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 and External Power Supplies

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

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

SUMMARY: The Energy Policy and Conservation Act (EPCA) prescribes energy conservation standards for various consumer products and commercial and industrial equipment, including battery chargers and external power supplies (EPSs). EPCA also requires the U.S. Department of Energy (DOE) to determine whether more stringent, amended standards for these products are technologically feasible, economically justified, and would save a significant amount of energy. In this notice, DOE proposes amended energy conservation standards for Class A EPSs and new energy conservation standards for non-Class A EPSs and battery chargers. The notice also announces a public meeting to receive comment on these proposed standards and associated analyses and results.

DATES: DOE will hold a public meeting on Wednesday, May 2, 2012 from 9 a.m. to 5 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 notice of proposed rulemaking (NOPR) before and after the public meeting, but no later than May 29, 2012. See section VI, ''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. To attend, please notify Ms. Brenda Edwards at (202) 586–2945. Please note that foreign nationals visiting DOE Headquarters are subject to advance security screening procedures. Any foreign national wishing to participate in the meeting should advise DOE as soon as possible by contacting Ms. Edwards to initiate the necessary procedures. Please also note that those wishing to bring laptops into the Forrestal Building will be required to obtain a property pass. Visitors should avoid bringing laptops, or allow an extra 45 minutes.

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

1. *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments.
2. *Email: BC&EPS_ECS@ee.doe.gov.* Include the docket number and/or RIN in the subject line of the message.
3. *Mail:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–2J, 1000 Independence Avenue SW., Washington, DC, 20585–0121. If possible, please submit all items on a CD. It is not necessary to include printed copies.
4. *Hand Delivery/Courier:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 950 L'Enfant Plaza, SW., Suite 600, Washington, DC, 20024. Telephone: (202) 586–2945. If possible, please submit all items on a CD. 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.*

For detailed instructions on submitting comments and additional information on the rulemaking process, see section VII of this document (Public Participation).

Docket: The docket is available for review at regulations.gov, including **Federal Register** notices, framework documents, public meeting attendee lists and transcripts, comments, and other supporting documents/materials. All documents in the docket are listed in the regulations.gov index. However, not all documents listed in the index may be publicly available, such as 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/residential/battery_external.html.* This web page will contain a link to the docket for this notice on the regulations.gov site. The regulations.gov web page will contain simple instructions on how to access all documents, including public comments, in the docket. See section VII for information on how to submit comments through regulations.gov.

For further information on how to submit or review public comments or participate in the public meeting, contact Ms. Brenda Edwards at (202) 586–2945 or email: *Brenda.Edwards@ee.doe.gov.*

FOR FURTHER INFORMATION CONTACT: Mr. Victor Petrolati, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE–2J, 1000 Independence Avenue SW., Washington, DC, 20585–0121. Telephone: (202) 586–4549. Email: *Victor.Petrolati@ee.doe.gov.*

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, GC–71, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–8145. Email: *michael.kido@hq.doe.gov.*

SUPPLEMENTARY INFORMATION:

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List of Tables

I. Summary of the Proposed Rule

Title III, Part B[1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Public Law 94–163 (42 U.S.C. 6291–6309, as codified), established the Energy Conservation Program for Consumer Products Other Than Automobiles. Pursuant to EPCA, any new or amended energy conservation standard that DOE prescribes for certain products, such as battery chargers and external power supplies (EPSs), shall be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)). Furthermore, the new or amended standard must result in a significant conservation of energy. (42 U.S.C. 6295(o)(3)(B)). In accordance with these and other statutory provisions discussed in this notice, DOE proposes amended energy conservation standards for Class A EPSs and new energy conservation standards for non-Class A EPSs and battery chargers. The proposed standards for direct operation EPSs, which are the minimum average efficiency in active mode and the maximum power consumption in no-load mode expressed as a function of the nameplate output power, are shown in Table I.1. The proposed standards for battery chargers, which consist of a set of maximum annual energy consumption levels expressed as a function of battery energy, are shown in Table I–2. These proposed standards, if adopted, would apply to all products listed in Table I.1 and Table I–2 and manufactured in, or imported into, the United States on or after July 1, 2013. In addition to being technologically

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

feasible and economically justified, DOE's proposed standards were also designed to maximize the net monetized benefits, as explained further below in this notice.

