.gov/popest/data/state/totals/2013/tables/NST-EST2013-01.xls*.

inflate the impact of these costs by effectively accounting for them twice in the analysis. DOE agrees with the comments made by NEEA, as any installation costs would likely be constant across all battery charger efficiency levels and would have no impact when comparing LCCs between CSLs in the analysis. Accordingly, DOE maintained its assumption that zero installation costs would continue to apply.[30]

3. Annual Energy Consumption

The SNOPR analysis uses the same approach for determining UECs as the approach used in the NOPR. The UEC was determined for each application based on battery characteristics and usage profiles. As a result of new testing and teardowns, described above, DOE updated some or all of the UEC values for battery charger Product Classes 2, 3, 4, 5 and 6 for the SNOPR. The same approach and equations used to calculate the representative unit UECs remain consistent with the NOPR. Further detail on the UEC calculations can be found in section IV.E of this notice and in chapter 7 of the SNOPR TSD.

4. Energy Prices

DOE determined energy prices by deriving regional average prices for 13 geographic areas consisting of the nine U.S. Census divisions, with four large States (New York, Florida, Texas, and California) treated separately. The derivation of prices was based on the latest available EIA data, covering 2012. In the NOPR analysis, DOE used data from EIA's *Annual Energy Outlook* (*AEO*) *2010* to project electricity prices to the end of the product lifetime.[31] For this SNOPR, DOE used the final release of the *AEO2014,*[32] which contained reference, high- and low-economic-growth scenarios. DOE received no comments on the electricity price forecasts it used in its NOPR analyses.

[30] DOE notes that ''installation costs'' are not the same as ''installed costs.'' ''Installation costs'' refer to the costs incurred to install a given product—in this case, to plug the charger into the electrical outlet in order to use it. In contrast, ''installed costs'' refer to the costs incurred to obtain and use the product. These costs, as noted earlier, include the cost of the product—which includes MSPs, manufacturer markups, retailer and distributor markups, and sales taxes—as well as any installation costs that might apply.

[31] U.S. Department of Energy. Energy Information Administration. Annual Energy Outlook 2010. November, 2010. Washington, DC *http://www.eia.gov/forecasts/aeo/*.

[32] U.S. Department of Energy. Energy Information Administration. Annual Energy Outlook 2014. May, 2014. Washington, DC *http://www.eia.gov/forecasts/aeo/*.

5. Repair and Maintenance Costs

In the NOPR analysis, DOE did not consider repair or maintenance costs for battery chargers. In making this decision, DOE recognized that in some cases the service life of a stand-alone battery charger typically exceeds that of the consumer product it powers. Furthermore, DOE noted that the cost to repair the battery charger might exceed the initial purchase cost, as these products are relatively low cost items. Thus, DOE estimated that it would be extremely unlikely that a consumer would incur repair or maintenance costs for a battery charger. Also, if a battery charger failed, DOE expects that consumers would typically discard the battery charger and purchase a replacement. DOE received no comments challenging this assumption and has continued relying on this assumption for purposes of calculating the SNOPR's potential costs and benefits.

Although DOE did not assume any repair or maintenance costs would apply generally to battery chargers, DOE included a maintenance cost for the replacement of lithium ion batteries in certain battery charger applications in the NOPR analysis. Through conversations with manufacturers and subject matter experts, DOE learned that such batteries would need replacing within the service life of the battery charger for certain applications based on the battery lifetime and the usage profile assigned to the application. Lithium ion batteries are marginally more expensive than batteries with nickel chemistries (*e.g.* ''Ni-MH''), as explained in chapter 5 of accompanying SNOPR TSD. The NOPR analysis accounted for this marginal cost increase of those applications at CSLs that require the use of lithium batteries. This maintenance cost only applied to applications where DOE believed the lifetime of the application would surpass the lifetime of the battery. DOE estimated the battery lifetime based on the total number of charges the battery could handle divided by the number of charges per year projected for the application. DOE relied on data provided by manufacturers to estimate the total number of charges the battery could undergo before expiring. See chapter 8, section 8.2.5 of the accompanying SNOPR TSD.

For the SNOPR, DOE determined that the maintenance costs included in the NOPR LCC analysis were not comparable to the costs associated with those applications that had no maintenance costs. While the NOPR costs considered the increase in price between repurchasing a lithium battery instead of a nickel battery, the increase when purchasing the initial battery was not considered for the analysis. Thus, DOE determined that the maintenance cost did not apply to the battery charger unit subject to the proposed standard, and removed all maintenance costs from the SNOPR LCC analysis. Further detail on maintenance costs can be found in chapter 8, section 8.2.5 of the SNOPR TSD.

6. Product Lifetime

For the NOPR analysis, DOE considered the lifetime of a battery charger to be from the moment it is purchased for end-use up until the time when it is permanently retired from service. Because the typical battery charger is purchased for use with a single associated application, DOE assumed that it would remain in service for as long as the application does. Even though many of the technology options to improve battery charger efficiencies may result in an increased useful life for the battery charger, the lifetime of the battery charger is still directly tied to the lifetime of its associated application. The typical consumer will not continue to use a battery charger once its application has been discarded. For this reason, DOE used the same lifetime estimate for the baseline and standard level designs of each application for the LCC and PBP analyses.

Following the NOPR, Lester encouraged DOE to carefully consider differences in product longevity in their LCC and PBP model. They noted that in Product Class 7, CSL 0 and CSL 1 products employed significantly different technologies that have considerably different lifetimes; the difference in product longevity could result in major changes to the DOE LCC and PBP model. (Lester Electrical, No. 139 at p. 3) DOE notes that because the lifetime of the battery charger is directly tied to the lifetime of its associated application, improved technologies affecting the lifetime of the battery charger will not change the effective lifetime for the typical consumer. In the absence of adverse comments to DOE's approach, DOE is continuing to use it in the SNOPR analysis. Further detail on product lifetimes and how they relate to applications can be found in chapter 3 of the SNOPR TSD.

7. Discount Rates

The NOPR analysis derived residential discount rates by identifying all possible debt or asset classes that might be used to purchase and operate products, including household assets that might be affected indirectly. DOE estimated the average shares of the various debt and equity classes in the average U.S. household equity and debt portfolios using data from the Survey of Consumer Finances (SCF) from 1989 to 2007.[33] DOE used the mean share of each class across the seven sample years as a basis for estimating the effective financing rate for products. DOE estimated interest or return rates associated with each type of equity using data from the U.S. Federal Reserve [34] and Damodaran. The analysis calculates the risk-free rate using a 40-year average return on 10-year U.S. Treasury notes, as reported by the U.S. Federal Reserve, and the equity risk premium using the geometric average return on the S&P 500 over a 40-year time period. The mean real effective rate across the classes of household debt and equity, weighted by the shares of each class, was 5.1 percent.

For the commercial sector, DOE derived the discount rate from the cost of capital of publicly-traded firms that manufacture products that involve the purchase of battery chargers. To obtain an average discount rate value for the commercial sector, DOE used the share of each industry category in total paid employees provided by BLS,[35] as well as employment data from both the U.S. Office of Personnel Management [36] and the U.S. Census Bureau.[37] By multiplying the discount rate for each industry category by its share of paid employees, DOE derived a commercial discount rate of 7.1 percent.

For the SNOPR, DOE used the same methodology as the NOPR with applicable updates to data sources. When deriving the residential discount rates, DOE added the 2010 Survey of Consumer Finances to their data set. For all time-series data, DOE evaluated rates over the 30-year time period of 1984–2013. The new discount rates are estimated to be 5.2 percent and 5.1 percent in the residential and commercial sectors, respectively. For further details on discount rates, see chapter 8 and appendix 8D of the SNOPR TSD.

8. Sectors Analyzed

The NOPR analysis included an examination of a weighted average of the residential and commercial sectors as the reference case scenario. Additionally, all application inputs were specified as either residential or commercial sector data. Using these inputs, DOE then sampled each application based on its shipment weighting and used the appropriate residential or commercial inputs based on the sector of the sampled application. This approach provided specificity as to the appropriate input values for each sector, and permitted an examination of the LCC results for a given product class in total. DOE maintained this approach in the SNOPR. For further details on sectors analyzed, see chapter 8 of the SNOPR TSD.

9. Base Case Market Efficiency Distribution

For purposes of conducting the LCC analysis, DOE analyzed CSLs relative to a base case (*i.e.,* a case without new Federal energy conservation standards). This analysis required an estimate of the distribution of product efficiencies in the base case (*i.e.,* what consumers would have purchased in 2018 in the absence of new Federal standards). Rather than analyzing the impacts of a particular standard level assuming that all consumers will purchase products at the baseline efficiency level, DOE conducted the analysis by taking into account the breadth of product energy efficiencies that consumers are expected to purchase under the base case.

In preparing the NOPR analysis, DOE derived base case market efficiency distributions that were specific to each application where it had sufficient data to do so. This approach helped to ensure that the market distribution for applications with fewer shipments was not disproportionately skewed by the market distribution of the applications with the majority of shipments. DOE factored into its efficiency distributions the current efficiency regulations in California. See section IV.G.3). For this SNOPR, DOE maintained the methodology for generating base case market efficiency distributions used in the NOPR analysis.

10. Compliance Date

The compliance date is the date when a new standard becomes operative, *i.e.,* the date by which battery charger manufacturers must manufacture products that comply with the standard. DOE's publication of a final rule in this standards rulemaking is scheduled for completion by 2016. There are no requirements for the compliance date for battery charger standards, but DOE has chosen a two-year time period between publication and compliance for two reasons. First, manufacturers are already complying with the current CEC standards, which suggests that a two-year time frame would be reasonable. Second, this time-frame is consistent with the one that DOE initially proposed to apply for external power supplies, which were previously bundled together with battery chargers as part of DOE's initial efforts to regulate both of these products. DOE calculated the LCCs for all consumers as if each would purchase a new product in the year that manufacturers would be required to meet the new standard (2018). However, DOE bases the cost of the equipment on the most recently available data, with all dollar values expressed in 2013$.

11. Payback Period Inputs

The PBP 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 energy price trends and discount rates are not needed; only energy prices for the year the standard becomes required for compliance (2018 in this case) are needed.

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

[33] The Federal Reserve Board, Survey of Consumer Finances. Available at: *http://www.federalreserve.gov/pubs/oss/oss2/scfindex.html*

[34] The Federal Reserve Board, Statistical Releases and Historical Data, Selected Interest Rates (Daily)—H.15. *http://www.federalreserve.gov/releases/H15/data.htm.*

[35] U.S. Bureau of Labor Statistics. Labor Force Statistics from the Current Population Survey. Table 17—Employed persons by Industry, Sex, Race, and Occupation. *http://www.bls.gov/cps/cpsaat17.pdf.*

[36] U.S. Office of Personnel Management. Federal Employment Reports. Historical Federal Workforce Tables. *http://www.opm.gov/policy-data-oversight/data-analysis-documentation/federal-employment-reports/historical-tables/total-government-employment-since-1962.*

[37] U.S. Census Bureau. Government Employment and Payroll. 2012 State and Local Government. *http://www2.census.gov/govs/apes/12stlall.xls.*

energy price forecast for the year in which compliance with the proposed standards would be required.

DOE received a comment from ITI on its PBP analysis. ITI pointed out that the NOPR stated ''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.'' (ITI, No. 131 at p. 6)

DOE's LCC and PBP analyses generate values that calculate the PBP for consumers of products subject to potential energy conservation standards, which includes, but is not limited to, the three-year PBP contemplated under the rebuttable presumption test. However, DOE routinely conducts a full economic analysis that considers the full range of impacts, including those to the consumer, manufacturer, Nation, and environment, as required under 42 U.S.C. 6295(o)(2)(B)(i) and 42 U.S.C. 6316(e)(1). The results of this 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).

G. Shipments Analysis

Projections of product shipments are needed to forecast the impacts that standards are likely to have on the Nation. DOE develops shipment projections based on an analysis of key market drivers for each considered product. In DOE's shipments model, shipments of products were calculated based on current shipments of product applications powered by battery chargers. The inventory model takes an accounting approach, tracking remaining shipments and the vintage of units in the existing stock for each year of the analysis period.

Based on comments received on the Preliminary Analysis, DOE conducted a sensitivity analysis to examine how increases in end-use product prices resulting from standards might affect shipment volumes. To DOE's knowledge, elasticity estimates are not readily available in existing literature for battery chargers, or the end-use consumer products that DOE is analyzing in this rulemaking. Because some applications using battery chargers could be considered more discretionary than major home appliances, which have an estimated relative price elasticity of −0.34,[38] DOE believed a higher elasticity of demand was possible. In its sensitivity analysis, DOE assumed a price elasticity of demand of −1, meaning a given percentage increase in the final product price would be accompanied by that same percentage decrease in shipments.

Even under this relatively high assumption for price elasticity of demand, DOE's battery charger standards are unlikely to have a significant effect on the shipment volumes of those battery charger applications mentioned by stakeholders, with forecasted effects ranging from a decrease of 0.004 percent for electric shavers to a decrease of 0.1 percent for do-it-yourself (''DIY'') power tools with detachable batteries. Results for all battery charger applications are contained in appendix 9A to the SNOPR TSD. The corresponding impacts on national energy savings (''NES'') and NPV are included in appendix 10A.

1. Shipment Growth Rate

In the NOPR, DOE noted that the market for battery chargers grew tremendously in the previous ten years. Additionally, DOE found that many market reports had predicted enormous future growth for the applications that employ battery chargers. However, in projecting the size of these markets over the next 30 years, DOE considered the possibility that much of the market growth associated with battery chargers had already occurred. In many reports predicting the growth of applications that employ battery chargers, DOE noted that this growth was predicted for new applications, but older applications were generally not included. That is, battery charger demand did not grow, but the products using these devices have transitioned to a new product mix. For example, during its initial market assessment, DOE identified mobile phones, digital cameras, personal digital assistants, and MP3 players as applications that use battery chargers. However, in the past several years, the use of smart phones, which can function as all four of these individual applications, has accelerated, and these individual products may no longer be sold in large volumes in the near future. A quantitative example of this is shown in Table IV–12. (See chapter 9 of the SNOPR TSD.)

TABLE IV–12—EXAMPLE OF PRODUCT TRANSITION

Application	2007 Shipments	2008 Shipments	2009 Shipments	2011 Shipments
Smart Phones	19,500,000	28,555,000	41,163,000	110,178,600
Mobile Phones	101,500,000	102,775,000	94,239,000	58,563,400
Personal Digital Assistants	2,175,000	1,977,000	1,750,000	800,000
MP3 Players	48,020,000	43,731,000	40,101,000	40,696,691
Total	171,195,000	177,038,000	177,253,000	210,238,691

With this in mind, DOE based its shipments projections such that the per-capita consumption of battery chargers will remain steady over time, and that the overall number of individual units that use battery chargers will grow at the same rate as the U.S. population.

The NOPR analysis estimated future market size while assuming no change in the per-capita battery charger purchase rate by using the projected population growth rate as the compound annual market growth rate. Population growth rate values were obtained from the U.S. Census Bureau

[38] See *http://ees.ead.lbl.gov/publications/analysis-price-elasticity* (last accessed January 13, 2015).

2009 National Projections, which forecast U.S. resident population through 2050. DOE took the average annual population growth rate, 0.75 percent, and applied this rate to all battery charger product classes.

For the SNOPR, DOE retained the same approach and updated the growth rate from 0.75% to 0.62% using U.S. Census Bureau projections released December 2012.

NRDC commented that battery chargers shipments had been growing significantly faster than the growth shown in the NOPR, driven in part by growth in consumer electronics and portable appliances over the previous few years. They suggested using a growth rate of 4% in 2011, gradually declining to 0.75% by 2028 (reduction of 0.2% per year). This would lead to shipment projections which are 32% higher in 2042 than what used in the NOPR analysis. (NRDC, No. 114 at p. 19) The CA IOUs also asserted that battery chargers shipments would grow faster than the population. These faster growth rates would increase the energy savings attributable to the standards. The CA IOUs stated that they supported the conclusions of NRDC, but did not present additional data of their own. (CA IOUs, No. 138 at p. 20)

DOE recognizes that shipments for certain applications are increasing very rapidly. However, DOE researched product growth trends dating back to 2006 and found that other products, like digital cameras, have seen flat shipments. Some critical applications have even had shipments decline year-over-year. There is also significant convergence in the consumer electronics industry, in which one new device may replace multiple retired devices (such as a single smart phone replacing a mobile phone, digital camera, GPS device, and PDA). DOE seeks to forecast shipments for battery chargers as a whole, but given the complexity of these markets, any attempts to forecast behavior of the market will be inherently inexact. Therefore, in this SNOPR, DOE decided to maintain its approach to use population growth to project shipments, but updated the value to match the latest U.S. Census information: from 0.75% growth per year from the NOPR to 0.62% growth rate in this SNOPR. In its shipment forecasts, DOE projects that by 2018, shipments of battery chargers will be 4.4% percent greater than they were in 2011.

2. Product Class Lifetime

For the NOPR, DOE calculated product class lifetime profiles using the percentage of shipments of applications within a given product class, and the lifetimes of those applications. These values were combined to estimate the percentage of units of a given vintage remaining in use in each year following the initial year in which those units were shipped and placed in service.

DOE received no comments regarding this methodology and maintained this methodology for the SNOPR. For more information on the calculation of product class lifetime profiles, see chapter 10 of the SNOPR TSD.

3. Forecasted Efficiency in the Base Case and Standards Cases

A key component of the NIA is the trend in energy efficiency forecasted for the base case (without new and amended standards) and each of the standards cases. To project the trend in efficiency over the entire forecast period, DOE considered recent standards, voluntary programs such as ENERGY STAR, and other trends.

For battery charger efficiency trends, DOE considered three key factors: European standards, the EPA's ENERGY STAR program, and the battery charger standards that took effect on February 1, 2013, in California.

The EU included battery chargers in a preparatory study on eco-design requirements that it published in January 2007.[39] However, it has not yet announced plans to regulate battery chargers. Thus, DOE did not adjust the efficiency distributions that it calculated for battery chargers between the present-day and the compliance date in 2018 to account for European standards.

DOE examined the ENERGY STAR voluntary program for battery charging systems and found that as of October 19, 2012, less than 350 battery charging systems had been qualified.[40] PTI commented that its members' products make up a significant portion of the ENERGY STAR Battery Charging Systems listings. PTI claimed that, to the extent that DOE's battery charger standard would impact future revisions to the ENERGY STAR criteria, then it is possible that there would be improvements in efficiency to some products in the market that already meet the DOE standard. (PTI, No. 133 at p. 5)

DOE recognizes that unforeseen new or revised energy efficiency specifications are a possibility and that these factors would impact the distribution of efficiency in the market. It is also possible that DOE's battery charger standards could cause other organizations to tighten their efficiency specifications as well. However, EPA's ENERGY STAR program for battery chargers ended on December 30, 2014, and the ENERGY STAR label is no longer available for this product category.[41] Thus, DOE did not adjust its battery charger efficiency distributions to account for any potential market effects of a future ENERGY STAR program.

The CEC battery charger standards that took effect in 2013, affect most, if not all, of the battery chargers within the scope of DOE's rulemaking. In the NOPR, DOE adjusted its base case efficiency distributions for battery chargers to account for these standards by assuming that, in the absence of Federal standards, all battery chargers sold in California would meet the CEC standards. In the absence of market share data, DOE assumed in the NOPR that California's share of the U.S. battery charger market would be equivalent to its share of U.S. GDP (13 percent).

Also in the NOPR, DOE recognized that the CEC standards may also raise the efficiency of battery chargers sold outside of California. However, the magnitude of this effect could not be determined. Nevertheless, to explore the full range of possibilities, DOE also evaluated the potential impacts of Federal standards under the assumption that the CEC standards become the *de facto* standard for the nation, *i.e.,* all battery chargers sold in the United States just before the Federal standard takes effect meet the CEC standards. This scenario represented an upper bound on the possible impacts of the CEC standards and a lower bound on the energy savings that could be achieved by Federal standards.

Both during and after the NOPR public meeting, multiple stakeholders provided input on how the CEC standards may impact products in California and the rest of the Nation. The CEC commented that California's standards, in the absence of national standards, would become the ''de facto'' national standards. Thus, less stringent standards—such as those proposed in the NOPR—would lead to greater national energy consumption than if DOE took no action, which would ''run afoul'' of 42 U.S.C. 6295(o)(3), which mandates that DOE prescribe standards that results in the significant conservation of energy. The CEC further

[39] Available here: *http://www.eceee.org/ecodesign/products/battery_chargers/Final_Report_Lot7.*

[40] EPA, ''Qualified Product (QP) List for ENERGY STAR Qualified Battery Charging Systems.'' Retrieved on October 18, 2012 from *http://downloads.energystar.gov/bi/qplist/Battery_Charging_Systems_Product_List.xls?5728–8a42.*

[41] *https://www.energystar.gov/sites/default/files/specs//BCS%20Final%20Decision%20Sunset%20Memo.pdf.*

argued that standards should be evaluated with a base case of no action, in which case the adoption of California's standards and the adoption of DOE's proposed standards would lead to an increase in national energy consumption. The CEC also advised that products sold in California that meet the CEC standards would regress to lower efficiency levels should DOE adopt standards lower than those set by the CEC because the CEC standards would be preempted. (California Energy Commission, No. 117 at p. 2–6)

Earthjustice concurred with the CEC's claims, stating that DOE's assumption that California's standards will not impact products sold outside of California was arbitrary and contrary to evidence presented for EPSs. With the CEC standards as the *de facto* national standards, the adoption by DOE of weaker requirements would not save significant energy and would be prohibited under EPCA. (Earthjustice, No. 118 at p. 3) Panasonic also claimed that the CEC standards would become *de facto* national standards in the absence of Federal regulations. (Panasonic, No. 120 at p. 5) The Appliance Standards Awareness Project agreed that DOE's proposal risked increasing national energy consumption. They recommended that, to fully understand the potential impacts of California's standards, DOE should explore scenarios in which 100%, 75%, and 50% of products sold outside of California comply with California's standard.