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Table I-1. Proposed Energy Conservation Standards for Direct Operation External Power Supplies

<table>
<tr><td colspan="3">AC-DC, Basic-Voltage External Power Supply</td></tr>
<tr><th>Nameplate Output Power (P_{out})</th><th>Minimum Average Efficiency in Active Mode *(expressed as a decimal)*</th><th>Maximum Power in No-Load Mode [W]</th></tr>
<tr><td>0 to ≤ 1 watt</td><td>$\geq 0.5 * P_{out} + 0.16$</td><td>≤ 0.100</td></tr>
<tr><td>> 1 to ≤ 49 watts</td><td>$\geq 0.071 * \ln(P_{out}) - 0.0014 * P_{out} + 0.67$</td><td>≤ 0.100</td></tr>
<tr><td>> 49 watts to ≤ 250 watts</td><td>≥ 0.880</td><td>≤ 0.210</td></tr>
<tr><td>> 250 watts</td><td>0.875</td><td>≤ 0.500</td></tr>
<tr><td colspan="3">AC-DC, Low-Voltage External Power Supply</td></tr>
<tr><th>Nameplate Output Power (P_{out})</th><th>Minimum Average Efficiency in Active Mode *(expressed as a decimal)*</th><th>Maximum Power in No-Load Mode [W]</th></tr>
<tr><td>0 to ≤ 1 watt</td><td>$\geq 0.517 * P_{out} + 0.087$</td><td>≤ 0.100</td></tr>
<tr><td>> 1 to ≤ 49 watts</td><td>$\geq 0.0834 * \ln(P_{out}) - 0.0014 * P_{out} + 0.609$</td><td>≤ 0.100</td></tr>
<tr><td>> 49 watts to ≤ 250 watts</td><td>≥ 0.870</td><td>≤ 0.210</td></tr>
<tr><td>> 250 watts</td><td>0.875</td><td>≤ 0.500</td></tr>
<tr><td colspan="3">AC-AC, Basic-Voltage External Power Supply</td></tr>
<tr><th>Nameplate Output Power (P_{out})</th><th>Minimum Average Efficiency in Active Mode *(expressed as a decimal)*</th><th>Maximum Power in No-Load Mode</th></tr>
<tr><td>0 to ≤ 1 watt</td><td>$\geq 0.5 * P_{out} + 0.16$</td><td>≤ 0.210</td></tr>
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<tr><td colspan="3">AC-AC, Low-voltage External Power Supply</td></tr>
<tr><th>Nameplate Output Power (P_{out})</th><th>Minimum Average Efficiency in Active Mode *(expressed as a decimal)*</th><th>Maximum Power in No-Load Mode</th></tr>
<tr><td>0 to ≤ 1 watt</td><td>$\geq 0.517 * P_{out} + 0.087$</td><td>≤ 0.210</td></tr>
</table>

> 1 to ≤ 49 watts	$\geq 0.0834 * \ln(P_{out}) - 0.0014 * P_{out} + 0.609$	≤ 0.210
> 49 watts to ≤ 250 watts	≥ 0.870	≤ 0.210
> 250 watts	0.875	≤ 0.500
Multiple-Voltage External Power Supply		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
0 to ≤ 1 watt	$\geq 0.497 \times P_{out} + 0.067$	≤ 0.300
> 1 to ≤ 49 watts	$\geq 0.075 \times \ln(P_{out}) + 0.561$	≤ 0.300
> 49 watts	≥ 0.860	≤ 0.300