AHAM suggested that DOE overestimated the amount of the market that would shift to comply with the CEC standards, because not all products will be able to meet those efficiency levels, even in California. However, AHAM suggested that DOE leave its analysis unchanged. (AHAM, No. 124 at p. 2) PTI commented that within the standard levels that DOE proposed, market elasticity is not an issue. However, it noted that at the CEC standard levels, there is a higher cost of compliance that would impact market elasticity. (PTI, No. 133 at p. 5)

The CEC also approximated CSLs that would be equivalent to its standard levels and inputted those CSLs into DOE's NIA model. It concluded that doing so yielded an additional 1.06 quads of energy savings and $3.8 billion of net social benefits nationally, when compared to DOE's proposal. Given these additional potential savings, the CEC recommended that DOE revise its analyses and adopt standards at least as stringent as those adopted in California. (California Energy Commission, No. 117 at p. 32) Citing an analysis performed by the Berkeley Research Group, PTI agreed with DOE that the CEC's adopted standards for Product Classes 2–4 would not be cost effective for the nation. (PTI, No. 133 at p. 2)

For this SNOPR, DOE has revised its base case efficiency distributions and now assumes that 95% of the market meets the CEC standards. DOE based this assumption on a review of the existing market, both online and via in-store visits, and found that retailers nationwide, and not just in California, are selling units complying with the CEC standards. DOE acknowledges, however, that units not complying with the current CEC standards can still be sold outside of California, but believes the percentage of such units is small. For this analysis, DOE assumed 5% of units sold do not meet the CEC standards. DOE's testing conducted for this SNOPR focused on improving baseline unit efficiency. In examining these units, DOE found that they complied with the CEC standards—including CEC-marked units purchased outside of California. While this resulted in assumptions of nearly all units sold nationally as meeting or exceeding the CEC standards, DOE recognizes that there are some units that could be sold outside of California and not through common channels and/or large retailers either online or in stores. DOE assumes that the volume of such non-CEC-compliant units is small. Using all of these assumptions, DOE developed its revised base case efficiency distribution using the CEC database [42] of battery charger models sold in California combined with DOE's usage profiles as described earlier in Section IV.C.4. See chapter 9 of the SNOPR TSD for more details.

To estimate efficiency trends in the standards cases, DOE has used ''roll-up'' and/or ''shift'' scenarios in its standards rulemakings. Under the ''roll-up'' scenario, DOE assumes: (1) Product efficiencies in the base case that do not meet the standard level under consideration would ''roll-up'' to meet the new standard level; and (2) product efficiencies above the standard level under consideration would not be affected. Under the ''shift'' scenario, DOE reorients the distribution above the new minimum energy conservation standard. For this rule, DOE proposed use of the ''roll-up'' scenario and has maintained this approach for the SNOPR. This approach was supported by Delta-Q Technologies in its public comments following publication of the NOPR. (Delta-Q Technologies, No. 113 at p. 1).

For further details about the forecasted efficiency distributions, see chapter 9 of the SNOPR TSD. DOE seeks comments on its approach in updating the base case efficiency distributions for this rule using the CEC database.

H. National Impacts Analysis

The NIA assesses the national energy savings (NES) and the NPV of total consumer costs and savings that would be expected to result from new and amended standards at specific efficiency levels. DOE calculates the NES and NPV based on projections of annual unit shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses. DOE projected the energy savings, operating cost savings, product costs, and NPV of net consumer benefits for products sold over a 30-year period—from 2018 through 2047.

CEA commented that it is unreasonable for DOE to project shipments, energy savings, and emissions reductions over a 30-year period. Product lifecycles for many of the covered products are typically measured in months, so it can be difficult to make projections years out. (CEA, No. 106 at p. 9) Although the 30-year analysis period is longer than the average lifetime of battery chargers, DOE estimates that the considered standard levels analyzed will transform the market to higher energy efficiencies than in the base-case, resulting in energy and emission savings throughout the analysis period. Further, DOE has conducted a sensitivity analysis that projects NIA results out over nine years of shipments instead of 30 years. Results of this sensitivity analysis are available in section V.B.3 of this notice.

As in the LCC analysis, DOE evaluates the national impacts of new and amended standards by comparing base-case projections with standards-case projections. The base-case projections characterize energy use and consumer costs for each product class in the absence of new and amended energy conservation standards. DOE compares these projections with projections characterizing the market for each product class if DOE adopted new and amended standards at specific energy efficiency levels (*i.e.,* the TSLs or standards cases) for that class.

To make the analysis more accessible and transparent to all interested parties, DOE used an MS Excel spreadsheet model to calculate the energy savings and the national consumer costs and savings from each TSL. The SNOPR TSD, and other supplemental

[42] *http://www.appliances.energy.ca.gov/AdvancedSearch.aspx.*

documentation DOE releases, collectively explain the models and how to use them. Interested parties can review DOE's analyses by changing various input quantities within the spreadsheet models that DOE releases. The NIA spreadsheet model uses average values as inputs (as opposed to probability distributions).

For this SNOPR, the NIA used projections of energy prices from the *AEO2014* Reference case. In addition, DOE analyzed scenarios that used inputs from the *AEO2014* High Economic Growth, and Low Economic Growth cases. These cases have higher or lower energy price trends compared to the Reference case. NIA results based on these cases are presented in appendix 10A to the SNOPR TSD.

Table IV–13 summarizes the inputs and key assumptions DOE used in the NIA. Discussion of these inputs and changes follows the table. See chapter 10 of the SNOPR TSD for further details.

TABLE IV–13—SUMMARY OF INPUTS, SOURCES AND KEY ASSUMPTIONS FOR THE NATIONAL IMPACT ANALYSIS

Inputs	NOPR Description	Changes for SNOPR rule
Base Year Shipments	Annual shipments from Market Assessment	No change in methodology. Includes updated data from 2011.
Shipment Growth Rate	0.75 percent annually, equal to population growth.	Updated to 0.62 percent using revised U.S. Census projections (2012).
Lifetimes	Battery charger lifetime is equal to the lifetime of the end-use product it powers..	No changes in methodology. Product Class lifetimes were revised based on removal of medical products.
Base Year Efficiencies	From Market Assessment	Obtained from the CEC's database of Small Battery Chargers (2014)
Base-Case Forecasted Efficiencies.	Efficiency distributions remain unchanged throughout the forecast period.	No change.
Standards-Case Forecasted Efficiencies.	"Roll-up" scenario	No change.
Annual Energy Consumption per Unit.	Annual shipment weighted-average marginal energy consumption values for each product class.	No change in the methodology. Inputs to the calculation were revised based on removal of medical products.
Improvement Cost per Unit	From the Engineering Analysis	No change.
Markups	From Markups Analysis	No change.
Repair and Maintenance Cost per Unit.	Assumed to be zero	No change.
Energy Prices	*AEO2010* projections (to 2035) and extrapolation for 2044 and beyond.	Updated to *AEO2014.*
Electricity Site-to-Source Conversion Factor.	Based on *AEO 2010*	Updated to *AEO2014.*
Present Year	2011	2015
Discount Rate	3% and 7% real	No change.
Compliance Date of Standard (Start of Analysis Period).	2013	2018

1. Product Price Trends

As noted in section IV.F.1, DOE assumed no change in battery charger pricing over the 2018–2047 period in the reference case. AHAM commented that it opposes the use of price trends and agreed that DOE should not use that approach. (AHAM, No. 124 at p. 9) In contrast, PG&E and SDG&E supported the consideration of price trends as an NIA sensitivity and recommended that price trends be incorporated into the reference case, given past declines in the costs of electronic products. (PG&E and SDG&E, No. 163 at pp. 1–2) The Power Sources Manufacturers Association (PSMA) agreed, stating that while improvements to overall battery charger efficiency do entail cost premiums, these premiums are often reduced as volumes increase and manufacturing technologies improve. (PSMA, No. 147 at p. 2)

As discussed in section IV.G.1, it is difficult to predict the consumer electronics market far in advance. To derive a price trend for battery chargers, DOE did not have any historical shipments data or sufficient historical Producer Price Index (PPI) data for the small electrical appliance manufacturing industry from BLS.[43] Therefore, DOE examined a projection based on the price indexes that were projected for *AEO2014.* DOE performed an exponential fit on two deflated projected price indexes that may include the products that battery chargers are components of: information equipment (Chained price index—investment in non-residential equipment and software—information equipment), and consumer durables (Chained price index—other durable goods). However, DOE believes that these indexes are too broad to accurately capture the trend for battery chargers. Furthermore, most battery chargers are unlike typical consumer products in that they are typically not purchased independently by consumers. Instead, they are similar to other commodities and typically bundled with end-use products.

Given the above considerations, DOE decided to use a constant price assumption as the default price factor index to project future battery charger prices in 2018 and out to 2047. While a more conservative method, following this approach helped ensure that DOE did not understate the incremental impact of standards on the consumer purchase price. Thus, DOE's product prices forecast for the LCC, PBP, and NIA analyses for the SNOPR were held constant for each efficiency level in each product class. DOE also conducted a sensitivity analysis using alternative price trends based on AEO indexes. These price trends, and the NPV results from the associated sensitivity cases, are described in Appendix 10B of the SNOPR TSD.

2. Unit Energy Consumption and Savings

DOE uses the efficiency distributions for the base case along with the annual unit energy consumption values to estimate shipment-weighted average unit energy consumption under the base and standards cases, which are then

[43] Series ID PCU33521–33521; *http://www.bls.gov/ppi/.*

compared against one another to yield unit energy savings values for each considered efficiency level.

As discussed in section IV.G.3, DOE assumes that energy efficiency will not improve after 2018 in the base case. Therefore, the projected UEC values in the analysis, as well as the unit energy savings values, do not vary over time. Consistent with the roll-up scenario, the analysis assumes that manufacturers would respond to a standard by improving the efficiency of underperforming products but not those that already meet or exceed the standard.

DOE received no comments on its methodology for calculating unit energy consumption and savings in the NOPR and maintained its methodology in the SNOPR. For further details on the calculation of unit energy savings for the NIA, see chapter 10 of the SNOPR TSD.

3. Unit Costs

DOE uses the efficiency distributions for the base case along with the unit cost values to estimate shipment-weighted average unit costs under the base and standards cases, which are then compared against one another to give incremental unit cost values for each TSL. DOE received no comments on its methodology for calculating unit costs in the NOPR and maintained its methodology in the SNOPR. For further details on the calculation of unit costs for the NIA, see chapter 10 of the SNOPR TSD.

4. Repair and Maintenance Cost per Unit

In the NOPR, DOE considered the incremental maintenance cost for the replacement of lithium ion batteries in certain applications. After examining the possible impact of this cost in the LCC and PBP analyses, DOE determined that the actual impact at the product class level would most likely be negligible. Thus, DOE opted not to retool its NIA model to account for this cost. For further discussion of this issue, see section IV.F.3 above. DOE received no comments on this approach, and maintained this assumption for the SNOPR.

5. Energy Prices

While the focus of this rulemaking is on consumer products found in the residential sector, DOE is aware that many products that employ battery chargers are located within commercial buildings. Given this fact, the NOPR analysis relied on calculated energy cost savings from such products using commercial sector electricity rates, which are lower in value than residential sector rates. DOE used this approach so as to not overstate energy cost savings in calculating the NIA.

In order to determine the energy usage split between the residential and commercial sector, DOE first separated products into residential-use and commercial-use categories. Then, for each product class, using shipment values for 2018, average lifetimes, and base-case unit energy consumption values, DOE calculated the approximate annual energy use split between the two sectors. DOE applied the resulting ratio to the electricity pricing to obtain a sector-weighted energy price for each product class. This ratio was held constant throughout the period of analysis.

DOE received no comments on its methodology for calculating energy costs in the NOPR and maintained its approach for the SNOPR. For further details on the determination of energy prices for the NIA, see chapter 10 of the SNOPR TSD.

6. National Energy Savings

The national energy savings analysis involves a comparison of national energy consumption of the considered products in each potential standards case with consumption in the base case with no new or amended energy conservation standards. DOE calculated the national energy consumption by multiplying the number of units (stock) of each product (by vintage or age) by the unit energy consumption (also by vintage). DOE calculated annual NES based on the difference in national energy consumption for the base case (without amended efficiency standards) and for each higher efficiency standard. 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 *AEO2014.* 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. EIA uses NEMS to prepare its Annual Energy Outlook.

For further details about the calculation of national energy savings, see chapter 10 of the SNOPR TSD. The approach used for deriving FFC measures of energy use and emissions is described in appendix 10B of the SNOPR TSD.

7. Discount Rates

The inputs for determining the NPV of the total costs and benefits experienced by consumers of battery chargers are: (1) total increased product cost, (2) total annual savings in operating costs, and (3) a discount factor. For each standards case, DOE calculated net savings each year as total savings in operating costs, less total increases in product costs, relative to the base case. DOE calculated operating cost savings over the life of each product shipped from 2018 through 2047.

DOE multiplied the net savings in future years by a discount factor to determine their present value. 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.[44] The 7-percent real value is an estimate of the average before-tax rate of return to private capital in the U.S. economy. The 3-percent real value represents the ‘‘societal rate of time preference,’’ which is the rate at which society discounts future consumption flows to their present value.

For further details about the calculation of net present value, see chapter 10 of the SNOPR TSD.

I. Consumer Subgroup Analysis

In analyzing the potential impacts of new or amended standards, DOE evaluates the impacts on the LCC of identifiable subgroups of consumers that may be disproportionately affected by a national standard. In the NOPR,

[44] OMB Circular A–4 (Sept. 17, 2003), section E, ‘‘Identifying and Measuring Benefits and Costs. Available at: *http://www.whitehouse.gov/omb/memoranda/m03-21.html.*

DOE analyzed four consumer subgroups of interest—low-income consumers, small businesses, top marginal electricity price tier consumers, and consumers of specific applications within a product class. In this SNOPR, DOE maintains the same subgroups; however, DOE separates the top marginal electricity price tier consumers into two subgroups because further analysis showed that these consumers were two distinct groups. The two new subgroups are top tier electricity price consumers and peak time-of-use electricity price consumers. For each subgroup, DOE considered variations on the standard inputs to the general LCC model.

DOE defined low-income consumers as residential consumers with incomes at or below the poverty line, as defined by the U.S. Census Bureau. In the NOPR stage, DOE found from 2005 Residential Energy Consumption Survey (RECS) data [45] that these consumers face electricity prices that are 0.2 cents per kWh lower, on average, than the prices faced by consumers above the poverty line. In the SNOPR stage, DOE found that the updated 2009 RECS data [46] no longer showed a significant difference in electricity price between low-income and general consumers. Instead, DOE used the same source to identify population distributions of low-income consumers among regions of the U.S. to distinguish low-income consumers from the general population. DOE requests comment on the new methodology of filtering RECS data to obtain a population distribution of low-income consumers.

For small businesses, DOE analyzed the potential impacts of standards by conducting the analysis with a different discount rate applicable to this subgroup, as small businesses do not have the same access to capital as larger businesses. DOE estimated that for businesses purchasing battery chargers, small companies have an average discount rate that is 4.16 percent higher than the industry average.

In the NOPR, DOE identified the highest rates for top tier marginal electricity price consumers using both tiered rates and time of usage. DOE found that top tier marginal rates for general usage in the residential and commercial sectors were $0.310 and $0.225, respectively. In the SNOPR stage, DOE divided this subgroup into two new subgroups because further analysis showed that these consumers were two distinct groups. For top tier electricity price consumers, DOE researched tiered electricity rates for general usage in the residential sector, and found the highest price to be $0.359. For peak time-of-use electricity price consumers, DOE researched prices that varied with the time of day for both the residential and commercial sectors, obtaining peak values of $0.514 and $.494, respectively.

Lastly, for the application-specific subgroup, DOE used the inputs from each application for lifetime, markups, market efficiency distribution, and UEC to calculate LCC and PBP results.

In response to the NOPR, Nokia noted that DOE should consider life-cycle costs when deciding standards. In the case of mobile phones, it argued that standards could not be justified on the basis of life-cycle costs (Nokia, No. 132 at p. 1).

Mobile phone battery chargers fall into Product Class 2. The selected CSL for Product Class 2 exhibits a positive LCC savings of $0.06 over the lifetime of a given mobile phone battery charger. DOE notes that the standards and life-cycle costs are for the battery chargers, and not for end-use products. Looking across all of Product Class 2, the standards proposed will be beneficial to consumers, on average. For this reason, DOE believes that standards are justified at the current proposed levels for mobile phones on the basis of life-cycle costs.

DOE's subgroup analysis for consumers of specific applications considered the LCC impacts of each application within a product class. This approach allowed DOE to consider the LCC impacts of individual applications when choosing the proposed standard level, regardless of the application's weighting in the calculation of average impacts. The impacts of the standard on the cost of the battery charger as a percentage of the application's total purchase price are not relevant to DOE's LCC analysis. DOE used the cost of the battery charger component, not the final price of the application, in the LCC. Therefore, a $2,000 and $20 product are assumed to have the same cost for a battery charger (*e.g.,* $5) if they are within the same CSL of the same product class. The application-specific subgroup analyses represent an estimate of the marginal impacts of standards on consumers of each application within a product class.

DOE maintained its approach to the application specific consumer subgroup in the SNOPR. Chapter 11 of the SNOPR TSD contains further information on the LCC analyses for all subgroups.

J. Manufacturer Impact Analysis

DOE conducted a manufacturer impact analysis (MIA) on battery chargers to estimate the financial impact of new energy conservation standards on this industry. The MIA is both a quantitative and qualitative analysis. The quantitative part of the MIA relies on the Government Regulatory Impact Model (GRIM), an industry cash flow model customized for applications that include battery chargers covered in this rulemaking. The key MIA output is industry net present value (INPV). DOE used the GRIM to calculate cash flows using standard accounting principles and to compare the changes in INPV resulting from the base case and various TSLs (the standards case). The difference in INPV between the base and standards cases represents the financial impact of the new standards on manufacturers. Different sets of assumptions (scenarios) produce different results.

DOE calculated the MIA impacts of new energy conservation standards by creating a GRIM for battery charger application manufacturers. In the GRIM, DOE grouped similarly impacted products to better analyze the effects new standards will have on the industry. DOE presented the battery charger application impacts by product class groups (Product Class 1; Product Classes 2, 3, and 4; Product Classes 5 and 6; and Product Class 7) and by TSL. DOE also presented the results for Product Classes 2, 3, and 4 by manufacturer industry (consumer electronics, small appliance, and power tool manufacturers). This is necessary because the impacts in this product class group vary significantly by industry type. Therefore, grouping all industries together could overlook the potential negative impacts that manufacturers of a specific industry face. By segmenting the results into these industries, DOE is also able to discuss how each subgroup of battery charger application manufacturers will be impacted by new energy conservation standards.

DOE outlined its complete methodology for the MIA in the NOPR. 77 FR 18478, 18549–59 (March 27, 2012). The complete MIA is presented in chapter 12 of the accompanying SNOPR TSD.

1. Manufacturer Production Costs

Through the MIA, DOE attempts to model how changes in efficiency impact manufacturer production costs

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[45] U.S. Department of Energy-Energy Information Administration. *RECS Public Use Microdata Files, calendar year 2005.* 2009. Washington, DC. *http://205.254.135.7/consumption/residential/data/2005/index.cfm?view=microdata*

[46] U.S. Department of Energy-Energy Information Administration. *RECS Public Use Microdata Files, calendar year 2009.* 2013. Washington, DC. *http://205.254.135.7/consumption/residential/data/2009/index.cfm?view=microdata*

(''MPCs''). DOE used two critical inputs to calculate manufacturer impacts at the OEM level. The first input is the price that the application OEM charges for its finished product, used to calculate revenue. The second input is the portion of that price represented by its battery charger, used to calculate costs, at each CSL.

For the first component, DOE determined representative retail prices for each application by surveying popular online retailer Web sites to sample a number of price points of the most commonly sold products for each application. The price of each application can vary greatly depending on many factors (such as the features of each individual product). For each application, DOE used the average application price found in the product survey. DOE then discounted this representative retail price back to the application MSP using the retail markups derived from annual SEC 10–K reports in the Markups Analysis, as discussed in section IV.D.

DOE calculated the second figure—the price of the battery charger itself at each CSL—in the engineering analysis. In this analysis, DOE calculated a separate cost efficiency curve for each of the seven battery charger product classes. Based on product testing data, tear-down data and manufacturer feedback, DOE created a BOM at the original device manufacturer (ODM) level to which markups were applied to calculate the MSP of the battery charger at each CSL. DOE then allocated the battery charger MSPs of each product class to all the applications within each product class. In this way, DOE arrived at the cost to the application OEM of the battery charger for each application.

NRDC commented that DOE overestimated the incremental MPCs in the NOPR analysis for battery chargers, which caused DOE to overstate the negative financial impacts reported in the NOPR MIA. (NRDC, No. 114 at p. 21) NRDC did not give any specific data to support their claim that DOE overestimated the incremental MPCs in the NOPR analysis. As part of the SNOPR analysis, DOE did conduct another round of product purchasing, testing, and tear downs to update the MPCs for the SNOPR analysis to account for the most recent pricing trends for each product. For some products, the incremental MPCs increased and for others the incremental MPCs decreased compared to the NOPR analysis incremental MPCs. DOE used a similar methodology for tear downs in the SNOPR as it did in the NOPR; however, the changes in incremental MPC from the NOPR to the SNOPR reflect the most recent battery charger pricing trends and changes in material costs from the previous analysis.

2. Product and Capital Conversion Costs

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

NRDC commented that DOE overestimated the conversion costs associated with battery charger standards and caused the MIA results to overstate the negative financial impacts on battery charger manufacturers. NRDC believes the changes required by the selected standards for battery chargers are simple and will only require limited capital conversion costs. (NRDC, No. 114 at p. 21) After reviewing the battery charger conversion costs, DOE believes that the values listed in the NOPR are accurate based on the available data and is declining to alter the battery charger conversion cost methodology for this SNOPR.

3. Comments From Interested Parties Related to Battery Chargers

Several stakeholders commented on DOE's NOPR MIA. These comments centered on compliance-related issues, employment impacts, and the MIA's scope.

a. Compliance Date and Implementation Period

Interested parties expressed concern regarding the proposed timeline for an appropriate compliance date to DOE's battery charger standard. They supported DOE's proposal to set a compliance date as soon as possible but not later than July 1, 2013 for battery charger products classes 2, 3, and 4. The industry also argued that since the CEC battery charger standards for these product classes are more stringent and would be effective in February 2013, setting an earlier compliance date for the standard would enable manufacturers to avoid performing two rounds of testing, labeling, and compliance with two different standards in a very short period of time. (AHAM, No. 124 at p. 5) (CEA, No. 106 at p. 3) (Motorola, No. 121 at p. 11) (Nintendo of America, No. 135 at p. 2) (Panasonic, No. 120 at p. 5) (Philips, No. 128 at p. 7) (PTI, No. 133 at p. 2 & 6) (Wahl, No. 153 at p. 1) (Pub. Mtg. Tr., No. 104 at p. 251–254) Additionally, ITI supported a compliance period of less than two years for Product Class 5 in addition to Product Classes 2, 3, and 4. It also asserted that manufacturers will be ready to meet DOE's proposed battery charger standards for all these product classes in the very near term and will not require the full two-year compliance period. (ITI, No. 131 at p. 2 & 6)

Other commenters urged DOE to adopt at least a two-year compliance period for all battery charger product classes. These commenters stated manufacturers must be allowed sufficient time to redesign and conduct thorough testing on their products in order to manufacture adequately safe and reliable products that comply with DOE's battery charger standards. (Flextronics, No. 145 at p.1) (Microsoft, No. p. 110) (Nebraska Energy Office, No. 98 at p. 2) (Nokia, No. 132 at p. 2) (Salcomp Plc, No. 73 at p. 2) (Schneider, No. 119 at p. 6) Additionally, some manufacturers supported a compliance date of at least 18 months or two years just for Product Classes 5, 6, and/or 7. (Actuant Electric, No. 146 at p. 2) (Lester Electrical, No. 139 at p. 2) (Lester Electrical, No. 87 at p. 1) (Schumacher, No. 143 at p. 2) (Pub. Mtg. Tr., No. 104 at p. 30)

Since the CEC battery charger standard has already been implemented at the time of this SNOPR publication and available data indicate that manufacturers are already complying with that standard, DOE is proposing to use a compliance date of two years after the publication of the final rule for this rulemaking.

b. Employment Impacts

Some manufacturers expressed concern that this rulemaking could lead to a loss of domestic jobs. Lester Electrical stated that the proposed standard level for Product Class 7 will lead to job losses in its domestic manufacturing plant. (Lester Electrical, No. 139 at p. 2) (Pub. Mtg. Tr., No. 104 at p. 31) The Nebraska Energy Office also commented that the proposed standard is not economically justified and would contribute an unacceptable level of regulatory burden. (Nebraska Energy Office, No. 98 at p. 2) DOE estimates that Lester Electrical employs approximately 100 domestic production workers that produce a wide variety of covered and non-covered battery chargers. The direct employment analysis indicates that a maximum of 100 domestic jobs could be lost as a result of DOE's proposed battery charger standards due to the projected impacts on Lester Electrical. This estimate of 100 domestic jobs lost represents the upper-bound of potential job loss, since it is likely that Lester Electrical will at least continue to produce the battery chargers not covered by this proposed standard domestically. Relocating a company's manufacturing facility is a complex business decision and not a decision mandated by any government action. Since one path to compliance is as likely as the next, it is difficult to accurately predict how Lester Electrical would respond to the proposed battery charger standards.

c. Scope of the MIA

A few manufacturers stated that they believe the MIA did not include all parties affected by DOE's battery charger standard. Duracell commented that DOE should specifically account for the impacts on battery manufacturers, especially those who design battery chargers around the batteries they manufacture. (Duracell, No. 109 at p. 4) The MIA focused on battery charger and battery charger application manufacturers only. DOE believes the MIA should only focus on businesses that are directly impacted by DOE's standards and does not believe that battery manufacturers fall into this category. While DOE acknowledges that battery manufacturers could be indirectly affected by the proposed standard, those impacts fall outside the scope of this rulemaking.

4. Manufacturer Interviews

DOE conducted additional interviews with manufacturers following the preliminary analysis in preparation for the NOPR analysis. These interviews were separate from those DOE conducted as part of the engineering analysis. DOE did not conduct additional interviews between the publication of the NOPR and this SNOPR. DOE outlined the key issues for this rulemaking for manufacturers in the NOPR. See 77 FR at 18558–18559. DOE did not receive any further comments on the key issues listed in the NOPR.

K. Emissions Analysis

In the emissions analysis, DOE estimated the reduction in power sector emissions of carbon dioxide (CO_2), nitrogen oxides (NO_X), sulfur dioxide (SO_2), and mercury (Hg) from potential energy conservation standards for battery chargers. In addition, DOE estimated emissions impacts in production activities (extracting, processing, and transporting fuels) that provide the energy inputs to power plants. These are referred to as ''upstream'' emissions. Together, these emissions account for the full-fuel-cycle (FFC). In accordance with DOE's FFC Statement of Policy (76 FR 51282 (Aug. 18, 2011)), the FFC analysis includes impacts on emissions of methane (CH_4) and nitrous oxide (N_2O), both of which are recognized as greenhouse gases.

DOE primarily conducted the emissions analysis using emissions factors for CO_2 and most of the other gases derived from data in *AEO2014.* Combustion emissions of CH_4 and N_2O were estimated using emissions intensity factors published by the Environmental Protection Agency (EPA), GHG Emissions Factors Hub.[47] DOE developed separate emissions factors for power sector emissions and upstream emissions. The method that DOE used to derive emissions factors is described in chapter 13 of the SNOPR TSD.

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 the physical units (*i.e.,* tons) by the gas' global warming potential (GWP) over a 100-year time horizon. Based on the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,[48] DOE used GWP values of 28 for CH_4 and 265 for N_2O.

EIA prepares the *Annual Energy Outlook* using the National Energy Modeling System (NEMS). Each annual version of NEMS incorporates the projected impacts of existing air quality regulations on emissions. *AEO2014* generally represents current legislation and environmental regulations, including recent government actions, for which implementing regulations were available as of October 31, 2013.

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 (DC). SO_2 emissions from 28 eastern states and DC were also limited under the Clean Air Interstate Rule (CAIR; 70 FR 25162 (May 12, 2005)), which created an allowance-based trading program that operates along with the Title IV program. CAIR was remanded to the U.S. Environmental Protection Agency (EPA) by the U.S. Court of Appeals for the District of Columbia Circuit but it remained in effect.[49] In 2011 EPA issued a replacement for CAIR, the Cross-State Air Pollution Rule (CSAPR). 76 FR 48208 (August 8, 2011). On April 29, 2014, the U.S. Supreme Court reversed the judgment of the D.C. Circuit and remanded the case for further proceedings consistent with the Supreme Court's opinion.[50] On October 23, 2014, the D.C. Circuit lifted the stay of CSAPR.[51] Pursuant to this action, CSAPR went into effect (and CAIR ceased to be in effect) as of January 1, 2015.

Because *AEO2014* was prepared prior to the Supreme Court's opinion, it assumed that CAIR remains a binding regulation through 2040. Thus, DOE's analysis used emissions factors that assume that CAIR, not CSAPR, is the regulation in force. However, the difference between CAIR and CSAPR is not relevant 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.

[47] *http://www.epa.gov/climateleadership/inventory/ghg-emissions.html.*

[48] IPCC, 2013: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [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 (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Chapter 8.

[49] 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).

[50] *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.

[51] *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 final 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. *AEO2014* 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 are used to reduce acid gas emissions, and they 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. Therefore, DOE believes that efficiency 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.[52] Energy conservation standards are expected to have little effect on NO_X 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. 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 SNOPR 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 *AEO2014,* which incorporates the MATS.

For this SNOPR, DOE did not receive any comments on this section of the analysis and retained the same approach as in the NOPR.

L. Monetizing Carbon Dioxide and Other Emissions Impacts

As part of the development of the 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 benefits, 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 each of these emissions reduction estimates and presents the values considered in this SNOPR.

For this SNOPR, DOE did not receive any comments on this section of the analysis and retained the same approach as in the NOPR. DOE relied on a set of values for the social cost of carbon (SCC) that was developed by a Federal interagency process. The basis for these values is summarized below, and a more detailed description of the methodologies used is provided as an appendix to chapter 14 of the SNOPR TSD.

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) 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) of Executive Order 12866, 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 the 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[53] 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.

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.

[52] CSAPR also applies to NOx and it would supersede 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.

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

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. Specifically, 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.

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 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, is 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,[54] although preference is given to consideration of the global benefits of reducing CO_2 emissions. Table IV–14 presents the values in the 2010 interagency group report,[55] which is reproduced in appendix 14–A of the SNOPR TSD.

TABLE IV–14—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 notice were generated using the most recent versions of the three integrated assessment models that have been published in the peer-reviewed literature.[56]

Table IV–15 shows the updated sets of SCC estimates in 5-year increments from 2010 to 2050. The full set of annual SCC estimates between 2010 and 2050 is reported in appendix 14B of the SNOPR 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.

[54] 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.

[55] *Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866.* Interagency Working Group on Social Cost of Carbon, United States Government (February 2010) (Available at: *http://www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf*).

[56] *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866,* Interagency Working Group on Social Cost of Carbon, United States Government (May 2013; revised November 2013) (Available at: *http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf*).

TABLE IV–15—ANNUAL SCC VALUES FROM 2013 INTERAGENCY REPORT, 2010–2050

[2007$ per Metric Ton CO_2]

Year	Discount rate			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
2010	11	32	51	89
2015	11	37	57	109
2020	12	43	64	128
2025	14	47	69	143
2030	16	52	75	159
2035	19	56	80	175
2040	21	61	86	191
2045	24	66	92	206
2050	26	71	97	220

It is important to recognize that a number of key uncertainties remain, and that current SCC estimates should be treated as provisional and revisable since they will evolve with improved scientific and economic understanding. The interagency group also recognizes that the existing models are imperfect and incomplete. The 2009 National Research Council report mentioned above 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.

In summary, in considering the potential global benefits resulting from reduced CO_2 emissions, DOE used the values from the 2013 interagency report, adjusted to 2013$ using the implicit price deflator for GDP from the Bureau of Economic Analysis. For each of the four sets of SCC values, the values for emissions in 2015 were $12.0, $40.5, $62.4, and $119 per metric ton avoided (values expressed in 2013$). DOE derived values after 2050 using the relevant growth rate for the 2040–2050 period in the interagency update.

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 above, DOE has taken into account how amended energy conservation standards would reduce site NO_X emissions nationwide and 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 resulting from each of the TSLs considered for this SNOPR based on estimates found in the relevant scientific literature. Estimates of the monetary value for reducing NO_X from stationary sources range from $476 to $4,893 per ton (in 2013$).[57] DOE calculated monetary benefits using an average value for NO_X emissions of $2,684 per short ton (in 2013$), and real discount rates of 3 percent and 7 percent.

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.

The CA IOUs and ECOVA asked that DOE take into account the decreased cost of complying with sulfur dioxide emission regulations as a result of standards. (CA IOUs, No. 138 at p. 19; ECOVA, Pub. pp. 292–293) As discussed in section IV.K, under the MATS, SO_2 emissions are expected to be well below the cap established by CAIR. Thus, it is unlikely that the reduction in electricity demand resulting from energy efficiency standards would have an impact on the cost of complying with the regulations.

[57] U.S. Office of Management and Budget, Office of Information and Regulatory Affairs, *2006 Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities* (2006) (Available at: *www.whitehouse.gov/sites/default/files/omb/assets/omb/inforeg/2006_cb/2006_cb_final_report.pdf*).

For the SNOPR, DOE retained the same approach as in the NOPR for monetizing the emissions reductions from the proposed standards.

M. Utility Impact Analysis

The utility impact analysis estimates several effects on the electric power industry that would result from the adoption of new and amended energy conservation standards. In the utility impact analysis, DOE analyzes the changes in installed electrical capacity and generation that would result for each trial standard level. The analysis is based on published output from NEMS, which is updated annually to produce 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 those published side cases that incorporate efficiency-related policies to estimate the marginal impacts of reduced energy demand on the utility sector. 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. Chapter 15 of the SNOPR TSD describes the utility impact analysis in further detail.

N. Employment Impact Analysis

DOE considers employment impacts in the domestic economy as one factor in selecting a proposed standard. Employment impacts 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 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 supplies by the utility industry; (3) increased 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 BLS.[58] 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.[59] 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, based on the BLS data alone, DOE believes 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 SNOPR using an input/output model of the U.S. economy called Impact of Sector Energy Technologies version 3.1.1 (ImSET).[60] 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, where these uncertainties are reduced. For more details on the employment impact analysis, see chapter 16 of the SNOPR TSD.

The CEC disagreed with DOE's NOPR employment impact analysis, which, in its view, shows that increasing energy efficiency causes U.S. job losses. (California Energy Commission, No. 117 at p. 33) It based its view on an assumed ratio of jobs in the consumer goods sector versus the utility sector. The CEC did not provide independent data sources or references to support the assumption. Nevertheless, DOE reviewed its inputs to estimate employment impacts. Because nearly all battery chargers are imported, DOE reports the employment impacts as a range, with the low end assuming all equipment cost increases remain in the manufacturing country and the high end assuming all equipment cost increases are returned to the United States economy via trade. DOE assumed 50%–75% of increased costs to return to the United States so the employment impacts fall near the middle of the reported range. The results of DOE's revised analysis are presented in section V.B.3.c.

O. Marking Requirements

Under 42 U.S.C. 6294(a)(5), Congress granted DOE with the authority to establish labeling or marking requirements for a number of consumer products. Among these products are battery chargers.

In this SNOPR, DOE is not proposing to establish marking requirements for battery chargers. DOE arrived at this decision after considering all of the public comments it received on this subject and weighing the expected benefits and burdens of marking requirements for battery chargers. These public comments are summarized here.

DOE received comments requesting that it not extend marking requirements to products for which such requirements do not already exist. AHAM opposed any marking requirement, noting that these types of requirements are used to (1) inform consumers who can then make educated choices, (2) differentiate between products where there are two standards (*e.g.,* UL/CSA); and/or (3) differentiate products that use a voluntary standard. According to AHAM, none of these purposes would be served in the context of a mandatory standard with which manufacturers will need to demonstrate compliance to DOE through its certification requirements. In AHAM's view, a marking requirement would add cost and burden without a corresponding benefit. (AHAM, No. 124 at p. 8) ITI made similar arguments and noted that consumers are likely to ignore these marks. (ITI, No. 131 at p. 8) Panasonic commented that efficiency marking requirements for battery chargers and EPSs are unnecessary and superfluous as the covered products must comply with standards as a condition of sale in the United States. (Panasonic, No. 120 at pp. 3, 4)

DOE acknowledges that manufacturers are required to certify compliance with standards using the Compliance Certification Management System (''CCMS'') database. Under these requirements, battery charger manufacturers, like other manufacturers of regulated products, would need to follow the CCMS submission requirements as well if DOE adopts standards for these products. While DOE also acknowledges that the use of general markings may have certain limitations in ensuring compliance, DOE also recognizes that manufacturers and retailers could use efficiency markings or labels to help ensure that the end-use consumer products they sell comply with all applicable standards. However, DOE has not received requests from such parties requesting additional marking requirements for such purposes.

AHAM, ITI, and Panasonic further requested that if DOE were to require an efficiency marking for battery chargers, that marking should be the ''BC'' mark already required by the CEC rather than a Roman numeral, as proposed by DOE. Brother International also commented in support of the ''BC'' mark already required by the CEC. The commenters asserted that the transition from the CEC's scheme to DOE's [Roman numeral] scheme would be very difficult and costly and could necessitate the wasteful scrapping of improperly marked devices. They also asserted that adopting the ''BC'' mark would avoid any potential confusion created by products bearing two

[58] Data on industry employment, hours, labor compensation, value of production, and the implicit price deflator for output for these industries are available upon request by calling the Division of Industry Productivity Studies (202–691–5618) or by sending a request by email to *dipsweb@bls.gov*. Available at: *www.bls.gov/news.release/prin1.nr0.htm*.

[59] See Bureau of Economic Analysis, *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II)*. Washington, DC. U.S. Department of Commerce, 1992.

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

markings during the transition period. (AHAM, No. 124 at p. 8; Brother International, No. 111 at p. 2; ITI, No. 131 at p. 8; Panasonic, No. 120 at p. 3, 4)

NRDC, CEC, CA IOUs, and Delta-Q Technologies all supported a multi-level, national or international marking protocol for battery chargers like the scheme proposed by DOE. NRDC strongly encouraged DOE to adopt its own marking requirements for battery chargers, rather than adopting the CEC's, and commented that doing so would (1) create a simple vocabulary for all stakeholders, especially between manufacturers, retailers and government enforcement agents; (2) facilitate enforcement, as it drives accountability from the retailer to its supply-chain; (3) facilitate international adoption by offering a flexible multi-level scheme that allows adoption of different levels; (4) facilitate market transformation by encouraging voluntary programs such as ENERGY STAR to require higher efficiency levels; and (5) create a longer lived policy with more opportunity for differentiation and future improvement. NRDC further encouraged DOE to initiate discussions with the CEC regarding marking as early as possible in order to give parties enough time to plan and implement any potential changes before CEC's marking requirement goes into effect on February 1, 2013. (NRDC, No. 114 at pp. 16–17) The CEC supported DOE's labeling proposal and suggested that if DOE finalizes a rule that differs in stringency and construction from the California standards, DOE should include a mark to represent the California standard levels or set an effective date for marking that is equivalent to DOE's earliest effective date for battery charger standards. (California Energy Commission, No. 117 at p. 30) The California IOUs commented that they contributed to and support the conclusions in the CEC and NRDC comments, including specifically that ''battery charger and EPS marking should [be] harmonize[d] internationally.'' (CA IOUs, No. 138 at p. 20) Finally, Delta-Q Technologies commented that any markings DOE decides to require should be consolidated with California so products do not have to be labeled twice and incur double the cost. (Delta-Q Technologies, No. 113 at p. 2)

After considering all of these comments and weighing the expected benefits and burdens of marking requirements for battery chargers, DOE is declining to propose marking requirements for battery chargers in this SNOPR.

DOE received comments from two interested parties requesting that it not view the CEC-mandated ''BC'' mark as a violation of Federal law. AHAM commented that DOE should ''address how it will view products that contain marks indicating compliance with CEC standards. DOE should minimize burden on manufacturers who decide to sell product in California after the California standard goes into effect, but are not yet preempted by DOE's standards by not considering it a violation to bear the California mark on a product for a reasonable time after DOE's standard becomes mandatory.'' (AHAM, No. 124 at p. 9) Panasonic also expressed its concern that a product bearing the California marking would not comply with Federal requirements once the DOE's regulation became effective. It sought DOE's guidance on how to treat ''BC''-marked products and suggested that a grace period to be provided to manufacturers to adjust to whatever new requirements DOE establishes. (Panasonic, No. 120 at pp. 3, 4)

In light of DOE's decision not to propose battery charger marking requirements, manufacturers need not be concerned that marking devices in accordance with the CEC's present requirements will be a violation of Federal law. The battery charger standards being proposed in this notice will become effective two years after the publication of a final rule, at which time the CEC will no longer be able to compel a manufacturer to mark its product with a ''BC'' to signal that product's compliance with the applicable CEC standard. (42 U.S.C. 6297) However, DOE is not aware of any provisions in law that would prohibit a manufacturer from voluntarily marking its battery charger with a ''BC'' before or after this time.

P. Reporting Requirements

Upon request from Panasonic, DOE confirms that the CCMS online compliance process will be required for this rulemaking. (Panasonic, No. 120 at p. 6)

V. Analytical Results

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

A. Trial Standards Levels

DOE analyzed the benefits and burdens of four TSLs for battery chargers. These TSLs were developed using combinations of efficiency levels for the product classes analyzed by DOE. DOE presents the results for those TSLs in this proposed rule. The results for all efficiency levels that DOE analyzed are in the SNOPR TSD. Table V–1 presents the TSLs and the corresponding efficiency levels for battery chargers. TSL 4 represents the maximum technologically feasible (''max-tech'') improvements in energy efficiency for all product classes. While DOE examined most product classes individually, there were two groups of product classes that use generally similar technology options and cover the exact same range of battery energies. Because of this situation, DOE grouped all three low-energy, non-inductive, product classes (*i.e.,* 2, 3, and 4) together and examined the results. Similarly, DOE grouped the two medium energy product classes, Product Classes 5 and 6, together when it examined those results.

TABLE V–1—TRIAL STANDARD LEVELS FOR BATTERY CHARGERS

Product Class	Trial standard level			
	TSL 1	TSL 2	TSL 3	TSL 4
PC1—Low E, Inductive	CSL 1	CSL 2	CSL 2	CSL 3
PC2—Low E, Low Voltage	CSL 1	CSL 1	CSL 2	CSL 4
PC3—Low E, Medium Voltage	CSL 1	CSL 1	CSL 2	CSL 3
PC4—Low E, High Voltage	CSL 1	CSL 1	CSL 2	CSL 3
PC5—Medium E, Low Voltage	CSL 1	CSL 2	CSL 3	CSL 3
PC6—Medium E, High Voltage	CSL 1	CSL 2	CSL 3	CSL 3

TABLE V–1—TRIAL STANDARD LEVELS FOR BATTERY CHARGERS—Continued

Product Class	Trial standard level			
	TSL 1	TSL 2	TSL 3	TSL 4
PC7—High E	CSL 1	CSL 1	CSL 2	CSL 2

For battery charger Product Class 1 (low-energy, inductive), DOE examined trial standard levels corresponding to each of three CSLs developed in the engineering analysis. TSL 1 is an intermediate level of performance above the baseline. TSLs 2 and 3 are equivalent to the best-in-market and corresponds to the maximum consumer NPV. TSL 4 is the max-tech level and corresponds to the greatest NES.