Table I-2. 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 $E_{batt} \geq 9.74$ Wh, $= 0.0933(E_{batt}) + 3.77$
4	Low-Energy, High-Voltage	For $E_{batt} < 9.71$ Wh, $= 9.03$ For $E_{batt} \geq 9.71$ Wh, $= 0.2411(E_{batt}) + 6.69$
5	Medium-Energy, Low-Voltage	For $E_{batt} < 355.18$ Wh, $= 20.06$ For $E_{batt} \geq 355.18$ Wh, $= 0.0219(E_{batt}) + 12.28$
6	Medium-Energy, High-Voltage	For $E_{batt} < 239.48$ Wh $= 30.37$ For $E_{batt} \geq 239.48$ Wh $= 0.0495(E_{batt}) + 18.51$
7	High-Energy	$= 0.502(E_{batt}) + 4.53$
8	Low-Voltage DC Input	0.66
9	High-Voltage DC Input	No Standard.
10a	AC Output, Basic (i.e. no Automatic Voltage Regulation)	For $E_{batt} < 37.2$ Wh, $= 2.54$ For $E_{batt} \geq 37.2$ Wh, $= 0.0733(E_{batt}) - 0.18$
10b	AC Output, Contains Automatic Voltage Regulation	For $E_{batt} < 37.2$ Wh, $= 6.18$ For $E_{batt} \geq 37.2$ Wh, $= 0.0733(E_{batt}) + 3.45$

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A. Benefits and Costs to Consumers

Table I–3 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of EPSs, as measured by the average life-cycle cost (LCC) savings and the median payback period. The projected economic impacts of the proposed standards on individual consumers are generally positive. For example, the estimated average life-cycle cost (LCC) savings are from −$0.45 to $0.69 for product class B, depending on the representative unit, $2.07 for product class X, and $129.08 for product class H.[2]

Table I-3 Impacts of Proposed Standards on Consumers of External Power Supplies

Product Class	Rep. Unit	Weighted Average LCC Savings [*2010$*]	Median Payback Period[3] [*yrs*]
B	2.5W AC-DC, Basic V	0.04	4.3
B	18W AC-DC, Basic V	0.69	3.1
B	60W AC-DC, Basic V	(0.45)	5.4
B	120W AC-DC, Basic V	0.61	1.9
X	203W Multiple-Voltage	2.07	4.7
H	345W High-Power	129.08	0.2

Table I–4 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 median payback period. The projected economic impacts of the proposed standards on individual consumers are generally positive. For example, the estimated average life-cycle cost (LCC) savings are $1.52 for product class 1, $0.16 for product class 2, $0.35 for product class 3, $0.43 for product class 4, $33.79 for product class 5, $40.78 for product class 6, $38.26 for product class 7, $3.04 for product class 8, and $8.30 for product class 10.[4]

Table I-4 Impacts of Proposed Standards on Consumers of Battery Chargers

Rep. Unit	Weighted Average LCC Savings [*2010$*]	Median Payback Period [*yrs*]
PC1 - Low E, Inductive	1.52	1.7
PC2 - Low E, Low-Voltage	0.16	0.5
PC3 - Low E, Medium-Voltage	0.35	3.9
PC4 - Low E, High-Voltage	0.43	3.0
PC5 - Medium E, Low-Voltage	33.79	0.0
PC6 - Medium E, High-Voltage	40.78	0.0
PC7 - High E	38.26	0.0
PC8 - DC-DC, <9V Input	3.04	0.0
PC10 - Low E, AC Out	8.30	1.5

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B. Impact on Manufacturers

The industry net present value (INPV) is the sum of the discounted cash flows to the industry from the base year through the end of the analysis period (2011 to 2042). Using a real discount rate of 7.1 percent, DOE estimates that

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[2] The LCC is the total consumer expense over the life of a product, consisting of purchase 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.

[3] As explained in V.B.1.a, DOE uses the median payback period rather than the mean payback period to dampen the effect of outliers on the data.

[4] The LCC is the total consumer expense over the life of a product, consisting of purchase 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 INPV for manufacturers of EPSs is $0.276 billion in 2010$. Under the proposed standards, DOE expects that manufacturers may lose up to 34.1 percent of their INPV, which is approximately $0.094 billion in 2010$. Based on DOE's interviews with the manufacturers of EPSs and because DOE did not identify any domestic EPS production, DOE does not expect any domestic plant closings or any significant change in employment, since the vast majority, if not all EPS production occurs abroad.

For battery chargers, DOE estimates that the INPV for manufacturers of applications that include battery chargers is between $53.918 and $53.205 billion in 2010$ using a real discount rate of 9.1 percent. Under the proposed standards, DOE expects that manufacturers may lose up to 10.2 percent of their INPV, which is approximately $5.428 billion in 2010$. Based on DOE's interviews with the manufacturers of battery chargers, DOE does not expect any domestic plant closings or significant change in employment, since DOE only identified one domestic battery charger manufacturer.