For its second set of TSLs, which covers Product Classes 2 (low-energy, low-voltage), 3 (low-energy, medium-voltage), and 4 (low-energy, high-voltage), DOE examined four TSLs of different combinations of the various efficiency levels found for each product class in the engineering analysis. In this grouping, TSLs 1 and 2 are intermediate efficiency levels above the baseline for each product class and corresponds to the maximum consumer NPV. TSL 3 corresponds to an incremental efficiency level below best-in-market for Product Class 2, and the best-in-market efficiency level for Product Classes 3 and 4. Finally, TSL 4 corresponds to the max-tech efficiency level for all product classes and therefore, the maximum NES. Note that for Product Class 2 only, CSL 3 (corresponding to a best-in-market efficiency level) was not analyzed in a given TSL due to the negative LCC savings results for this product class at CSL 3 and the fact that only four TSLs were analyzed.

DOE's third set of TSLs corresponds to the grouping of Product Classes 5 (medium-energy, low-voltage) and 6 (medium-energy, high-voltage). For both product classes, TSL 1 is an intermediate efficiency level above the baseline. TSL 2 corresponds to the best-in-market efficiency level for both product classes and is the level with the highest consumer NPV. Finally, TSLs 3 and 4 correspond to the max-tech efficiency level for both product classes and the maximum NES.

For Product Class 7 (high-energy), DOE examined only two CSLs because of the paucity of products available on the market. TSLs 1 and 2 correspond to an efficiency level equivalent to the best-in-market and maximizes consumer NPV. TSLs 3 and 4 comprise the max-tech level corresponding to the level with the maximum NES.

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

DOE analyzed the economic impacts on battery charger consumers by looking at the effects potential national 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 SNOPR TSD provides detailed information on the LCC and PBP analyses.

The key outputs of the LCC analysis are average LCC savings for each product class for each TSL, relative to the base case, as well as the percentage of consumers for which the LCC will increase relative to the base case. Battery chargers are used in applications that can have a wide range of operating hours. Battery chargers that are used more frequently will tend to have a larger net LCC benefit than those that are used less frequently because of the large operating cost savings.

The key output of the PBP analysis is the median PBP at each TSL. DOE presents the median PBP rather than the mean PBP because it is more robust in the presence of outliers in the data.[61] These outliers can skew the mean PBP calculation but have little effect on the median PBP calculation. A small change in operating costs, which derive the denominator of the PBP calculation, can sometimes result in a very large PBP, which would skew the mean PBP calculation. For example, consider a sample of PBPs of 2, 2, 2, and 20 years, where 20 years is an outlier. The mean PBP would return a value of 6.5 years, whereas the median PBP would return a value of 2 years. Therefore, DOE considers the median PBP, which is not susceptible to skewing by occasional outliers.

Table V–2 through Table V–15 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. In the second table, the LCC savings are measured relative to the base-case efficiency distribution in the compliance year (see section IV.F.9 of this notice).

TABLE V–2—AVERAGE LCC AND PBP RESULTS BY TSL FOR PRODUCT CLASS 1

TSL	CSL	Average costs (*2013$*)				Simple payback *years*	Average lifetime *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC		
–	0	4.39	1.08	4.71	9.10	–	5.0
1	1	4.72	0.76	3.29	8.01	1.1	5.0
2	2	5.37	0.38	1.64	7.01	1.5	5.0
3	2	5.37	0.38	1.64	7.01	1.5	5.0

[61] DOE notes that it uses the median payback period to reduce the effect of outliers on the data. This method, however, does not eliminate the outliers from the data.

TABLE V–2—AVERAGE LCC AND PBP RESULTS BY TSL FOR PRODUCT CLASS 1—Continued

TSL	CSL	Average costs (*2013$*)				Simple payback *years*	Average lifetime *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC		
4	3	10.62	0.16	0.69	11.32	7.4	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 product.

TABLE V–3—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR PRODUCT CLASS 1

TSL	CSL	Life-cycle cost savings	
		% of consumers that experience net cost	Average savings* *2013$*
1	1	0.0	0.08
2	2	0.0	0.71
3	2	0.0	0.71
4	3	96.3	−3.44

* The calculation includes households with zero LCC savings (no impact).

TABLE V–4—AVERAGE LCC AND PBP RESULTS BY TSL FOR PRODUCT CLASS 2

TSL	CSL	Average costs (*2013$*)				Simple payback *years*	Average lifetime *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC		
–	0	2.62	0.43	1.43	4.05	–	4.0
1	1	2.68	0.27	0.86	3.54	0.6	4.0
2	1	2.68	0.27	0.86	3.54	0.6	4.0
3	2	3.11	0.16	0.45	3.57	2.5	4.0
4	4	7.31	0.11	0.31	7.62	19.5	4.0

TABLE V–5—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR PRODUCT CLASS 2

TSL	CSL	Life-cycle cost savings	
		% of consumers that experience net cost	Average savings* *2013$*
1	1	1.2	0.07
2	1	1.2	0.07
3	2	33.1	0.06
4	4	73.8	−2.79

TABLE V–6—AVERAGE LCC AND PBP RESULTS BY TSL FOR PRODUCT CLASS 3

TSL	CSL	Average costs (*2013$*)				Simple payback *years*	Average lifetime *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC		
–	0	2.59	0.52	2.30	4.89	–	4.9
1	1	2.70	0.18	0.82	3.52	0.8	4.9
2	1	2.70	0.18	0.82	3.52	0.8	4.9
3	2	6.84	0.10	0.43	7.27	21.6	4.9
4	3	8.83	0.09	0.41	9.24	31.2	4.9

TABLE V–7—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR PRODUCT CLASS 3

TSL	CSL	Life-cycle cost savings	
		% of consumers that experience net cost	Average savings* *2013$*
1	1	0.6	0.08
2	1	0.6	0.08
3	2	39.0	−1.36
4	3	40.8	−2.17

TABLE V–8—AVERAGE LCC AND PBP RESULTS BY TSL FOR PRODUCT CLASS 4

TSL	CSL	Average costs (*2013$*)				Simple payback *years*	Average lifetime *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC		
–	0	3.75	1.61	5.62	9.37		3.7
1	1	4.89	0.67	2.28	7.17	1.4	3.7
2	1	4.89	0.67	2.28	7.17	1.4	3.7
3	2	9.29	0.45	1.55	10.84	5.2	3.7
4	3	27.06	0.38	1.30	28.36	20.7	3.7

TABLE V–9—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR PRODUCT CLASS 4

TSL	CSL	Life-cycle cost savings	
		% of consumers that experience net cost	Average savings* *2013$*
1	1	1.3	0.11
2	1	1.3	0.11
3	2	12.6	−0.38
4	3	25.8	−4.91

TABLE V–10—AVERAGE LCC AND PBP RESULTS BY TSL FOR PRODUCT CLASS 5

TSL	CSL	Average costs (*2013$*)				Simple payback *years*	Average lifetime *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC		
–	0	46.58	11.68	68.85	115.43		4.0
1	1	51.37	7.74	45.38	96.75	2.3	4.0
2	2	58.94	2.87	16.36	75.30	2.7	4.0
3	3	207.68	1.26	7.10	214.77	29.1	4.0
4	3	207.68	1.26	7.10	214.77	29.1	4.0

TABLE V–11—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR PRODUCT CLASS 5

TSL	CSL	Life-cycle cost savings	
		% of consumers that experience net cost	Average savings* *2013$*
1	1	0.0	0.00
2	2	0.6	0.84
3	3	99.7	−138.63
4	3	99.7	−138.63

TABLE V–12—AVERAGE LCC AND PBP RESULTS BY TSL FOR PRODUCT CLASS 6

TSL	CSL	Average costs (*2013$*)				Simple payback *years*	Average lifetime *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC		
–	0	45.39	15.93	113.08	158.47		9.7
1	1	50.14	10.81	77.60	127.74	1.0	9.7
2	2	57.64	4.45	33.33	90.98	1.1	9.7
3	3	205.07	2.24	16.94	222.01	12.5	9.7
4	3	205.07	2.24	16.94	222.01	12.5	9.7

TABLE V–13—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR PRODUCT CLASS 6

TSL	CSL	Life-cycle cost savings	
		% of consumers that experience net cost	Average savings * *2013$*
1	1	0.0	0.00
2	2	0.0	1.89
3	3	100.0	−129.15
4	3	100.0	−129.15

TABLE V–14—AVERAGE LCC AND PBP RESULTS BY TSL FOR PRODUCT CLASS 7

TSL	CSL	Average costs (*2013$*)				Simple payback *years*	Average lifetime *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC		
–	0	221.94	29.42	95.03	316.97		3.5
1	1	181.55	22.09	70.81	252.36	0.0	3.5
2	1	181.55	22.09	70.81	252.36	0.0	3.5
3	2	334.87	15.14	48.60	383.47	8.1	3.5
4	2	334.87	15.14	48.60	383.47	8.1	3.5

TABLE V–15—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR PRODUCT CLASS 7

TSL	CSL	Life-cycle cost savings	
		% of consumers that experience net cost	Average savings * *2013$*
1	1	0.0	51.06
2	1	0.0	51.06
3	2	100.0	−80.05
4	2	100.0	−80.05

The LCC results for battery chargers depend on the product class being considered. See Table V–2 through Table V–15. LCC savings results for Product Class 1 are positive through TSL 3. For the low-energy product classes (Product Classes 2, 3, and 4), LCC results are positive through TSL 2 and become negative at TSL 3, with Product Class 2 becoming negative at TSL 4. The medium-energy product classes (Product Classes 5 and 6) are positive through TSL 2 but become negative at TSL 3. The high-energy product class (Product Class 7) has positive LCC savings through TSL 2, and then becomes negative at TSL 3.

b. Consumer Subgroup Analysis

Certain consumer subgroups may be disproportionately affected by standards. DOE performed LCC subgroup analyses in this SNOPR for low-income consumers, small businesses, residential top tier electricity price consumers, time-of-use peak electricity price consumers, and consumers of specific applications. See section IV.F of this SNOPR for a review of the inputs to the LCC analysis. LCC and PBP results for consumer subgroups are presented in Table V–16 through Table V–22. The abbreviations are described after Table V–22. The ensuing discussion presents the most significant results from the LCC subgroup analysis.

TABLE V–16—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS FOR PRODUCT CLASS 1

TSL	Average life-cycle cost savings (2013$)					Simple payback period (years)				
	LI	SB	TT	P–TOU	All	LI	SB	TT	P–TOU	All
1	0.08	0.00	0.26	0.39	0.08	1.1	0.0	0.3	0.2	1.1
2	0.71	0.00	2.88	4.31	0.71	1.5	0.0	0.5	0.3	1.5
3	0.71	0.00	2.88	4.31	0.71	1.5	0.0	0.5	0.3	1.5
4	(3.46)	0.00	0.44	3.00	(3.44)	7.4	0.0	2.3	1.6	7.4

TABLE V–17—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS FOR PRODUCT CLASS 2

TSL	Average life-cycle cost savings (2013$)					Simple payback period (years)				
	LI	SB	TT	P–TOU	All	LI	SB	TT	P–TOU	All
1	0.06	0.08	0.17	0.29	0.07	0.5	0.6	0.2	0.1	0.6
2	0.06	0.08	0.17	0.29	0.07	0.5	0.6	0.2	0.1	0.6
3	0.05	(0.01)	0.58	0.96	0.06	2.4	3.8	0.9	0.6	2.5
4	(2.76)	(3.29)	(2.05)	(1.56)	(2.79)	18.6	25.2	6.9	4.8	19.5

TABLE V–18—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS FOR PRODUCT CLASS 3

TSL	Average life-cycle cost savings (2013$)					Simple payback period (years)				
	LI	SB	TT	P–TOU	All	LI	SB	TT	P–TOU	All
1	0.07	0.14	0.23	0.36	0.08	0.8	0.2	0.2	0.2	0.8
2	0.07	0.14	0.23	0.36	0.08	0.8	0.2	0.2	0.2	0.8
3	(1.38)	(1.10)	(0.86)	(0.43)	(1.36)	22.0	4.8	6.9	4.8	21.6
4	(2.19)	(1.85)	(1.65)	(1.20)	(2.17)	31.3	6.6	10.0	7.0	31.2

TABLE V–19—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS FOR PRODUCT CLASS 4

TSL	Average life-cycle cost savings (2013$)					Simple payback period (years)				
	LI	SB	TT	P–TOU	All	LI	SB	TT	P–TOU	All
1	0.15	0.06	0.57	0.68	0.11	0.9	1.5	0.3	0.3	1.4
2	0.15	0.06	0.57	0.68	0.11	0.9	1.5	0.3	0.3	1.4
3	(0.49)	(0.27)	0.07	0.53	(0.38)	4.0	5.5	1.2	1.1	5.2
4	(5.80)	(3.83)	(5.07)	(3.79)	(4.91)	15.6	21.7	4.7	4.3	20.7

TABLE V–20—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS FOR PRODUCT CLASS 5

TSL	Average life-cycle cost savings (2013$)					Simple payback period (years)				
	LI	SB	TT	P–TOU	All	LI	SB	TT	P–TOU	All
1	0.00	0.00	0.00	0.00	0.00	2.3	0.0	0.8	0.5	2.3
2	0.84	0.00	3.14	4.64	0.84	2.7	0.0	0.9	0.6	2.7
3	(138.81)	0.00	(118.82)	(105.75)	(138.63)	29.1	0.0	9.8	6.8	29.1
4	(138.81)	0.00	(118.82)	(105.75)	(138.63)	29.1	0.0	9.8	6.8	29.1

TABLE V–21—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS FOR PRODUCT CLASS 6

TSL	Average life-cycle cost savings (2013$)					Simple payback period (years)				
	LI	SB	TT	P–TOU	All	LI	SB	TT	P–TOU	All
1	0.00	0.00	0.00	0.00	0.00	1.0	0.0	0.3	0.2	1.0
2	1.87	0.00	6.24	9.10	1.89	1.1	0.0	0.4	0.3	1.1
3	(129.38)	0.00	(93.98)	(70.73)	(129.15)	12.6	0.0	4.0	2.8	12.5
4	(129.38)	0.00	(93.98)	(70.73)	(129.15)	12.6	0.0	4.0	2.8	12.5

TABLE V–22—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS FOR PRODUCT CLASS 7

TSL	Average life-cycle cost savings (2013$)					Simple payback period (years)				
	LI	SB	TT	P–TOU	All	LI	SB	TT	P–TOU	All
1	51.88	49.36	89.56	116.93	51.06	0.0	0.0	0.0	0.0	0.0
2	51.88	49.36	89.56	116.93	51.06	0.0	0.0	0.0	0.0	0.0
3	(93.28)	(82.08)	(39.75)	62.98	(80.05)	20.1	8.0	6.4	1.6	8.1
4	(93.28)	(82.08)	(39.75)	62.98	(80.05)	20.1	8.0	6.4	1.6	8.1

Where:
LI = Low-income consumers
SB = Small businesses
TT = Top tier electricity price consumers
P–TOU = Peak time-of-use electricity price consumers
All = Entire population

Low-Income Consumers

For low-income consumers, the LCC impacts and PBPs are different from the general population. This subgroup considers only the residential sector, and uses an adjusted population distribution from the reference case scenario. Using 2009 RECS data, DOE determined that low-income consumers have a different population distribution than the general population. To account for this difference, DOE adjusted population distributions for each region analyzed according to the shift between general and low-income populations.

The LCC savings and PBPs of low-income consumers are similar to that of the total population of consumers. In general, low-income consumers experience slightly reduced LCC savings, with the exceptions of TSL 4 of Product Class 2 and TSLs 1 and 2 of Product Classes 4 and 7. None of the changes in LCC savings move a TSL from positive to negative LCC savings, or vice versa.

Small Businesses

For small business customers, the LCC impacts and PBPs are different from the general population. This subgroup analysis considers only the commercial sector, and uses an adjusted discount rate from the reference case scenario. DOE found that small businesses typically have a cost of capital that is 4.16 percent higher than the industry average, which was applied to the discount rate for the small business consumer subgroup analysis.

The small business consumer subgroup LCC results are not directly comparable to the reference case LCC results because this subgroup only considers commercial applications. In the reference case scenario, the LCC results are strongly influenced by the presence of residential applications, which typically comprise the majority of application shipments. Note that Product Classes 1, 5, and 6 have no results for small businesses because there are no commercial applications for these product classes. No LCC results that were positive for all consumers become negative in the small business subgroup analysis, with the exception of Product Class 2, which became -$0.01 at TSL 3. No negative LCC results for all consumers became positive for small businesses. These observations indicate that small business consumers would experience similar LCC impacts as the general population.

Top Tier Electricity Price Consumers

For top tier electricity price consumers, the LCC impacts and PBPs are different from the general population. Tiered pricing is generally only used for residential electricity rates, so the analysis for this subgroup only considers the residential sector. DOE researched upper tier inclined marginal block rates for the electricity, resulting in a price of $0.359 per kWh.

Consumers in the top tier electricity price bracket generally experience greater LCC savings than those in the reference case scenario. This result occurs because these consumers pay more for their electricity than other consumers, and, therefore, experience greater savings when using products that are more energy efficient. This subgroup analysis changed the negative LCC savings for Product Class 1 at TSL 4 and Product Class 4 at TSL 3 to positive LCC savings.

Peak Time-of-Use Electricity Price Consumers

For peak time-of-use electricity price consumers, the LCC impacts and PBPs are different from the general population. Time-of-use pricing is available for both residential and commercial electricity rates, so both sectors were considered. DOE researched upper tier inclined marginal block rates for electricity, resulting in adjusted electricity prices of $0.514 per kWh for residential and $0.494 for commercial consumers.

This subgroup analysis increased the LCC savings of most of the representative units significantly. This subgroup analysis changed the following negative LCC results to positive savings: Product Class 1 at TSL 4, Product Class 4 at TSL 3, and Product Class 7 at TSLs 3 and 4. Some product classes would still have negative LCC savings, which indicates that these product classes have increasing installed costs (purchase price plus installation costs, the latter of which are assumed to be zero) at higher TSLs that cannot be overcome through operating cost savings using peak time-of-use electricity prices.

Consumers of Specific Applications

DOE performed an LCC and PBP analysis on every application within each product class. This subgroup analysis used each application's specific inputs for lifetime costs, markups, base case market efficiency distribution, and UEC. Many applications in each product class experienced LCC impacts and PBPs that were different from the average results across the product class. Because of the large number of applications considered in the analysis, some of which span multiple product classes, DOE did not present application-specific LCC results here. Detailed results on each application are available in chapter 11 of the SNOPR TSD.

DOE noted a few trends highlighted by the application-specific subgroup. For Product Class 2, the top two application LCC savings representing 46 percent of shipments are negative beyond TSL 1, but frequently used applications within that class—*e.g.,* answering machines, cordless phones, and home security systems—experience positive LCC savings. Because these applications have significantly positive LCC savings, they balance out the negative savings from the top two applications. Some Product Class 4 applications at TSLs 1 through 3 featured results that were positive where the shipment-weighted results were negative, or vice versa. However, shipments and magnitude of the LCC savings were not enough to change the overall direction (positive or negative) of the weighted average. In the other battery charger product classes, the individual application results reflected the same trend as the overall results for the product class. See chapter 11 of the SNOPR TSD for further detail.

c. Rebuttable Presumption Payback

As discussed in section III.E.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. As required by EPCA, DOE based the energy use calculation on the DOE test procedures for battery chargers. Table V–23 presents the rebuttable-presumption PBPs for the considered TSLs. While DOE examined the rebuttable-presumption criterion, it considered whether the standard levels considered for this rule 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–23 shows considered TSLs for the battery charger product classes where the rebuttable presumption PBPs show they are economically justified. Because a PBP of less than three years indicates that the increased purchase cost is less than three times the value of the first-year energy savings for that efficiency level, this table highlights product class TSLs where the PBP is less than three years.

TABLE V–23—TRIAL STANDARD LEVELS WITH REBUTTABLE PAYBACK PERIOD LESS THAN THREE YEARS

Product class	Description	Trial standard level	Candidate standard level	Rebuttable presumption PBP *years*
1	Low-Energy, Inductive	1	1	1.1
		2	2	1.5
		3	2	1.5
2	Low-Energy, Low-Voltage	1	1	0.6
		2	1	0.6
		3	2	2.5
3	Low-Energy, Medium-Voltage	1	1	0.8
		2	1	0.8
4	Low-Energy, High-Voltage	1	1	1.4
		2	1	1.4
5	Medium-Energy, Low-Voltage	1	1	2.3
		2	2	2.7
6	Medium-Energy, High-Voltage	1	1	1.0
		2	2	1.1
7	High-Energy	1	1	0.0
		2	1	0.0

2. Economic Impact on Manufacturers

DOE performed an MIA to estimate the impact of new energy conservation standards on battery charger application manufacturers. The following sections describe the expected impacts on battery charger application manufacturers at each TSL. Chapter 12 of this SNOPR TSD explains the MIA in further detail.

a. Industry Cash-Flow Analysis Results

The INPV results refer to the difference in industry value between the base case and the standards case, which DOE calculated by summing the discounted industry cash flows from the base year (2015) through the end of the analysis period. The discussion also notes the difference in the annual cash flow between the base case and the standards case in the year before the compliance date of new energy conservation standards. This figure provides a proxy for the magnitude of the required conversion costs, relative to the cash flow generated by the industry in the base case.