C. National Benefits

External Power Supplies

DOE's analyses indicate that the proposed standards would save a significant amount of energy over 30 years (2013–2042)—an estimated 0.99 quads of cumulative energy for EPSs.

The product classes at issue are comprised of the following groupings of EPS products listed below.

Table I-5. External Power Supply Product Classes

Product Class	Product Class Description	
B	DC Output, Basic-Voltage	2.5 W (0-10.25 W)
		18 W (10.25-39 W)
		60 W (39-90 W)
		120 W (91-250 W)
C	DC Output, Low-Voltage	
D	AC Output, Basic-Voltage	
E	AC Output, Low-Voltage	
X	Multiple-Voltage	
H	High-Power	
N	Indirect Operation	

The cumulative national net present value (NPV) of total consumer costs and savings of the proposed standards in 2010$ ranges from $0.79 billion (at a 7-percent discount rate) to $1.87 (at a 3-percent discount rate) for EPSs. This NPV expresses the estimated total value of future operating-cost savings minus the estimated increased product costs for products purchased in 2013–2042, discounted to 2011.

In addition, the proposed standards would have significant environmental benefits. The energy saved is in the form of electricity, would result in cumulative greenhouse gas emission reductions of 46.5 million metric tons (Mt)[5] of carbon dioxide (CO_2) in 2013–2042. During this period, the proposed standards would result in emissions reductions of 38 thousand tons of nitrogen oxides (NO_X) and 0.25 tons (t) of mercury (Hg).[6] DOE estimates the net

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[5] A metric ton is equivalent to 1.1 short tons. Results for NO_X and Hg are given in short tons.

[6] DOE calculates emissions reductions relative to the most recent version of the Annual Energy Outlook (AEO) Reference case forecast. This forecast accounts for regulatory emissions reductions from in-place regulations, including the Clean Air Interstate Rule (CAIR, 70 FR 25162 (May 12, 2005)), but not the Clean Air Mercury Rule (CAMR, 70 FR 28606 (May 18, 2005)). Subsequent regulations, including the finalized CAIR

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present monetary value of the CO_2 emissions reduction is between $0.20 and $2.95 billion, expressed in 2010$ and discounted to 2011. DOE also estimates the net present monetary value of the NO_X emissions reduction, expressed in 2010$ and discounted to 2011, is between $6.11 and $62.79 million at a 7-percent discount rate, and between $10.97 and $112.73 million at a 3-percent discount rate.[7]

The benefits and costs of today's proposed standards, for products sold in 2013–2042, 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 proposed standards (consisting primarily of operating cost savings from using less energy, minus increases in equipment purchase 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.[8] The value of the CO_2 reductions, otherwise known as the Social Cost of Carbon (SCC), is calculated using a range of values per metric ton of CO_2 developed by a recent interagency process. The derivation of the SCC values is discussed in section IV.M.

Although combining the values of operating savings and CO_2 reductions provides a useful perspective, two issues should be considered. First, the national operating savings are domestic U.S. consumer 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 CO_2 savings are performed with different methods that use quite different time frames for analysis. The national operating cost savings is measured for the lifetime of EPSs shipped in 2013–2042. The SCC values, on the other hand, reflect the present value of all future climate-related impacts resulting from the emission of one ton of carbon dioxide in each year. These impacts continue well beyond 2100.

Table I–6 shows the annualized values for today's proposed standards for EPSs. (All monetary values below are expressed in 2010$.) 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 $22.3/ton in 2010, the cost of the standards proposed in today's rule is $251.9 million per year in increased equipment costs, while the annualized benefits are $325.2 million per year in reduced equipment operating costs, $52.3 million in CO_2 reductions, and $3.2 million in reduced NO_X emissions. In this case, the net benefit amounts to $128.7 million per year. Using a 3-percent discount rate for all benefits and costs and the SCC series corresponding to a value of $22.3/ton in 2010, the cost of the standards proposed in today's rule is $247.3 million per year in increased equipment costs, while the benefits are $348.2 million per year in reduced operating costs, $52.3 million in CO_2 reductions, and $3.3 million in reduced NO_X emissions. In this case, the net benefit amounts to $156.6 million per year.

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replacement rule, the Cross-State Air Pollution rule issued on July 6, 2011, do not appear in the forecast. On December 30, 2011, the D.C. Circuit stayed CSAPR while ordering EPA to continue administering the also remanded 2005 Clean Air Interstate Rule (CAIR, which has a similar structure, but with less stringent budgets and less restrictive trading provisions) and tentatively set a briefing schedule to allow the case to be heard by April 2012.

[7] DOE is aware of multiple agency efforts to determine the appropriate range of values used in evaluating the potential economic benefits of reduced Hg emissions. DOE has decided to await further guidance regarding consistent valuation and reporting of Hg emissions before it once again monetizes Hg in its rulemakings.

[8] The process that DOE used to convert the time-series of costs and benefits into annualized values is explained in section V.C.3 of this notice.

Table I-6 Annualized Benefits and Costs of Proposed Standards for External Power Supplies Shipped in 2013-2042

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*	High Net Benefits Estimate*
		Monetized (million 2010$/year)		
Benefits				
Operating Cost Savings	7%	325.2	309.1	341.1
	3%	348.2	329.5	367.3
CO_2 Reduction at $4.9/t**	5%	14.1	14.1	14.1
CO_2 Reduction at $22.3/t**	3%	52.3	52.3	52.3
CO_2 Reduction at $36.5/t**	2.5%	81.4	81.4	81.4
CO_2 Reduction at $67.6/t**	3%	159.6	159.6	159.6
NO_X Reduction at $2,537/t**	7%	3.2	3.2	3.2
	3%	3.3	3.3	3.3
Total†	7% plus CO_2 range	342.5 to 488.0	326.4 to 471.9	358.4 to 503.9
	7%	380.7	364.6	396.6
	3%	403.9	385.1	422.9
	3% plus CO_2 range	365.7 to 511.2	346.9 to 492.5	384.7 to 530.3
Costs				
Incremental Product Costs	7%	251.9	251.9	251.9
	3%	247.3	247.3	247.3
Total Net Benefits				
Total †	7% plus CO_2 range	90.5 to 236.1	74.4 to 220.0	106.5 to 252.0
	7%	128.7	112.6	144.7
	3%	156.6	137.9	175.7
	3% plus CO_2 range	118.4 to 264.0	99.7 to 245.2	137.5 to 283.0

* 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 analysis.

† 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.

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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 today's proposal for EPSs, other than product class H (high-power EPSs). 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 and less stringent energy use 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 use 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 use 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.

Battery Chargers

DOE's analyses for battery chargers indicate that the proposed standards would save a significant amount of energy over 30 years (2013–2042)—an estimated 1.36 quads of cumulative energy for battery chargers.

The product classes at issue are comprised of the groupings of battery chargers listed in Table I–7. Each product class grouping was established based on the battery charger's input/output type, and further divided into product classes according to battery energy and voltage.

Table I-7. Battery Charger Product Classes

Product Class #	Input / Output Type	Battery Energy (Wh)	Special Characteristic or Battery Voltage	Product Class Description
1	AC In, DC Out	< 100	Inductive Connection	Low-Energy, Inductive
2			< 4 V	Low-Energy, Low-Voltage
3			4 – 10 V	Low-Energy, Medium-Voltage
4			> 10 V	Low-Energy, High-Voltage
5		100–3000	< 20 V	Medium-Energy, Low-Voltage
6			≥ 20 V	Medium-Energy, High-Voltage
7		> 3000	-	High-Energy
8	DC In, DC Out	-	< 9 V Input	Low-Voltage DC Input
9		-	≥ 9 V Input	High-Voltage DC Input
10a	AC In, AC Out	-	Basic (i.e. no Automatic Voltage Regulation)	10a
10b		-	Contains Automatic Voltage Regulation	10b

The cumulative national net present value (NPV) of total consumer costs and savings of the proposed standards in 2010$ ranges from $6.04 billion (at a 7-percent discount rate) to $10.96 billion (at a 3-percent discount rate) for battery chargers. This NPV expresses the estimated total value of future operating-cost savings minus the estimated increased product costs for products purchased in 2013–2042, discounted to 2011.