DOE reports INPV impacts at each TSL for the four product class groupings. When appropriate, DOE also discusses the results for groups of related applications that would experience impacts significantly different from the overall product class group to which they belong.

In general, two major factors drive the INPV results: (1) the relative difference between a given applications' MSP and the incremental cost of improving its battery charger; and (2) the dominant base case battery charger technology that a given application uses, which is approximated by the application's efficiency distribution.

With respect to the first factor, the higher the MSP of the application relative to the battery charger cost, the lower the impacts of battery charger standards on OEMs of the application. For example, an industry that sells an application for $500 would be less affected by a $2 increase in battery charger costs than one that sells its application for $10. On the second factor regarding base case efficiency distribution, some industries, such as producers of laptop computers, already incorporate highly efficient battery chargers. Therefore, a higher standard would be unlikely to impact the laptop industry as it would other applications using baseline technology in the same product class.

DOE analyzed three markup scenarios—constant price, pass-through, and flat markup. The constant price scenario analyzes the situation in which application manufacturers are unable to pass on any incremental costs of more efficient battery chargers to their customers. This scenario generally results in the most significant negative impacts because no incremental costs added to the application—whether driven by higher battery charger component costs or depreciation of required capital investments—can be recouped.

In the pass-through scenario, DOE assumes that manufacturers are able to pass the incremental costs of more efficient battery chargers through to their customers, but not with any markup to cover overhead and profit. Therefore, though less severe than the constant price scenario in which manufacturers absorb all incremental costs, this scenario results in negative cash flow impacts due to margin compression and greater working capital requirements.

Finally, DOE considers a flat markup scenario to analyze the upper bound (most positive) of profitability impacts. In this scenario, manufacturers are able to maintain their base case gross margin, as a percentage of revenue, at higher CSLs, despite the higher product costs associated with more efficient battery chargers. In other words, manufacturers can fully pass on—and markup—the higher incremental product costs associated with more efficient battery chargers.

Product Class 1

Table V–24 through Table V–27 summarize information related to the analysis performed to project the potential impacts on Product Class 1 battery charger application manufacturers.

TABLE V–24—APPLICATIONS IN PRODUCT CLASS 1

Product class 1
Rechargeable Toothbrushes
Rechargeable Water Jets

TABLE V–25—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 1 BATTERY CHARGER APPLICATIONS—FLAT MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	497	497	496	496	519
Change in INPV	2013$ Millions		0	(1)	(1)	22
	(%)		0.0	(0.1)	(0.1)	4.5
Product Conversion Costs	2013$ Millions		0.1	1.7	1.7	5.1
Capital Conversion Costs	2013$ Millions		0.0	1.5	1.5	2.3
Total Investment Required	2013$ Millions		0.1	3.2	3.2	7.4

TABLE V–26—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 1 BATTERY CHARGER APPLICATIONS—PASS THROUGH MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	497	491	470	470	348
Change in INPV	2013$ Millions		(6)	(27)	(27)	(149)
	(%)		(1.1)	(5.4)	(5.4)	(29.9)
Product Conversion Costs	2013$ Millions		0.1	1.7	1.7	5.1
Capital Conversion Costs	2013$ Millions		0.0	1.5	1.5	2.3
Total Investment Required	2013$ Millions		0.1	3.2	3.2	7.4

TABLE V–27—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 1 BATTERY CHARGER APPLICATIONS—CONSTANT PRICE MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	497	478	412	412	122
Change in INPV	2013$ Millions		(18)	(84)	(84)	(375)
	(%)		(3.7)	(16.9)	(16.9)	(75.5)
Product Conversion Costs	2013$ Millions		0.1	1.7	1.7	5.1
Capital Conversion Costs	2013$ Millions		0.0	1.5	1.5	2.3
Total Investment Required	2013$ Millions		0.1	3.2	3.2	7.4

Product Class 1 has only two applications: rechargeable toothbrushes and water jets. Rechargeable toothbrushes represent over 99 percent of the Product Class 1 shipments. DOE found the majority of these models include Ni-Cd battery chemistries, although products with NiMH and Li-ion chemistries exist in the market. During interviews, manufacturers indicated that energy efficiency was not a primary selling point in this market. As a consequence, manufacturers expect that stringent standards would likely impact the low-end of the market, where price competition is most fierce and retail selling prices are lowest.

TSL 1 sets the efficiency level at CSL 1 for Product Class 1. At TSL 1, DOE estimates impacts on the change in INPV to range from −$18 million to less than one million dollars, or a change in INPV of −3.7 percent to less than 0.1 percent. At TSL 1, industry free cash flow (operating cash flow minus capital expenditures) is estimated to decrease by less than one million dollars, which corresponds to less than one percent in 2017, the year leading up to new energy conservation standards.

Percentage impacts on INPV are slightly negative at TSL 1. DOE does not anticipate that Product Class 1 battery charger application manufacturers would lose a significant portion of their INPV at this TSL. DOE projects that in the expected year of compliance, 2018, 93 percent of all Product Class 1 battery charger applications would meet or exceed the efficiency levels required at TSL 1. Consequently, DOE expects conversion costs to be small at TSL 1, since so many applications already meet or exceed this requirement.

TSL 2 and TSL 3 set the efficiency level at CSL 2 for Product Class 1. At TSL 2 and TSL 3, DOE estimates impacts on the change in INPV to range from −$84 million to −$1 million, or a change in INPV of −16.9 percent to −0.1 percent. At TSL 2 and TSL 3, industry free cash flow is estimated to decrease to $38 million, or a drop of 4 percent, compared to the base-case value of $39 million in 2017.

Percentage impacts on INPV range from slightly negative to moderately negative at these TSLs. DOE does not anticipate that Product Class 1 battery charger application manufacturers would lose a significant portion of their INPV at these TSLs. DOE projects that in the expected year of compliance, 2018, 37 percent of all Product Class 1 battery charger applications would meet or exceed the efficiency levels required at TSL 2 and TSL 3. DOE expects conversion costs to increase from $0.1 million at TSL 1 to $3.2 million at TSL 2 and TSL 3. This is still a relatively modest amount compared to the base case INPV of $497 million and annual cash flow of $39 million for Product Class 1 battery charger applications.

TSL 4 sets the efficiency level at CSL 3 for Product Class 1. This represents max tech for Product Class 1. At TSL 4, DOE estimates impacts on the change in INPV to range from −$375 million to $22 million, or a change in INPV of −75.5 percent to 4.5 percent. At TSL 4, industry free cash flow is estimated to decrease to $36 million, or a drop of 8 percent, compared to the base-case value of $39 million in 2017.

Percentage impacts on INPV range from significantly negative to slightly positive at TSL 4. DOE anticipates that some Product Class 1 battery charger application manufacturers could lose a significant portion of their INPV at TSL 4. DOE projects that in the expected year of compliance, 2018, 4 percent of all Product Class 1 battery charger applications would meet the efficiency levels required at TSL 4. DOE expects conversion costs to increase from $3.2 million at TSL 2 and TSL 3 to $7.4 million at TSL 4. This is still relatively a modest amount compared to the base case INPV of $497 million and annual cash flow of $39 million for Product Class 1 battery charger applications. At TSL 4, the battery charger MPC increases to $6.80 compared to the baseline MPC value of $2.05. This represents a moderate increase in the application price when compared to the shipment-weighted average application MPC of $40.06.

Product Classes 2, 3, and 4

The following tables (Table V–28 through Table V–34) summarize information related to the analysis performed to project the potential impacts on manufacturers of devices falling into Product Classes 2, 3, and 4.

TABLE V–28—APPLICATIONS IN PRODUCT CLASSES 2, 3, AND 4

Product class 2	Product class 3	Product class 4
Answering Machines	Air Mattress Pumps	DIY Power Tools (External)
Baby Monitors	Blenders	Flashlights/Lanterns
Beard and Moustache Trimmers	Camcorders	Handheld Vacuums
Bluetooth Headsets	DIY Power Tools (External)	Netbooks
Can Openers	DIY Power Tools (Integral)	Notebooks
Consumer Two-Way Radios	Handheld Vacuums	Portable Printers
Cordless Phones	LAN Equipment	Professional Power Tools
Digital Cameras	Mixers	Rechargeable Garden Care Products
DIY Power Tools (Integral)	Portable DVD Players	Robotic Vacuums
E-Books	Portable Printers	Stick Vacuums
Hair Clippers	RC Toys	Universal Battery Chargers
Handheld GPS	Stick Vacuums	
Home Security Systems	Toy Ride-On Vehicles	
In-Vehicle GPS	Universal Battery Chargers	
Media Tablets	Wireless Speakers	
Mobile Internet Hotspots		
Mobile Phones		
MP3 Players		
MP3 Speaker Docks		
Personal Digital Assistants		
Portable Video Game Systems		
Shavers		
Smartphone		
Universal Battery Chargers		
Video Game Consoles		
Wireless Headphones		

TABLE V–29—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 2, 3, AND 4 BATTERY CHARGER APPLICATIONS—FLAT MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	76,791	76,782	76,782	76,774	77,290
Change in INPV	2013$ Millions		(10)	(10)	(17)	499
	(%)		(0.0)	(0.0)	(0.0)	0.6
Product Conversion Costs	2013$ Millions		11.5	11.5	90.1	280.5
Capital Conversion Costs	2013$ Millions		1.8	1.8	25.6	67.3
Total Investment Required	2013$ Millions		13.4	13.4	115.7	347.8

TABLE V–30—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 2, 3, AND 4 BATTERY CHARGER APPLICATIONS—PASS THROUGH MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	76,791	76,740	76,740	76,322	71,407
Change in INPV	2013$ Millions		(51)	(51)	(469)	(5,384)
	(%)		(0.1)	(0.1)	(0.6)	(7.0)
Product Conversion Costs	2013$ Millions		11.5	11.5	90.1	280.5
Capital Conversion Costs	2013$ Millions		1.8	1.8	25.6	67.3
Total Investment Required	2013$ Millions		13.4	13.4	115.7	347.8

TABLE V–31—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 2, 3, AND 4 BATTERY CHARGER APPLICATIONS—CONSTANT MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	76,791	76,650	76,650	75,392	62,307
Change in INPV	2013$ Millions		(141)	(141)	(1,400)	(14,484)
	(%)		(0.2)	(0.2)	(1.8)	(18.9)
Product Conversion Costs	2013$ Millions		11.5	11.5	90.1	280.5
Capital Conversion Costs	2013$ Millions		1.8	1.8	25.6	67.3
Total Investment Required	2013$ Millions		13.4	13.4	115.7	347.8

Taken together, Product Classes 2, 3, and 4 include the greatest number of applications and account for approximately 96 percent of all battery charger application shipments in 2018, the anticipated compliance year for new energy conservation standards.

TSL 1 and TSL 2 set the efficiency level at CSL 1 for all product classes in this grouping. At TSL 1 and TSL 2, DOE estimates impacts on the change in INPV to range from −$141 million to −$10 million, or a change in INPV of −0.2 percent to less than −0.1 percent. At TSL 1 and TSL 2, industry free cash flow is estimated to decrease to $6,018 million, or a drop of less than one percent, compared to the base-case value of $6,024 million in 2017.

Percentage impacts on INPV are slightly negative at TSL 1 and TSL 2. DOE does not anticipate that most Product Class 2, 3, and 4 battery charger application manufacturers would lose a significant portion of their INPV at TSL 1 or TSL 2. DOE projects that in the expected year of compliance, 2018, 91 percent of all Product Class 2 battery charger applications, 94 percent of all Product Class 3 battery charger applications, and 94 percent of all Product Class 4 battery charger applications would meet or exceed the efficiency levels required at TSL 1 and TSL 2. Consequently, DOE expects conversion costs to be small at TSL 1 and TSL 2, approximately $13.4 million since so many applications already meet or exceed this requirement.

TSL 3 sets the efficiency level at CSL 2 for all product classes in this grouping. At TSL 3, DOE estimates impacts on the change in INPV to range from −$1,400 million to $17 million, or a change in INPV of −1.8 percent to less than −0.1 percent. At TSL 3, industry free cash flow is estimated to decrease to $5,973 million, or a drop of 1 percent, compared to the base-case value of $6,024 million in 2017.

Percentage impacts on INPV are slightly negative at this TSL. DOE does not anticipate that Product Class 2, 3, and 4 battery charger application manufacturers would lose a significant portion of their INPV at this TSL. DOE projects that in the expected year of compliance, 2018, 49 percent of all Product Class 2 battery charger applications, 60 percent of all Product Class 3 battery charger applications, and 86 percent of all Product Class 4 battery charger applications would meet or exceed the efficiency levels required at TSL 3. DOE expects conversion costs to increase from $13.4 million at TSL 1 and TSL 2 to $115.7 million at TSL 3. This represents a relatively modest amount compared to the base case INPV of $76.8 billion and annual cash flow of $6,02 billion for Product Class 2, 3, and 4 battery charger applications.

TSL 4 sets the efficiency level at CSL 3 for Product Classes 3 and 4 and CSL 4 for Product Class 2. These efficiency levels represent max tech for all the product classes in this grouping. At TSL 4, DOE estimates impacts on the change in INPV to range from −$14.48 billion to $499 million, or a change in INPV of −18.9 percent to 0.6 percent. At TSL 4, industry free cash flow is estimated to decrease to $5.87 billion, or a drop of 3 percent, compared to the base-case value of $6.02 billion in 2017.

Percentage impacts on INPV range from moderately negative to slightly positive at TSL 4. DOE anticipates that some Product Class 2, 3, and 4 battery charger application manufacturers could lose a significant portion of their INPV at TSL 4. DOE projects that in the expected year of compliance, 2018, 25 percent of all Product Class 2 battery charger applications, 58 percent of all Product Class 3 battery charger applications, and 74 percent of all Product Class 4 battery charger applications would meet the efficiency levels required at TSL 4. DOE expects conversion costs to significantly increase from $115.7 million at TSL 3 to $347.8 million at TSL 4. At TSL 4, the Product Class 2 battery charger MPC increases to $4.31 compared to the baseline MPC value of $1.16. This represents a small application price increase considering that the shipment-weighted average Product Class 2 battery charger application MPC is $127.73. For Product Class 3, the MPC increases to $5.51 compared to the baseline MPC value of $1.12. This estimate also represents a small application price increase since the shipment-weighted average Product Class 3 battery charger application MPC is $61.11. For Product Class 4, the battery charger MPC increases to $18.34 compared to the baseline battery charger MPC of $1.79. While DOE recognizes that this projected increase of $16.55 in the battery charger MPC from the baseline to the max tech may seem significant, its impact is modest when compared to the shipment-weighted average Product Class 4 battery charger application MPC of $192.40—in essence, it represents a 8.6 percent increase in the average battery charger application MPC.

These product classes also include a wide variety of applications, characterized by differing shipment volumes, base case efficiency distributions, and MSPs. Because of this variety, this product class grouping, more than any other, requires a greater level of disaggregation to evaluate specific industry impacts. Presented only on a product class basis, industry impacts are effectively shipment-weighted and mask impacts on certain industry applications that vary substantially from the aggregate results. Therefore, in addition to the overall product class group results, DOE also presents results by industry subgroups—consumer electronics, power tools, and small appliances—in the pass-through scenario, which approximates the mid-point of the potential range of INPV impacts. These results highlight impacts at various TSLs.

As discussed in the previous section, these aggregated results can mask differentially impacted industries and manufacturer subgroups. Nearly 90 percent of shipments in Product Classes 2, 3 and 4 fall under the broader consumer electronics category, with the remaining share split between small appliances and power tools. Consumer electronics applications have a much higher shipment-weighted average MPC ($147.29) than the other product categories ($58.32 for power tools and $43.63 for small appliances). Consequently, consumer electronics manufacturers are better able to absorb higher battery charger costs than small appliance and power tool manufacturers. Further, consumer electronics typically incorporate higher efficiency battery chargers already, while small appliances and power tool applications tend to cluster around baseline and CSL 1 efficiencies. These factors lead to proportionally greater impacts on small appliance and power tool manufacturers in the event they are not able to pass on and markup higher battery charger costs.

Table V–32 through Table V–34 present INPV impacts in the pass-through markup scenario for consumer electronic, power tool, and small appliance applications, respectively (for only those applications incorporating battery chargers in Product Classes 2, 3 or 4). The results indicate manufacturers of power tools and small appliances would face disproportionately adverse impacts, especially at the higher TSLs, as compared to consumer electronics manufacturers and the overall product group's results (shown in Table V–29 through Table V–31), if they are not able to mark up the incremental product costs.

TABLE V–32—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 2, 3, AND 4 BATTERY CHARGER APPLICATIONS—PASS THROUGH MARKUP SCENARIO—CONSUMER ELECTRONICS

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	73,840	73,805	73,805	73,511	69,568
Change in INPV	2013$ Millions		(36)	(36)	(329)	(4,272)
	(%)		(0.0)	(0.0)	(0.4)	(5.8)
Product Conversion Costs	2013$ Millions		10.2	10.2	77.6	242.2
Capital Conversion Costs	2013$ Millions		1.7	1.7	20.0	56.3
Total Investment Required	2013$ Millions		11.9	11.9	97.6	298.5

TABLE V–33—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 2, 3, AND 4 BATTERY CHARGER APPLICATIONS—PASS THROUGH MARKUP SCENARIO—POWER TOOLS

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	2,190	2,179	2,179	2,102	1,351
Change in INPV	2013$ Millions		(11)	(11)	(88)	(839)
	(%)		(0.5)	(0.5)	(4.0)	(38.3)
Product Conversion Costs	2013$ Millions		0.9	0.9	7.3	22.3
Capital Conversion Costs	2013$ Millions		0.0	0.0	3.3	5.5
Total Investment Required	2013$ Millions		1.0	1.0	10.6	27.8

TABLE V–34—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 2, 3, AND 4 BATTERY CHARGER APPLICATIONS—PASS THROUGH MARKUP SCENARIO—SMALL APPLIANCES

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	761	756	756	709	487
Change in INPV	2013$ Millions		(5)	(5)	(52)	(273)
	(%)		(0.6)	(0.6)	(6.8)	(35.9)
Product Conversion Costs	2013$ Millions		0.4	0.4	5.1	16.0
Capital Conversion Costs	2013$ Millions		0.1	0.1	2.4	5.5
Total Investment Required	2013$ Millions		0.5	0.5	7.5	21.5

Product Classes 5 and 6

The following tables (Table V–35 through Table V–38) summarize information related to the analysis performed to project the potential impacts on manufacturers of devices falling into Product Classes 5 and 6.

TABLE V–35—APPLICATIONS IN PRODUCT CLASSES 5 AND 6

Product class 5	Product class 6
Marine/Automotive/ RV Chargers	Electric Scooters
Mobility Scooters	Lawn Mowers
Toy Ride-On Vehicles	Motorized Bicycles
Wheelchairs	Wheelchairs

TABLE V–36—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 5 AND 6 BATTERY CHARGER APPLICATIONS—FLAT MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	1,493	1,493	1,493	2,065	2,065
Change in INPV	2013$ Millions		0	0	572	572
	(%)		0.0	0.0	38.3	38.3
Product Conversion Costs	2013$ Millions		0.0	1.1	33.1	33.1
Capital Conversion Costs	2013$ Millions		0.0	0.2	6.4	6.4
Total Investment Required	2013$ Millions		0.0	1.3	39.6	39.6

TABLE V–37—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 5 AND 6 BATTERY CHARGER APPLICATIONS—PASS THROUGH MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	1,493	1,491	1,370	878	878
Change in INPV	2013$ Millions		(2)	(123)	(615)	(615)
	(%)		(0.2)	(8.2)	(41.2)	(41.2)
Product Conversion Costs	2013$ Millions		0.0	1.1	33.1	33.1
Capital Conversion Costs	2013$ Millions		0.0	0.2	6.4	6.4
Total Investment Required	2013$ Millions		0.0	1.3	39.6	39.6

TABLE V–38—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 5 AND 6 BATTERY CHARGER APPLICATIONS—CONSTANT MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	1,493	1,486	1,145	586	586
Change in INPV	2013$ Millions		(7)	(348)	(907)	(907)
	(%)		(0.5)	(23.3)	(60.8)	(60.8)
Product Conversion Costs	2013$ Millions		0.0	1.1	33.1	33.1
Capital Conversion Costs	2013$ Millions		0.0	0.2	6.4	6.4
Total Investment Required	2013$ Millions		0.0	1.3	39.6	39.6

Product Classes 5 and 6 together comprise seven unique applications. Toy ride-on vehicles represent over 70 percent of the Product Class 5 and 6 shipments. DOE found that all Product Class 5 and 6 shipments are at either CSL 1 or CSL 2. The battery charger cost associated with each CSL is the same for Product Class 5 and 6 applications, but the energy usage profiles are different.

TSL 1 sets the efficiency level at CSL 1 for Product Classes 5 and 6. At TSL

1, DOE estimates impacts on the change in INPV to range from −$7 million to no change at all, or a change in INPV of −0.5 percent to no change at all. At TSL 1, industry free cash flow is estimated to remain at $117 million in 2017.

Percentage impacts on INPV range from slightly negative to unchanged at TSL 1. DOE does not anticipate that Product Class 5 and 6 battery charger application manufacturers would lose a significant portion of their INPV at TSL 1. DOE projects that in the expected year of compliance, 2018, all Product Class 5 and 6 battery charger applications would meet or exceed the efficiency levels required at TSL 1. Consequently, DOE does not expect there to be any conversion costs at TSL 1.

TSL 2 sets the efficiency level at CSL 2 for Product Classes 5 and 6. At TSL 2, DOE estimates impacts on the change in INPV to range from −$348 million to less than one million dollars, or a change in INPV of −23.3 percent to less than 0.1 percent. At TSL 2, industry free cash flow is estimated to decrease to $117 million, or a drop of less than one percent, compared to the base-case value of $117 million in 2017.

Percentage impacts on INPV range from moderately negative to slightly positive at TSL 2. DOE projects that in the expected year of compliance, 2018, 95 percent of all Product Class 5 battery charger applications and 95 percent of all Product Class 6 battery charger applications would meet or exceed the efficiency levels required at TSL 2. DOE expects conversion costs to slightly increase to $1.3 million at TSL 2.

TSL 3 and TSL 4 set the efficiency level at CSL 3 for Product Classes 5 and 6. This efficiency level represents max tech for Product Classes 5 and 6. At TSL 3 and TSL 4, DOE estimates impacts on the change in INPV to range from −$907 million to $572 million, or a change in INPV of −60.8 percent to 38.3 percent. At TSL 3 and TSL 4, industry free cash flow is estimated to decrease to $100 million, or a drop of 15 percent, compared to the base-case value of $117 million in 2017.

Percentage impacts on INPV range from significantly negative to significantly positive at TSL 3 and TSL 4. This large INPV range is related to the significant increase in battery charger MPC required at TSL 3 and TSL 4. DOE believes that it is unlikely battery charger application manufacturers would be able to pass on this larger increase in the MPC of the battery charger, which would imply that the negative INPV impact is a more realistic scenario than the positive INPV impact scenario. DOE anticipates that most Product Class 5 and 6 battery charger application manufacturers could lose a significant portion of their INPV at TSL 3 and TSL 4. DOE projects that in the expected year of compliance, 2018, no Product Class 5 or 6 battery charger applications would meet the efficiency levels required at TSL 3 and TSL 4. DOE expects conversion costs to significantly increase from $1.3 million at TSL 2 to $39.6 million at TSL 3 and TSL 4. At TSL 3 and TSL 4, the Product Class 5 and 6 battery charger MPC increases to $127.00 compared to the baseline battery charger MPC value of $18.48. This represents a huge application price increase considering that the shipment-weighted average Product Class 5 and 6 battery charger application MPC, with no standards, is $131.14 and $262.21 respectively.

Product Class 7

The following tables (Table V–39 through Table V–42) summarize information related to the analysis performed to project the potential impacts on manufacturers of devices falling into Product Class 7.

TABLE V–39—APPLICATIONS IN PRODUCT CLASS 7

Product class 7
Golf Cars

TABLE V–40—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 7 BATTERY CHARGER APPLICATIONS—FLAT MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	1,124	1,116	1,116	1,143	1,143
Change in INPV	2013$ Millions		(8)	(8)	20	20
	(%)		(0.7)	(0.7)	1.7	1.7
Product Conversion Costs	2013$ Millions		1.3	1.3	3.3	3.3
Capital Conversion Costs	2013$ Millions		0.4	0.4	1.8	1.8
Total Investment Required	2013$ Millions		1.7	1.7	5.1	5.1

TABLE V–41—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 7 BATTERY CHARGER APPLICATIONS—PASS THROUGH MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	1,124	1,134	1,134	1,091	1,091
Change in INPV	2013$ Millions		11	11	(32)	(32)
	(%)		0.9	0.9	(2.9)	(2.9)
Product Conversion Costs	2013$ Millions		1.3	1.3	3.3	3.3
Capital Conversion Costs	2013$ Millions		0.4	0.4	1.8	1.8
Total Investment Required	2013$ Millions		1.7	1.7	5.1	5.1

TABLE V–42—MANUFACTURERS IMPACT ANALYSIS FOR PRODUCT CLASS 7 BATTERY CHARGER APPLICATIONS—CONSTANT MARKUP SCENARIO

	Units	Base case	Trial standard level			
			1	2	3	4
INPV	2013$ Millions	1,124	1,168	1,168	998	998
Change in INPV	2013$ Millions		44	44	(126)	(126)
	(%)		3.9	3.9	(11.2)	(11.2)
Product Conversion Costs	2013$ Millions		1.3	1.3	3.3	3.3
Capital Conversion Costs	2013$ Millions		0.4	0.4	1.8	1.8
Total Investment Required	2013$ Millions		1.7	1.7	5.1	5.1

Golf cars are the only application in Product Class 7. Approximately 80 percent of the market incorporates baseline battery charger technology—the remaining 20 percent employs technology that meets the efficiency requirements at CSL 1. The cost of a battery charger in Product Class 7, though higher relative to other product classes, remains a small portion of the overall selling price of a golf cart. This analysis, however, focuses on the application manufacturer (OEM). DOE identified one small U.S. manufacturer of golf cart battery chargers. The impacts of standards on these small businesses is addressed in the Regulatory Flexibility Analysis (see section VI.B for the results of that analysis).

TSL 1 and TSL 2 set the efficiency level at CSL 1 for Product Class 7. At TSL 1 and TSL 2, DOE estimates impacts on the change in INPV to range from −$8 million to $44 million, or a change in INPV of −0.7 percent to 3.9 percent. At TSL 1 and TSL 2, industry free cash flow is estimated to decrease to $87 million, or a drop of 1 percent, compared to the base-case value of $88 million in 2017.

Percentage impacts on INPV range from slightly negative to slightly positive at TSL 1 and TSL 2. DOE does not anticipate that Product Class 7 battery charger application manufacturers, the golf car manufacturers, would lose a significant portion of their INPV at this TSL. DOE projects that in the expected year of compliance, 2018, 20 percent of all Product Class 7 battery charger applications would meet or exceed the efficiency levels required at TSL 1 and TSL 2. DOE expects conversion costs to be $1.7 million at TSL 1 and TSL 2.

TSL 3 and TSL 4 set the efficiency level at CSL 2 for Product Class 7. This represents max tech for Product Class 7. At TSL 3 and TSL 4, DOE estimates impacts on the change in INPV to range from −$126 million to $20 million, or a change in INPV of −11.2 percent to 1.7 percent. At TSL 3 and TSL 4, industry free cash flow is estimated to decrease to $86 million, or a drop of 3 percent, compared to the base-case value of $88 million in 2017.

Percentage impacts on INPV range from moderately negative to slightly positive at TSL 3 and TSL 4. DOE projects that in the expected year of compliance, 2018, no Product Class 7 battery charger applications would meet the efficiency levels required at TSL 3 and TSL 4. DOE expects conversion costs to increase from $1.7 million at TSL 1 and TSL 2 to $5.1 million at TSL 3 and TSL 4. This represents a relatively modest amount compared to the base case INPV of $1,124 million and annual cash flow of $88 million for Product Class 7 battery charger applications. At TSL 3 and TSL 4 the battery charger MPC increases to $164.14 compared to the baseline battery charger MPC value of $88.07. This change represents only a moderate increase in the application price since the shipment-weighted average application MPC is $2,608.09.

b. Impacts on Employment

DOE attempted to quantify the number of domestic workers involved in battery charger production. Based on manufacturer interviews and reports from vendors such as Hoovers, Dun and Bradstreet, and Manta, the vast majority of all small appliance and consumer electronic applications are manufactured abroad. When looking specifically at the battery charger component, which is typically designed by the application manufacturer but sourced for production, the same dynamic holds to an even greater extent. That is, in the rare instance when an application's production occurs domestically, it is very likely that the battery charger component is still produced and sourced overseas. For example, DOE identified several power tool applications with some level of domestic manufacturing. However, based on more detailed information obtained during interviews, DOE believes the battery charger components for these applications are sourced from abroad.

Also, DOE was able to find a few manufacturers of medium and high power applications with facilities in the U.S. However, only a limited number of these companies produce battery chargers domestically for these applications. Therefore, based on manufacturer interviews and DOE's research, DOE believes that golf cars are the only application with U.S.-based battery charger manufacturing. Any change in U.S. production employment due to new battery charger energy conservation standards is likely to come from changes involving these particular products. DOE seeks comment on the presence of any domestic battery charger manufacturing outside of the golf car industry and beyond prototyping for R&D purposes.

At the proposed efficiency levels, domestic golf car manufacturers will need to decide whether to attempt to manufacture more efficient battery chargers in-house and try to compete with a greater level of vertical integration than their competitors, move production to lower-wage regions abroad, or outsource their battery charger manufacturing. DOE believes one of the latter two strategies would be more likely for domestic golf car manufacturers. DOE describes the major implications for golf car employment in the regulatory flexibility act section, VI.B, because the major domestic manufacturer is also a small business manufacturer. DOE does not anticipate any major negative changes in the domestic employment of the design, technical support, or other departments of battery charger application manufacturers located in the U.S. in response to new energy conservation standards. Standards may require some companies to redesign their battery chargers, change marketing literature, and train some technical and sales support staff. However, during interviews, manufacturers generally agreed these changes would not lead to positive or negative changes in employment, outside of the golf car battery charger industry.

c. Impacts on Manufacturing Capacity

DOE does not anticipate that the standards proposed in this SNOPR would adversely impact manufacturer capacity. The battery charger application industry is characterized by rapid product development lifecycles. While there is no specific statutory compliance date for battery charger standards, DOE believes a compliance date of two years after the publication of the final rule would provide sufficient time for manufacturers to ramp up capacity to meet the proposed standards for battery chargers. DOE requests comment on the appropriate compliance date for battery charger.

d. Impacts on Sub-Group of Manufacturers

Using average cost assumptions to develop an industry cash-flow estimate is not adequate for assessing differential impacts among manufacturer subgroups. Small manufacturers, niche equipment manufacturers, and manufacturers exhibiting a cost structure substantially different from the industry average could be affected disproportionately. DOE addressed manufacturer subgroups in the battery charger MIA, by breaking out manufacturers by application grouping (consumer electronics, small appliances, power tools, and high energy application). Because certain application groups are disproportionately impacted compared to the overall product class groupings, DOE reports those manufacturer application group results individually so they can be considered as part of the overall MIA. For the results of this manufacturer subgroup, see section V.B.2.a.

DOE also identified small businesses as a manufacturer subgroup that could potentially be disproportionally impacted. DOE discusses the impacts on the small business subgroup in the regulatory flexibility analysis, section VI.B.

e. Cumulative Regulatory Burden

One aspect of assessing manufacturer burden involves looking at 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 or equipment. DOE believes that 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 recent 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 product efficiency.

For the cumulative regulatory burden analysis, DOE looks at other regulations that could affect battery charger application manufacturers that will take effect approximately three years before or after the compliance date of new energy conservation standards for these products. The compliance years and expected industry conversion costs of relevant new energy conservation standards are indicated in Table V–43.

TABLE V–43—COMPLIANCE DATES AND EXPECTED CONVERSION EXPENSES OF FEDERAL ENERGY CONSERVATION STANDARDS AFFECTING BATTERY CHARGER APPLICATION MANUFACTURERS

Federal energy conservation standards	Approximate compliance date	Estimated total industry conversion expense
External Power Supplies 79 FR 7846 (February 10, 2014)	2016	$43.4 million (2012$)
Computer and Battery Backup Systems	*2019	N/A †

* The dates listed are an approximation. The exact dates are pending final DOE action.
† For energy conservation standards for rulemakings awaiting DOE final action, DOE does not have a finalized estimated total industry conversion cost.

DOE is aware that the CEC already has energy conservation standards in place for battery chargers. DOE assumes that this rulemaking will preempt the CEC battery charger standards when finalized. Therefore, DOE did not consider the CEC standards as contributing to the cumulative regulatory burden of this rulemaking. DOE seeks comment on the compliance costs of any other regulations battery charger and battery charger application manufacturers must make.

3. National Impact Analysis

a. Significance of Energy Savings

For each TSL, DOE projected energy savings for battery chargers purchased in the 30-year period that begins in the year of compliance with amended standards (2018–2047). The savings are measured over the entire lifetime of products purchased in the 30-year period. DOE quantified the energy savings attributable to each TSL as the difference in energy consumption between each standards case and the base case. Table V–44 and Table V–45 present the estimated primary and full-fuel cycle energy savings, respectively, for each considered TSL. The approach used is further described in section IV.H.[62]

[62] Chapter 10 of the SNOPR TSD presents tables that show the magnitude of the energy savings discounted at rates of 3 percent and 7 percent. Discounted energy savings represent a policy perspective in which energy savings realized farther in the future are less significant than energy savings realized in the nearer term.

TABLE V–44—BATTERY CHARGERS: CUMULATIVE PRIMARY NATIONAL ENERGY SAVINGS FOR PRODUCTS SHIPPED IN 2018–2047 (QUADS)

Product class	Trial standard level			
	1	2	3	4
1	0.004	0.047	0.047	0.084
2, 3, 4	0.087	0.087	0.307	0.423
5, 6	0.000	0.017	0.130	0.130
7	0.012	0.012	0.026	0.026

TABLE V–45—BATTERY CHARGERS: CUMULATIVE FFC NATIONAL ENERGY SAVINGS FOR PRODUCTS SHIPPED IN 2018–2047 (QUADS)

Product class	Trial standard level			
	1	2	3	4
1	0.004	0.049	0.049	0.088
2, 3, 4	0.091	0.091	0.321	0.442
5, 6	0.000	0.018	0.136	0.136
7	0.013	0.013	0.028	0.028

OMB Circular A–4 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. [63] 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 general timeline in EPCA for the review of certain energy conservation standards and potential revision of, and compliance with, such revised standards.[64] The review timeframe established in EPCA is generally not synchronized with the product lifetime, product manufacturing cycles, or other factors specific to battery chargers. Thus, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology. The NES sensitivity analysis results based on a nine-year analytical period are presented in Table V–46. The impacts are counted over the lifetime of products purchased in 2018–2026.

TABLE V–46—BATTERY CHARGERS: CUMULATIVE FFC NATIONAL ENERGY SAVINGS FOR PRODUCTS SHIPPED IN 2018–2026 (QUADS)

Product class	Trial standard level			
	1	2	3	4
1	0.001	0.015	0.015	0.027
2, 3, 4	0.028	0.028	0.097	0.134
5, 6	0.000	0.005	0.041	0.041
7	0.004	0.004	0.008	0.008

b. Net Present Value of Consumer Costs and Benefits

DOE estimated the cumulative NPV of the total costs and savings for customers that would result from the TSLs considered for battery chargers. In accordance with OMB's guidelines on regulatory analysis,[65] DOE calculated the NPV using both a 7-percent and a 3-percent real discount rate. The 7-percent rate is an estimate of the average before-tax rate of return on private capital in the U.S. economy, and reflects the returns on real estate and small business capital as well as corporate capital. This discount rate approximates the opportunity cost of capital in the private sector. (OMB analysis has found the average rate of return on capital to be near this rate.) The 3-percent rate reflects the potential effects of standards on private consumption (*e.g.,* through higher prices for products and reduced purchases of energy). This rate represents the rate at which society discounts future consumption flows to their present value. It can be approximated by the real rate of return on long-term government debt (*i.e.,* yield on United States Treasury Notes), which has averaged about 3 percent for the past 30 years.

Table V–47 shows the customer NPV results for each TSL considered for battery chargers. The impacts cover the

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

[64] Section 325(m) of EPCA requires DOE to review its standards at least once every 6 years, and requires, for certain products, a 3-year period after any new standard is promulgated before compliance is required, except that in no case may any new standards be required within 6 years of the compliance date of the previous standards. While adding a 6-year review to the 3-year compliance period adds up to 9 years, DOE notes that it may undertake reviews at any time within the 6 year period and that the 3-year compliance date may yield to the 6-year backstop. A 9-year analysis period may not be appropriate given the variability that occurs in the timing of standards reviews and the fact that for some consumer products, the compliance period is 5 years rather than 3 years.

[65] OMB Circular A–4, section E (Sept. 17, 2003). Available at: *http://www.whitehouse.gov/omb/circulars_a004_a–4*.

lifetime of products purchased in 2018–2047.

TABLE V–47—BATTERY CHARGERS: CUMULATIVE NET PRESENT VALUE OF CONSUMER BENEFITS FOR PRODUCTS SHIPPED IN 2018–2047

[2013$ billions]

Discount rate	Trial standard level (*billion 2013$*)			
	1	2	3	4
3 percent	0.9	1.2	−16.2	−47.9
7 percent	0.5	0.6	−9.5	−27.9

The NPV results based on the aforementioned 9-year analytical period are presented in Table V–48. The impacts are counted over the lifetime of products purchased in 2018–2026. As mentioned previously, this information is presented for informational purposes only and is not indicative of any change in DOE's analytical methodology or decision criteria.

TABLE V–48—BATTERY CHARGERS: CUMULATIVE NET PRESENT VALUE OF CONSUMER BENEFITS FOR PRODUCTS SHIPPED IN 2018–2026

[2013$ billions]

Discount rate	Trial standard level (billion 2013$)			
	1	2	3	4
3 percent	0.3	0.4	−6.2	−18.1
7 percent	0.2	0.3	−4.8	−14.1

c. Indirect Impact on Employment

DOE expects energy conservation standards for battery chargers to reduce energy bills for consumers of these products, and the resulting net savings to be 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, 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, where these uncertainties are reduced.

DOE reviewed its inputs and determined that the indirect employment impacts will be positive at TSL 1 (in 2018 and 2023) and TSL 2 (in 2023 only), while at TSL 3 and TSL 4, the increased equipment costs are far larger than the operating cost savings. The magnitude of the estimated effect is very small, however. The results suggest that the proposed standards are likely to have 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 SNOPR TSD presents more detailed results.

4. Impact on Utility and Performance of the Products

Based on testing conducted in support of this proposed rule, discussed in section IV.C.5 of this notice, DOE concluded that the standards proposed in this SNOPR would not reduce the utility or performance of the battery chargers under consideration in this rulemaking. Manufacturers of these products currently offer units that meet or exceed these proposed standards. DOE has also declined to propose battery charger marking requirements as part of today's SNOPR, providing manufacturers with more flexibility in the way that they design, label, and market their products.

5. Impact on Any Lessening of Competition

DOE has also considered any lessening of competition that is likely to result from the proposed standards. The Attorney General determines the impact, if any, of any lessening of competition likely to result from a proposed standard, and transmits such determination to DOE, together with an analysis of the nature and extent of such impact. (42 U.S.C. 6295(o)(2)(B)(i)(V) and (B)(ii))

To keep the Attorney General informed of DOE's rulemaking efforts with respect to battery chargers, DOE will transmit a copy of this SNOPR and the accompanying SNOPR TSD to the Attorney General. DOE will consider DOJ's comments, if any, on this supplemental proposal in determining whether to proceed with the proposed energy conservation standards. DOE will also publish and respond to DOJ's comments in the **Federal Register**.

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 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 SNOPR TSD presents the estimated reduction in generating capacity for the TSLs that DOE considered in this rulemaking.

Energy savings from standards for battery chargers are expected to yield environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases. Table V–49 provides DOE's estimate of cumulative emissions reductions to result from the TSLs considered in this rulemaking. The table includes both power sector emissions and upstream emissions. DOE reports annual emissions reductions for each TSL in chapter 13 of the SNOPR TSD.

TABLE V–49—BATTERY CHARGERS: CUMULATIVE EMISSIONS REDUCTION FOR PRODUCTS SHIPPED IN 2018–2047

	Trial standard level			
	1	2	3	4
Power Sector Emissions				
CO_2 (*million metric tons*)	6.29	9.92	31.03	40.41
SO_2 (*thousand tons*)	5.62	8.82	27.56	35.92
NO_X (*thousand tons*)	5.01	7.88	24.64	32.10
Hg (*tons*)	0.017	0.027	0.085	0.111
CH_4 (*thousand tons*)	0.583	0.922	2.886	3.757
N_2O (thousand tons)	0.084	0.132	0.413	0.538
Upstream Emissions				
CO_2 (*million metric tons*)	0.335	0.530	1.659	2.159
SO_2 (*thousand tons*)	0.060	0.095	0.296	0.385
NO_X (*thousand tons*)	4.75	7.52	23.57	30.67
Hg (*tons*)	0.000	0.000	0.001	0.001
CH_4 (*thousand tons*)	27.7	43.8	137.3	178.7
N_2O (thousand tons)	0.003	0.005	0.015	0.019
Total FFC Emissions				
CO_2 (*million metric tons*)	6.63	10.45	32.69	42.57
SO_2 (*thousand tons*)	5.68	8.92	27.86	36.30
NO_X (*thousand tons*)	9.76	15.41	48.21	62.77
Hg (*tons*)	0.017	0.027	0.086	0.112
CH_4 (*thousand tons*)	28.3	44.8	140.2	182.4
CH_4 (*thousand tons CO_2eq*)*	791	1253	3925	5108
N_2O (*thousand tons*)	0.086	0.137	0.428	0.557
N_2O (*thousand tons CO_2eq*)*	22.9	36.2	113.4	147.6

* CO_2eq is the quantity of CO_2 that would have the same 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. As discussed in section IV.L of this notice, 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 2013$) are represented by $12.0/metric ton (the average value from a distribution that uses a 5-percent discount rate), $40.5/metric ton (the average value from a distribution that uses a 3-percent discount rate), $62.4/metric ton (the average value from a distribution that uses a 2.5-percent discount rate), and $119/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 (emissions-related costs) as the projected magnitude of climate change increases.

Table V–50 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 SNOPR TSD.

TABLE V–50—BATTERY CHARGERS: ESTIMATES OF GLOBAL PRESENT VALUE OF CO_2 EMISSIONS REDUCTION FOR PRODUCTS SHIPPED IN 2018–2047

TSL	SCC Case* (million 2013$)			
	5% Discount rate, average	3% Discount rate, average	2.5% Discount rate, average	3% Discount rate, 95th percentile
Power Sector Emissions				
1	50.7	218.6	342.7	673.1
2	79.4	343.5	538.7	1058.1
3	247.7	1072.5	1682.4	3304.0
4	322.9	1397.6	2192.3	4305.4
Upstream Emissions				
1	2.6	11.4	18.0	35.3

TABLE V–50—BATTERY CHARGERS: ESTIMATES OF GLOBAL PRESENT VALUE OF CO_2 EMISSIONS REDUCTION FOR PRODUCTS SHIPPED IN 2018–2047—Continued

TSL	SCC Case * (million 2013$)			
	5% Discount rate, average	3% Discount rate, average	2.5% Discount rate, average	3% Discount rate, 95th percentile
2	4.1	18.1	28.4	55.8
3	12.9	56.5	88.8	174.4
4	16.8	73.6	115.7	227.0
Total FFC Emissions				
1	53.3	230.1	360.7	708.5
2	83.5	361.6	567.1	1113.8
3	260.5	1129.0	1771.3	3478.4
4	339.7	1471.2	2307.9	4532.5

* For each of the four cases, the corresponding SCC value for emissions in 2015 is $12.0, $40.5, $62.4, and $119 per metric ton (2013$).

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 reducing 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 ongoing 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 battery chargers. The dollar-per-ton value that DOE used is discussed in section IV.L of this notice. Table V–51 presents the cumulative present values for each TSL calculated using 7-percent and 3-percent discount rates.

TABLE V–51—BATTERY CHARGERS: ESTIMATES OF PRESENT VALUE OF NO_X EMISSIONS REDUCTION FOR PRODUCTS SHIPPED IN 2018–2047

TSL	Million 2013$	
	3% Discount rate	7% Discount rate
Power Sector Emissions		
1	8.2	4.8
2	12.8	7.4
3	39.9	22.9
4	52.1	29.9
Upstream Emissions		
1	7.4	4.0
2	11.6	6.3
3	36.3	19.5
4	47.3	25.5
Total FFC Emissions		
1	15.6	8.8
2	24.4	13.6
3	76.2	42.4
4	99.3	55.4

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)) DOE did not consider any other factors with respect to the specific standards proposed in this SNOPR. As for those particular battery chargers that DOE is declining to regulate at this time, the reasons underlying that decision are discussed above.

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–52 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 for battery chargers, at both a 7-percent and a 3-percent discount rate. The CO_2 values used in the columns of each table correspond to the four sets of SCC values discussed above.

TABLE V–52—BATTERY CHARGERS: NET PRESENT VALUE OF CONSUMER SAVINGS COMBINED WITH PRESENT VALUE OF MONETIZED BENEFITS FROM CO_2 AND NO_X EMISSIONS REDUCTIONS

TSL	Billion 2013$			
	SCC Case $12.0/t and medium NO_X value	SCC Case $40.5/t and medium NO_X value	SCC Case $62.4/t and medium NO_X value	SCC Case $119/t and medium NO_X value
Consumer NPV at 3% Discount Rate added with:				
1	0.9	1.1	1.2	1.6
2	1.3	1.6	1.8	2.3
3	−15.9	−15.0	−14.4	−12.6
4	−47.5	−46.4	−45.5	−43.3
Consumer NPV at 7% Discount Rate added with:				
1	0.5	0.7	0.8	1.2
2	0.7	1.0	1.2	1.8
3	−9.2	−8.4	−7.7	−6.0
4	−27.5	−26.4	−25.5	−23.3

Although adding the value of consumer savings to the values of emission reductions provides a valuable perspective, two issues should be considered. 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 2018 to 2047. Because CO_2 emissions have a very long residence time in the atmosphere,[66] the SCC values in future years reflect future climate-related impacts resulting from the emission of CO_2 that continue well beyond 2100.

C. Conclusions

When considering proposed standards, the new or amended energy conservation standard 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, considering to the greatest extent practicable the seven statutory factors discussed previously. (42 U.S.C. 6295(o)(2)(B)(i)) The new or amended standard must also result in a significant conservation of energy. (42 U.S.C. 6295(o)(3)(B))

The Department considered the impacts of standards at each TSL, beginning with a maximum technologically feasible level, to determine whether that level was economically justified. Where the max-tech level was not justified, DOE then considered the next most efficient level and undertook the same evaluation until it reached the highest efficiency level that would be both technologically feasible and economically justified and save a significant amount of energy.

To aid the reader as DOE discusses the benefits and/or burdens of each TSL, DOE has included a series of tables presenting 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. Those include the impacts on identifiable subgroups of consumers who may be disproportionately affected by a national standard. Section V.B.1.b of this notice presents the estimated impacts of each TSL for these subgroups.

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. This undervaluation suggests that regulation that promotes energy efficiency can produce significant net private gains (as well as producing social gains by, for example, reducing pollution). 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 (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 a purchase of a product in the standards case, this

[66] The atmospheric lifetime of CO_2 is estimated of the order of 30–95 years. Jacobson, MZ (2005). ''Correction to 'Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming.' '' *J. Geophys. Res.* 110. pp. D14105.

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 used 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 and appendix 9A of the SNOPR 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.[67]

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 efficiency standards, and potential enhancements to the methodology by which these impacts are defined and estimated in the regulatory process.[68] DOE welcomes comments on how to more fully assess the potential impact of energy conservation standards on consumer choice and how to quantify this impact in its regulatory analysis in future rulemakings.

1. Benefits and Burdens of TSLs Considered for Battery Chargers

Table V–53 and Table V–54 summarize the quantitative impacts estimated for each TSL for battery chargers. The efficiency levels contained in each TSL are described in section V.A of this notice.

TABLE V–53—BATTERY CHARGERS: SUMMARY OF NATIONAL IMPACTS

Category	TSL 1	TSL 2	TSL 3	TSL 4
Cumulative FFC Energy Savings (quads)				
	0.108	0.170	0.534	0.695
NPV of Consumer Costs and Benefits (2013$ billion)				
3% discount rate	0.9	1.2	−16.2	−47.9
7% discount rate	0.5	0.6	−9.5	−27.9
Cumulative FFC Emissions Reduction				
CO_2 *million metric tons*	6.63	10.45	32.69	42.57
SO_2 *thousand tons*	5.68	8.92	27.86	36.30
NO_X *thousand tons*	9.76	15.41	48.21	62.77
Hg *tons*	0.017	0.027	0.086	0.112
CH_4 *thousand tons*	28.3	44.8	140.2	182.4
CH_4 *thousand tons* CO_2eq*	791	1253	3925	5108
N_2O *thousand tons*	0.086	0.137	0.428	0.557
N_2O *thousand tons* CO_2eq*	22.9	36.2	113.4	147.6
Value of Emissions Reduction				
CO_2 *2013$ billion***	0.053 to 0.708	0.084 to 1.114	0.261 to 3.478	0.340 to 4.532
NO_X—3% discount rate *2013$ million*	15.60	24.43	76.19	99.34
NO_X—7% discount rate *2013$ million*	8.80	13.65	42.41	55.38

Parentheses indicate negative (−) values.
* CO_2eq is the quantity of CO_2 that would have the same 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–54—BATTERY CHARGERS: SUMMARY OF MANUFACTURER AND CONSUMER IMPACTS

Category	TSL 1*	TSL 2*	TSL 3*	TSL 4*
Manufacturer Impacts				
Industry NPV (2013$ million) (*Base Case INPV = 79,904*)	79,782–79,887	79,375–79,887	77,387–80,479	64,012–81,017
Industry NPV *(% change)*	(0.2)–(0.0)	(0.7)–(0.0)	(3.2)–0.7	(19.9)–1.4
Consumer Average LCC Savings (2013$)				
PC1—Low E, Inductive*	0.08	0.71	0.71	(3.44)
PC2—Low E, Low-Voltage	0.07	0.07	0.06	(2.79)
PC3—Low E, Medium-Voltage	0.08	0.08	(1.36)	(2.17)
PC4—Low E, High-Voltage	0.11	0.11	(0.38)	(4.91)
PC5—Medium E, Low-Voltage*	0.00	0.84	(138.63)	(138.63)
PC6—Medium E, High-Voltage*	0.00	1.89	(129.15)	(129.15)

[67] P.C. Reiss and M.W. White. Household Electricity Demand, Revisited. *Review of Economic Studies* (2005) 72, 853–883.

[68] Alan Sanstad, Notes on the Economics of Household Energy Consumption and Technology Choice. Lawrence Berkeley National Laboratory. 2010. Available online at: *www1.eere.energy.gov/buildings/appliance_standards/pdfs/consumer_ee_theory.pdf*

TABLE V–54—BATTERY CHARGERS: SUMMARY OF MANUFACTURER AND CONSUMER IMPACTS—Continued

Category	TSL 1*	TSL 2*	TSL 3*	TSL 4*
PC7—High E	51.06	51.06	(80.05)	(80.05)
Consumer Simple PBP (years)				
PC1—Low E, Inductive*	1.1	1.5	1.5	7.4
PC2—Low E, Low-Voltage	0.6	0.6	2.5	19.5
PC3—Low E, Medium-Voltage	0.8	0.8	21.6	31.2
PC4—Low E, High-Voltage	1.4	1.4	5.2	20.7
PC5—Medium E, Low-Voltage*	2.3	2.7	29.1	29.1
PC6—Medium E, High-Voltage*	1.0	1.1	12.5	12.5
PC7—High E	0.0	0.0	8.1	8.1
% of Consumers that Experience Net Cost				
PC1—Low E, Inductive*	0.0	0.0	0.0	96.3
PC2—Low E, Low-Voltage	1.2	1.2	33.1	73.8
PC3—Low E, Medium-Voltage	0.6	0.6	39.0	40.8
PC4—Low E, High-Voltage	1.3	1.3	12.6	25.8
PC5—Medium E, Low-Voltage*	0.0	0.6	99.7	99.7
PC6—Medium E, High-Voltage*	0.0	0.0	100.0	100.0
PC7—High E	0.0	0.0	100.0	100.0

* Parentheses indicate negative (−) values.

DOE first considered TSL 4, which represents the max-tech efficiency levels. TSL 4 would save 0.695 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be -$27.9 billion using a discount rate of 7 percent, and -$47.9 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 42.57 Mt of CO_2, 62.77 thousand tons of NO_X, 36.30 thousand tons of SO_2, 0.112 ton of Hg, 182.4 thousand tons of CH_4, and 0.557 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 4 ranges from $0.340 billion to $4.532 billion.

At TSL 4, the average LCC impact is a cost of $3.44 for PC1, $2.79 for PC2, $2.17 for PC3, $4.91 for PC4, $138.63 for PC5, $129.15 for PC6, and $80.05 for PC7. The simple payback period is 7.4 years for PC1, 19.5 years for PC2, 31.2 years for PC3, 20.7 years for PC4, 29.1 years for PC5, 12.5 years for PC6, and 8.1 years for PC7. The fraction of consumers experiencing a net LCC cost is 96.3 percent for PC1, 73.8 percent for PC2, 40.8 percent for PC3, 25.8 percent for PC4, 99.7 percent for PC5, 100 percent for PC6, and 100 percent for PC7.

At TSL 4, the projected change in INPV ranges from a decrease of $15,892 million to an increase of $1,113 million, equivalent to −19.9 percent and 1.4 percent, respectively.

The Secretary tentatively concludes that at TSL 4 for battery chargers, the benefits of energy savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions would be outweighed by the economic burden on consumers (demonstrated by a negative NPV and LCC for all product classes), 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. TSL 3 would save 0.534 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be −$9.5 billion using a discount rate of 7 percent, and −$16.2 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 32.69 Mt of CO_2, 48.21 thousand tons of NO_X, 27.86 thousand tons of SO_2, 0.086 ton of Hg, 140.2 thousand tons of CH_4, and 0.428 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 3 ranges from $0.261 billion to $3.478 billion.

At TSL 3, the average LCC impact is a savings of $0.71 for PC1 and $0.06 for PC2, and a cost of $1.36 for PC3, $0.38 for PC4, $138.63 for PC5, $129.15 for PC6, and $80.05 for PC7. The simple payback period is 1.5 years for PC1, 2.5 years for PC2, 21.6 years for PC3, 5.2 years for PC4, 29.1 years for PC5, 12.5 years for PC6, and 8.1 years for PC7. The fraction of consumers experiencing a net LCC cost is 0.0 percent for PC1, 33.1 percent for PC2, 39.0 percent for PC3, 12.6 percent for PC4, 99.7 percent for PC5, 100 percent for PC6, and 100 percent for PC7.

At TSL 3, the projected change in INPV ranges from a decrease of $2,517 million to an increase of $574 million, equivalent to −3.2 percent and 0.7 percent, respectively.

The Secretary tentatively concludes that at TSL 3 for battery chargers, the benefits of energy savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions would be outweighed by the economic burden on consumers (demonstrated by a negative NPV and LCC for most product classes), 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 3 is not economically justified.

DOE then considered TSL 2. TSL 2 would save 0.170 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefit would be $0.6 billion using a discount rate of 7 percent, and $1.2 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 10.45 Mt of CO_2, 15.41 thousand tons of NO_X, 8.92 thousand tons of SO_2, 0.027 ton of Hg, 44.8 thousand tons of CH_4, and 0.137 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 2 ranges from $0.084 billion to $1.114 billion.

At TSL 2, the average LCC impact is a savings of $0.71 for PC1, $0.07 for PC2, $0.08 for PC3, $0.11 for PC4, $0.84 for PC5, $1.89 for PC6, and $51.06 for PC7. The simple payback period is 1.5 years for PC1, 0.6 years for PC2, 0.8

years for PC3, 1.4 years for PC4, 2.7 years for PC5, 1.1 years for PC6, and 0.0 years for PC7. The fraction of consumers experiencing a net LCC cost is 0.0 percent for PC1, 1.2 percent for PC2, 0.6 percent for PC3, 1.3 percent for PC4, 0.6 percent for PC5, 0.0 percent for PC6, and 0.0 percent for PC7.

At TSL 2, the projected change in INPV ranges from a decrease of $529 million to a decrease of $18 million, equivalent to −0.7 percent and less than −0.1 percent, respectively.

The Secretary tentatively concludes that at TSL 2 for battery chargers, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the CO_2 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.

After considering the analysis and the benefits and burdens of TSL 2, the Secretary tentatively concludes that this TSL will offer the maximum improvement in efficiency that is technologically feasible and economically justified, and will result in the significant conservation of energy. Therefore, DOE proposes TSL 2 for battery chargers. The proposed amended energy conservation standards for battery chargers are shown in Table V–55.

TABLE V–55—PROPOSED ENERGY CONSERVATION STANDARDS FOR BATTERY CHARGERS

Product class	Description	Maximum unit energy consumption (kWh/yr)
1	Low-Energy, Inductive	3.04
2	Low-Energy, Low-Voltage	0.1440 * E_{batt} + 2.95
3	Low-Energy, Medium-Voltage	For E_{batt} < 10Wh, UEC = 1.42 kWh/y E_{batt} ≥ 10 Wh, = 0.0255 * E_{batt} + 1.16
4	Low-Energy, High-Voltage	= 0.11 * E_{batt} + 3.18
5	Medium-Energy, Low-Voltage	For E_{batt} < 19 Wh, = 1.32 kWh/yr For E_{batt} ≥ 19 Wh, = 0.0257 * E_{batt} + .815
6	Medium-Energy, High-Voltage	For E_{batt} < 18 Wh = 3.88 kWh/yr For E_{batt} ≥ 18 Wh = 0.0778 * E_{batt} + 2.4
7	High-Energy	= 0.0502(E_{batt}) + 4.53

2. Annualized Benefits and Costs of the Proposed Standards

The benefits and costs of the proposed standards can also be expressed in terms of annualized values. The annualized monetary values are the sum of (1) the annualized national economic value of the benefits from operating products that meet the proposed standards (consisting of operating cost savings from using less energy, minus increases in product purchase costs, which is another way of representing consumer NPV), and (2) the monetary value of the benefits of CO_2 and NO_X emission reductions.[69]

Table V–56 shows the annualized values for battery chargers under TSL 2, expressed in 2013$. The results under the primary estimate are as follows. Using a 7-percent discount rate for benefits and costs other than CO_2 reductions, for which DOE used a 3-percent discount rate along with the SCC series corresponding to a value of $40.5/ton in 2015 (in 2013$), the cost of the standards for battery chargers in the proposed rule is $9 million per year in increased equipment costs, while the annualized benefits are $68 million per year in reduced equipment operating costs, $20 million in CO_2 reductions, and $1.26 million in reduced NO_X emissions. In this case, the net benefit amounts to $80 million per year. Using a 3-percent discount rate for all benefits and costs and the SCC series corresponding to a value of $40.5/ton in 2015 (in 2013$), the cost of the standards for battery chargers in the proposed rule is $10 million per year in increased equipment costs, while the benefits are $75 million per year in reduced operating costs, $20 million in CO_2 reductions, and $1.32 million in reduced NO_X emissions. In this case, the net benefit amounts to $86 million per year.

TABLE V–56—ANNUALIZED BENEFITS AND COSTS OF NEW AND AMENDED STANDARDS FOR BATTERY CHARGERS

	Discount rate	(Million 2013$/year)		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
Benefits				
Operating Cost Savings	7%	68	68	69
	3%	75	74	76

[69] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2014, 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.

TABLE V–56—ANNUALIZED BENEFITS AND COSTS OF NEW AND AMENDED STANDARDS FOR BATTERY CHARGERS—Continued

	Discount rate	(Million 2013$/year)		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
CO_2 Reduction Monetized Value ($12.0/t case)*.	5%	6	6	6
CO_2 Reduction Monetized Value ($40.5/t case)*.	3%	20	20	20
CO_2 Reduction Monetized Value ($62.4/t case)*.	2.5%	28	28	28
CO_2 Reduction Monetized Value ($119/t case)*.	3%	60	60	60
NO_X Reduction Monetized Value (at $2,684/ton)**.	7%	1.26	1.26	1.26
	3%	1.32	1.32	1.32
Total Benefits †	7% plus CO_2 range	76 to 130	75 to 130	76 to 131
	7%	89	89	90
	3% plus CO_2 range	82 to 136	82 to 136	83 to 138
	3%	96	95	97
Costs				
Consumer Incremental Product Costs.	7%	9	9	6
	3%	10	10	6
Net Benefits				
Total †	7% plus CO_2 range	66 to 120	66 to 120	70 to 124
	7%	80	79	84
	3% plus CO_2 range	73 to 127	72 to 126	77 to 132
	3%	86	86	91

* This table presents the annualized costs and benefits associated with battery chargers shipped in 2018 – 2047. These results include benefits to consumers which accrue after 2047 from the products purchased in 2018 – 2047. 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 Benefits, and High Benefits Estimates utilize projections of energy prices from the *AEO2014* Reference case, Low Estimate, and High Estimate, respectively. Additionally, the High Benefits Estimates include a price trend on the incremental product costs.

** The CO_2 values represent global monetized values of the SCC, in 2013$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% 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. The value for NO_X is the average of high and low values found in the literature.

† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to the average SCC with 3-percent discount rate ($40.5/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.

3. Stakeholder Comments on Standards Proposed in NOPR

In addition to the issues addressed above, DOE received a number of general comments on the appropriateness of the battery charger standards proposed in the NOPR. The CEC, CBIA, ASAP, and NRDC, NEEP, and PSMA—along with a number of representatives from a variety of State legislatures [70] and the City of Cambridge, Massachusetts—all supported DOE's proposed levels for Product Classes 1, 7, 8, and 10 but urged DOE to adopt the more stringent levels proposed in California for Product Classes 2, 3, 4, 5, and 6. These interested parties provided a number of justifications for harmonizing with California that are addressed in detail elsewhere. The CEC and ASAP urged DOE to take the time to fully analyze the more stringent levels, even if it means a later effective date for the standards, while both the City of Cambridge and the various State legislators urged DOE to adopt levels similar to those already in place in California. (CEC, No. 117 at p. 6; CBIA, No. 126 at p. 2; ASAP Et Al., No. 136 at p. 2; NEEP, No. 160 at p.1; States, No. 159 at p. 1; City of Cambridge, MA, No. 155 at p. 1; PSMA, No. 147 at p. 1)

In addition, manufacturers, including AHAM, PTI, CEA, Motorola, and Philips, generally opposed harmonization with California for Product Classes 2 through 6, arguing that DOE's proposed levels are technologically feasible and economically justified while California's are not. (AHAM, No. 124 at p. 4; PTI, No. 133 at p. 3; CEA, No. 106 at p. 2; Motorola Mobility, No. 121 at p. 6; Philips, No. 128 at p. 6) For Product Class 7, Delta-Q Technologies found that the proposed standard was acceptable, while Lester Electrical opposed the proposed level. (Delta-Q Technologies, No. 113 at p. 2; Lester Electrical, No. 139 at p. 2). Panasonic commented that the proposed standard for Product Class 1 was too stringent. (Panasonic, No. 120 at p. 2)

DOE has addressed the specific points underpinning these general comments in the preceding sections of this SNOPR. The proposed standard levels would, if adopted, save a significant amount of energy, are technologically feasible, and are economically justified.

[70] Comments were received in the form of a letter from Senator Jackie Dingfelder of the Oregon State Senate. Representatives of the following States also signed onto that letter: Alaska, Arkansas, Colorado, Illinois, Iowa, Maine, Maryland, Minnesota, Montana, Nebraska, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Washington, and Wisconsin.

The CEC commented that failing to set standards for Product Class 9 would create a category of unregulated products that could lead to compliance and enforcement loopholes in the future. It stated that battery chargers with DC input greater than 9V are regulated under the California standards and will remain so if the DOE does not adopt standards, but expressed concern that this may lead to industry confusion. (California Energy Commission, No. 117 at p. 7) While it is technically possible that a product that is not an in-vehicle charger could meet the parameters of Product Class 9, no such products existed when DOE conducted its analysis. DOE can only evaluate whether standards are justified based on the products currently on the market. If new products come on the market in the future, DOE can revisit whether to set standards for Product Class 9 as part of a future rulemaking.

Regarding California's assertions related to preemption, DOE notes that under 42 U.S.C. 6297, which lays out the process by which State and local energy conservation standards are preempted, once DOE sets standards for a product any State or local standards for that product are preempted. In the case of battery chargers, preemption does not apply until the Federal standards are required for compliance. See 42 U.S.C. 6295(ii)(1). In particular, under this provision, any State or local standard prescribed or enacted for battery chargers before the date on which the final rule is issued shall not be preempted ''until the energy conservation standard that has been established [under the appropriate statutory provision] for the product takes effect.'' While this provision has clear implications regarding the timing of preemption, it does not alter the scope of its application by narrowing the range of products that would be affected by preemption once DOE has set standards for ''the product'' at issue. Accordingly, in DOE's view, once the Agency sets standards for battery chargers and the compliance date for those standards has been reached, all State and local energy conservation standards for battery chargers would be preempted. With respect to any labeling requirements, DOE notes that 42 U.S.C. 6297 already prescribes that States and local jurisdictions may not require the disclosure of information other than that required by DOE or FTC. Since DOE is not proposing to require that manufacturers label their battery chargers, those labeling requirements would also be preempted. See 42 U.S.C. 6297(a). An individual manufacturer would be free, however, to voluntarily use the ''BC'' mark if it chose to do so.

Cobra Electronics commented that the ENERGY STAR program is an effective means for encouraging the development of more efficient technologies. Furthermore, the use of a voluntary program would allow DOE to comply with Executive Order 13563, which directed Federal agencies to ''identify and assess available alternatives to direct regulation.'' (Cobra Electronics, No. 130 at p. 8) DOE notes that Executive Order 13563 also stated that regulations should be adopted ''only upon a reasoned determination that its benefits justify its costs.'' Because the selected standard levels are technologically feasible and economically justified, DOE has fulfilled its statutory obligations as well as the directives in Executive Order 13563. In addition, DOE considered the impacts of a voluntary program as part of the Regulatory Impact Analysis and found that such a program would save less energy than the proposed standards, especially since the ENERGY STAR program for battery chargers has already ended. See Chapter 17 of the SNOPR TSD.

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 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 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.

In addition, DOE has determined that this proposed regulatory action is not a ''significant regulatory action'' under Executive Order 12866. Therefore, DOE did not present for review to the Office of Information and Regulatory Affairs (OIRA) in the OMB the draft rule and other documents prepared for this rulemaking, including a regulatory impact analysis (RIA).

DOE has also reviewed this regulation pursuant to Executive Order 13563. 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, the Office of Information and Regulatory Affairs 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 proposed rule 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 (August 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 Web site (*http://energy.gov/gc/office-general-counsel*). DOE has prepared the following IRFA for the products that are the subject of this rulemaking.

As a result of this review, DOE has prepared an IRFA addressing the impacts on small manufacturers. DOE will transmit a copy of the IRFA to the Chief Counsel for Advocacy of the Small Business Administration (SBA) for review under 5 U.S.C 605(b). As presented and discussed in the following sections, the IFRA describes potential impacts on small business manufacturers of battery chargers associated with the required capital and product conversion costs at each TSL and discusses alternatives that could minimize these impacts.

A statement of the reasons and objectives of the proposed rule, along with its legal basis, are set forth elsewhere in the preamble and not repeated here.

1. Description on Estimated Number of Small Entities Regulated

a. Methodology for Estimating the Number of Small Entities

For manufacturers of battery chargers, the 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. 65 FR 30836, 30848 (May 15, 2000), as amended at 65 FR 53533, 53544 (Sept. 5, 2000) and codified at 13 CFR part 121. The size standards are listed by North American Industry Classification System (NAICS) code and industry description and are available at *http://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf*. Battery charger 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 for this category.

To estimate the number of companies that could be small business manufacturers of products covered by this rulemaking, DOE conducted a market survey using all available public information to identify potential small battery charger manufacturers. DOE's research involved industry trade association membership directories, product databases, individual company Web sites, and the SBA's Small Business Database to create a list of every company that could potentially manufacture products covered by this rulemaking. DOE also asked stakeholders and industry representatives if they were aware of any other small manufacturers during manufacturer interviews and at previous DOE public meetings. DOE contacted companies on its list, as necessary, to determine whether they met the SBA's definition of a small business manufacturer of covered battery chargers. DOE screened out companies that did not offer products covered by this rulemaking, did not meet the definition of a ''small business,'' or are foreign-owned and operated.

Based on this screening, DOE identified 30 companies that could potentially manufacture battery chargers. DOE eliminated most of these companies from consideration as small business manufacturers based on a review of product literature and Web sites. When those steps yielded inconclusive information, DOE contacted the companies directly. As part of these efforts, DOE identified Lester Electrical, Inc. (Lincoln, Nebraska), a manufacturer of golf car battery chargers, as the only small business that appears to produce covered battery chargers domestically.

b. Manufacturer Participations

Before issuing this proposed rule, DOE contacted the potential small business manufacturers of battery chargers it had identified. One small business consented to being interviewed during the MIA interviews conducted prior to the publication of the NOPR. DOE also obtained information about small business impacts while interviewing large manufacturers.

c. Industry Structure

With respect to battery chargers, industry structure is typically defined by the characteristics of the industry of the application(s) for which the battery chargers are produced. In the case of the small business DOE identified, however, the battery charger itself is the product the small business produces. That is, the company does not also produce the applications with which the battery charger is intended to be used—in this case, battery chargers predominantly intended for golf cars (Product Class 7).

A high level of concentration exists in both battery charger markets. Two golf car battery charger manufacturers account for the vast majority of the golf car battery charger market and each have a similar share. Both competitors in the golf car battery charger market are, in terms of the number of their employees, small entities: one is foreign-owned and operated, while the other is a domestic small business, as defined by SBA. Despite this concentration, there is considerable competition for three main reasons. First, each golf car battery charger manufacturer sells into a market that is almost as equally concentrated: three golf car manufacturers supply the majority of the golf cars sold domestically and none of them manufactures golf car battery chargers. Second, while there are currently only two major suppliers of golf car battery chargers to the domestic market, the constant prospect of potential entry from other foreign countries has ceded substantial buying power to the three golf car OEMs. Third, golf car manufacturers can choose not to build electric golf cars (eliminating the need for the battery charger) by opting to build gas-powered products. DOE examines a price elasticity sensitivity scenario for this in chapter 12 of the SNOPR TSD to assess this possibility. Currently, roughly three-quarters of the golf car market is electric-based, with the remainder gas-powered.

The majority of industry shipments flow to the ''fleet'' segment—*i.e.* battery chargers sold to golf car manufacturers who then lease the cars to golf courses. Most cars are leased for the first few years before being sold to smaller golf courses or other individuals for personal use. A smaller portion of golf cars are sold as new through dealer distribution.

Further upstream, approximately half of the battery chargers intended for golf car use is manufactured domestically, while the other half is foreign-sourced. During the design cycle of the golf car, the battery charger supplier and OEM typically work closely together when designing the battery charger.

The small business manufacturer is also a relatively smaller player in the markets for wheelchair and industrial lift battery chargers. Most wheelchair battery chargers and the wheelchairs themselves are manufactured overseas. Three wheelchair manufacturers supply the majority of the U.S. market, but do not have domestic manufacturing.

d. Comparison Between Large and Small Entities

As discussed in the previous section, there are two major suppliers in the golf car battery charger market. Both are small entities, although one is foreign-owned and operated and does not qualify as a small business per the SBA definition. These two small entities have a similar market share and sales volumes. DOE did not identify any large businesses with which to compare the projected impacts on small businesses.

2. Description and Estimate of Compliance Requirements

The U.S.-owned small business DOE identified manufacturers of battery chargers for golf cars (Product Class 7). DOE anticipates the proposed rule will require both capital and product conversion costs to achieve compliance. The CSLs proposed for Product Classes 5, 6, and 7 will drive different levels of small business impacts. The compliance costs associated with the proposed TSLs are present in Table VI–1 through Table VI–3.

DOE does not expect the proposed TSL to require significant capital expenditures. Although some replacement of fixtures, new assembly equipment and tooling would be required, the magnitude of these expenditures would be unlikely to cause significant adverse financial impacts. Product Class 7 drives the majority of these costs. See Table VI–1 for the estimated capital conversion costs for a typical small business.

TABLE VI–1—ESTIMATED CAPITAL CONVERSION COSTS FOR A SMALL BUSINESS

Product class and estimated capital conversion cost	TSL 1	TSL 2 *	TSL 3	TSL 4
Product Classes 5 and 6	CSL 1	CSL 2	CSL 3	CSL 3
Product Class 7	CSL 1	CSL 1	CSL 2	CSL 2
Estimated Capital Conversion Costs (2013$)	$0.1	$0.1	$0.2	$0.2

* This is the TSL proposed in this SNOPR rulemaking.

The product conversion costs associated with standards are more significant for the small business manufacturer at issue than the projected capital conversion costs. TSL 2 for Product Class 7 reflects a technology change from a linear battery charger or less efficient high-frequency design battery charger at the baseline to a more efficient switch-mode or high-frequency design battery charger. This change would require manufacturers that produce linear or less efficient high-frequency design battery chargers to invest in the development of a new product design, which would require investments in engineering resources for R&D, testing and certification, and marketing and training changes. Again, the level of expenditure at each TSL is driven almost entirely by the changes required for Product Class 7 at each TSL. Additionally, based on market research conducted during the analysis period of this SNOPR, DOE has found that manufacturers (including those based domestically) who previously sold exclusively, or primarily, linear battery chargers, are now selling switch-mode battery chargers, which are capable of charging batteries equal to similar batteries charged by linear battery chargers offered by the same manufacturer. See Table VI–2 for the estimated product conversion costs for a typical small business.

TABLE VI–2—ESTIMATED PRODUCT CONVERSION COSTS FOR A SMALL BUSINESS

Product class and estimated product conversion cost	TSL 1	TSL 2 *	TSL 3	TSL 4
Product Classes 5 and 6	CSL 1	CSL 2	CSL 3	CSL 3
Product Class 7	CSL 1	CSL 1	CSL 2	CSL 2
Estimated Product Conversion Costs (2013$)	$1.8	$2.0	$5.1	$5.1

* This is the TSL proposed in this SNOPR rulemaking.

Table VI–3 displays the total capital and product conversion costs associated with each TSL.

TABLE VI–3—ESTIMATED TOTAL CONVERSION COSTS FOR A SMALL BUSINESS

Product class and estimated total conversion cost	TSL 1	TSL 2 *	TSL 3	TSL 4
Product Classes 5 and 6	CSL 1	CSL 2	CSL 3	CSL 3
Product Class 7	CSL 1	CSL 1	CSL 2	CSL 2
Estimated Total Conversion Costs (2013$)	$1.9	$2.1	$4.3	$4.3

* This is the TSL proposed in this SNOPR rulemaking.

Based on its engineering analysis, manufacturer interviews and public comments, DOE believes TSL 2 for Product Class 7 would establish an efficiency level that standard linear battery chargers could not cost-effectively achieve. Not only would the size and weight of such chargers potentially conflict with end-user preferences, but the additional steel and copper requirements would make such chargers cost-prohibitive in the marketplace. Baseline linear designs are already significantly more costly to manufacture than the more-efficient switch-mode designs, as DOE's cost efficiency curve shows in the engineering section (see Table IV–10). While the majority of the battery chargers manufactured by the one small business DOE identified, that would be affected by the proposed battery charger standards, would need to be modified to meet the proposed standards for Product Class 7, this manufacturer has the capability to manufacture switch-mode battery chargers. Therefore, DOE anticipates that this manufacturer could comply with the proposal by modifying their existing switch-mode battery charger specifications. This would require significantly fewer R&D resources than completely redesigning all of their production line. Additionally, DOE acknowledges that some or all existing domestic linear battery charger manufacturing could be lost due to the proposed standards, since it is likely that switch-mode battery charger manufacturing would likely be manufactured abroad.

3. Duplication, Overlap and Conflict With Other Rules and Regulations

Since the CEC battery charger standards would be preempted by a battery charger energy conservation standard set by DOE, DOE is not aware of any rules or regulations that duplicate, overlap, or conflict with the rule being considered in this notice.

4. Significant Alternatives to the Proposed Rule

The discussion in the previous sections analyzes impacts on small businesses that would result from the other TSLs DOE considered. Though TSLs lower than the proposed TSL are expected to reduce the impacts on small entities, DOE is required by EPCA to establish standards that achieve the maximum improvement in energy efficiency that are technically feasible and economically justified, and result in a significant conservation of energy. Once DOE determines that a particular TSL meets those requirements, DOE adopts that TSL in satisfaction of its obligations under EPCA.

In addition to the other TSLs being considered, the SNOPR TSD for this proposed rule includes an analysis of non-regulatory alternatives in chapter 17. For battery chargers, these policy alternatives included: (1) No standard, (2) consumer rebates, (3) consumer tax credits, (4) manufacturer tax credits, and (5) early replacement. While these alternatives may mitigate to some varying extent the economic impacts on small entities compared to the proposed standards, DOE does not intend to consider these alternatives further because in several cases, they would not be feasible to implement without authority and funding from Congress, and in all cases, DOE has determined that the energy savings of these alternatives are significantly smaller than those that would be expected to result from adoption of the proposed standard levels. Accordingly, DOE is declining to adopt any of these alternatives and is proposing the standards set forth in this rulemaking. (See chapter 17 of the SNOPR TSD for further detail on the policy alternatives DOE considered.)

DOE continues to seek input from businesses that would be affected by this rulemaking and will consider comments received in the development of any final rule.

C. Review Under the Paperwork Reduction Act

If DOE adopts standards for battery chargers, manufacturers of these products would need to certify to DOE that their products comply with the applicable energy conservation standards. In certifying compliance, manufacturers must test their products according to the DOE test procedures for battery chargers, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including battery chargers. (76 FR 12422 (March 7, 2011); 80 FR 5099 (Jan. 30, 2015). 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. Public reporting burden for the certification is estimated to average 30 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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 this proposal would fit 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 Appendix B, B1–B5. This proposal fits within this category of actions because it would establish 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 rule. DOE's CX determination for this rule is available at *http://cxnepa.energy.gov*.

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. Public Law 104–4, sec. 201 (codified at 2 U.S.C. 1531). For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect them. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820. DOE's policy statement is also available at *http://energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf*.

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

Section 202 of UMRA authorizes a Federal agency to respond to the content requirements of UMRA in any other statement or analysis that accompanies the proposed rule. (2 U.S.C. 1532(c)). The content requirements of section 202(b) of UMRA relevant to a private sector mandate substantially overlap the economic analysis requirements that apply under section 325(o) of EPCA and Executive Order 12866. The **SUPPLEMENTARY INFORMATION** section of the proposed rule and the ''Regulatory Impact Analysis'' section of the SNOPR 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(o), this proposed rule would establish energy conservation standards for battery chargers that are designed to achieve the maximum improvement in energy efficiency that DOE has determined to be both technologically feasible and economically justified. A full discussion of the alternatives considered by DOE is presented in the ''Regulatory Impact Analysis'' section of the SNOPR 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 proposed 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 proposed rule 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 energy conservation standards for battery chargers, is not a significant energy action because the proposed standards are not likely to have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as such by the Administrator at OIRA. Accordingly, DOE has not prepared a Statement of Energy Effects on this proposed rule.

L. 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.'' 70 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 Web site: *www1.eere.energy.gov/buildings/appliance_standards/peer_review.html.*

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 notice. If you plan to attend the public meeting, please notify Ms. Brenda Edwards at (202) 586–2945 or *Brenda.Edwards@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 email: *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 building. Any person wishing to bring these devices into the Forrestal 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 ID requirements for individuals wishing to enter Federal buildings from specific states and U.S. territories. Driver's licenses from the following states or territory will not be accepted for building entry and 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 Web site at: *http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx?productid=84.* 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 notice. 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. 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. 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 regulations.gov. The regulations.gov Web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

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

Do not submit to 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 regulations.gov cannot be claimed as CBI. Comments received through the Web site 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 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 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, or mail also will be posted to 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. It is not necessary to submit printed copies. No facsimiles (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. According 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 which 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 stakeholder comment on the proposed elimination of Product Classes 8, 9, 10a, and 10b from the analysis. (See section IV.A.3.b)

2. DOE requests stakeholder comments on the updated engineering analysis results presented in this analysis for products classes 2–6. (See section IV.C.9)

3. DOE requests comment on the new methodology of shifting CSLs in Product Classes 2–6 to more closely align with the CEC standards. (See section IV.C.4)

4. DOE seeks comment on its methodology in scaling the results of Product Class 5 to Product Class 6, including the decision to hold MSPs constant. (See section IV.C.9)

5. DOE requests comment on the new methodology for determining the base case efficiency distributions using the CEC database of battery charger models sold in California combined with DOE's usage profiles. (See section IV.G.3)

6. DOE requests comment on the methodology of filtering RECS data to obtain a population distribution of low-income consumers that was used for the low-income consumers LCC subgroup analysis. (See section V.B.1)

7. DOE seeks comments on its approach in updating the base case efficiency distributions for this rule using the CEC database. (See section IV.G.3)

8. DOE seeks comment on the potential domestic employment impacts to battery charger manufacturers at the proposed efficiency levels. (See section V.B.2.b and section VI.B).

9. DOE seeks comment on the compliance costs of any other regulations battery charger and battery charger application manufacturers must make, especially if compliance with those other regulations is required three years before or after the estimated compliance date of this proposed standard (2018) (see section V.B.2.e).

10. DOE seeks comments on the existence of any small business battery charger or battery charger application manufacturers other than the one identified by DOE. DOE also requests comments on the impacts of the proposed efficiency levels on any small businesses manufacturing battery chargers that would be subject to the proposed standards or applications that would use these chargers. (See section VI.B).

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this proposed rule.

List of Subjects in 10 CFR Part 430

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

Issued in Washington, DC, on July 30, 2015.

David T. Danielson,

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) to read as follows:

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

* * * * *

(z) *Battery Chargers.* (1) Battery chargers manufactured starting on the date corresponding to two years after the publication of the final rule for this rulemaking, shall have a unit energy consumption (UEC) less than or equal to the prescribed ''Maximum UEC'' standard when using the equations for the appropriate product class and corresponding measured battery energy as shown in the following table:

Product class No.	Input/Output type	Battery energy (Wh)	Special characteristic or battery voltage	Maximum UEC (kWh/yr)
1	AC In, DC Out	< 100	Inductive Connection*	3.04.
2			< 4 V	0.1440 * E_{batt} + 2.95.
3			4–10 V	For E_{batt} < 10Wh, 1.42 kWh/yr; E_{batt} ≥ 10 Wh, 0.0255 * E_{batt} + 1.16.
4			> 10 V	0.11 * E_{batt} + 3.18.
5		100–3000	< 20 V	For E_{batt} < 19 Wh, 1.32 kWh/yr; For E_{batt} ≥ 19 Wh, 0.0257 * E_{batt} + .815.
6			≥ 20 V	For E_{batt} < 18 Wh, 3.88 kWh/yr; For E_{batt} ≥ 18 Wh, 0.0778 * E_{batt} + 2.4.
7		> 3000		0.0502 * E_{batt} + 4.53.

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

** E_{batt} = Measured battery energy as determined in section 5.6 of appendix Y to subpart B of this part.

(2) Unit energy consumption shall be calculated for a device seeking certification as being compliant with the relevant standard using one of the two equations (equation (i) or equation (ii)) listed below. If a device is tested and its charge test duration as determined in section 5.2 of appendix Y to subpart B of this part minus 5 hours exceeds the threshold charge time listed in the table below, equation (ii) shall be used to calculate UEC; otherwise a device's UEC shall be calculated using equation (i).

(i) $UEC = 365(n(E_{24} - 5P_m - E_{batt})\frac{24}{t_{cd}} + \left(P_m(t_{a\&m} - (t_{cd} - 5)n)\right) + (P_{sb}t_{sb}) + \left(P_{off}t_{off}\right))$ or,

(ii) $UEC = 365(n(E_{24} - 5P_m - E_{batt})\frac{24}{(t_{cd}-5)} + (P_{sb}t_{sb}) + \left(P_{off}t_{off}\right))$

Where:
E_{24} = 24-hour energy as determined in § 429.39(a) of this chapter,
E_{batt} = Measured battery energy as determined in § 429.39(a) of this chapter,
P_m = Maintenance mode power as determined in § 429.39(a) of this chapter,
P_{sb} = Standby mode power as determined in § 429.39(a) of this chapter,
P_{off} = Off mode power as determined in § 429.39(a) of this chapter,
t_{cd} = Charge test duration as determined in § 429.39(a) of this chapter, and
$t_{a\&m}$, n, t_{sb}, and t_{off}, are constants used depending upon a device's product class and found in the following table:

Product class	Active + maintenance ($t_{a\&m}$)	Standby (t_{sb})	Off (t_{off})	Charges (n)	Threshold charge time *
	Hours per Day **			Number per Day	Hours
1	20.66	0.10	0.00	0.15	135.41
2	7.82	5.29	0.00	0.54	19.00
3	6.42	0.30	0.00	0.10	67.21
4	16.84	0.91	0.00	0.50	33.04
5	6.52	1.16	0.00	0.11	56.83
6	17.15	6.85	0.00	0.34	50.89
7	8.14	7.30	0.00	0.32	25.15

* If the duration of the charge test (minus 5 hours) as determined in section 5.2 of appendix Y to subpart B of this part exceeds the threshold charge time, use equation (ii) to calculate UEC otherwise use equation (i).
** If the total time does not sum to 24 hours per day, the remaining time is allocated to unplugged time, which means there is 0 power consumption and no changes to the UEC calculation is needed.

(3) A battery charger shall not be subject to the standards in paragraph (z)(1) of this section if it is a device that requires Federal Food and Drug Administration (FDA) listing and approval as a life-sustaining or life-supporting device in accordance with section 513 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360(c)).

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