In addition, the proposed standards would have significant environmental benefits. The savings would result in cumulative greenhouse gas emission reductions of 62.9 Mt of CO_2 in 2013–2042. During this period, the proposed standards would result in emissions reductions of 52 thousand tons of NO_X and 0.35 tons of mercury. DOE estimates the net present monetary value of the CO_2 emissions reduction is between $0.27 and $4.04 billion, expressed in 2010$ and discounted to 2011. DOE also estimates the net present monetary value of the NO_X emissions reduction, expressed in 2010$ and discounted to 2011, is between $8.19 and $84.14 million at a 7-percent discount rate, and between $14.88 and $153.05 million at a 3-percent discount rate.

The benefits and costs of today's proposed standards, for products sold in 2013–2042, 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 proposed standards (consisting primarily of operating cost savings from using less energy, minus increases in equipment purchase 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. The value of the CO_2 reductions is calculated using a range of values per metric ton of CO_2 developed by a recent interagency process. The derivation of the SCC values is discussed in section IV.M.

Although combining the values of operating savings and CO_2 reductions provides a useful perspective, two issues should be considered. First, the national operating savings are domestic U.S. consumer 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 CO_2 savings are performed with different methods that use quite different time frames for analysis. The national operating cost savings is measured for the lifetime of battery chargers shipped in 2013–2042. The SCC values, on the other hand, reflect the present value of all future climate-related impacts resulting from the emission of one ton of carbon dioxide in each year. These impacts continue well beyond 2100.

Table I–8 shows the annualized values for today's proposed standards for battery chargers. (All monetary values below are expressed in 2010$.) 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 $22.3/ton in 2010, the standards proposed in today's rule result in $110.0 million per year in equipment costs savings, and the annualized benefits are $447.2 million per year in reduced equipment operating costs, $71.6 million in CO_2 reductions, and $4.3 million in reduced NO_X emissions. In this case, the benefit amounts to $633.0 million per year. Using a 3-percent discount rate for all benefits and costs and the SCC series corresponding to a value of $22.3/ton in 2010, the standards proposed in today's rule result in $107.9 million per year in equipment costs savings, and the benefits are $485.2 million per year in reduced operating costs, $71.6 million in CO_2 reductions, and $4.5 million in reduced NO_X emissions. In this case, the net benefit amounts to $669.3 million per year.

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Table I-8 Annualized Benefits and Costs of Proposed Standards for Battery Chargers Shipped in 2013-2042

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*	High Net Benefits Estimate*
		Monetized (million 2010$/year)		
Benefits				
Operating Cost Savings	7%	447.2	425.6	468.8
	3%	485.2	459.7	511.2
CO_2 Reduction at $4.9/t**	5%	19.3	19.3	19.3
CO_2 Reduction at $22.3/t**	3%	71.6	71.6	71.6
CO_2 Reduction at $36.5/t**	2.5%	111.5	111.5	111.5
CO_2 Reduction at $67.6/t**	3%	218.5	218.5	218.5
NO_X Reduction at $2,537/t**	7%	4.3	4.3	4.3
	3%	4.5	4.5	4.5
Total †	7% plus CO_2 range	470.7 to 670.0	449.1 to 648.4	492.4 to 691.6
	7%	523.1	501.5	544.7
	3%	561.3	535.8	587.4
	3% plus CO_2 range	509.0 to 708.2	483.5 to 682.7	535.0 to 734.3
Costs				
Incremental Product Costs[9]	7%	(110.0)	(110.0)	(110.0)
	3%	(107.9)	(107.9)	(107.9)
Total Net Benefits				
Total †	7% plus CO_2 range	580.7 to 780.0	559.1 to 758.3	602.3 to 801.6
	7%	633.0	611.4	654.7
	3%	669.3	643.8	695.3
	3% plus CO_2 range	616.9 to 816.2	591.4 to 790.7	643.0 to 842.2

* 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 analysis.

† 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.

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[9] The incremental product costs for battery chargers are negative because of a shift in technology from linear power supplies to switch mode power for the larger battery chargers in product classes 5, 6, and 7.

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 today's proposal for battery chargers, other than product class 10 (AC output). 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 and less-stringent energy use 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 use 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 use 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 today's proposal, as well as some of the relevant historical background related to the establishment of standards for battery chargers and EPSs.

A. Authority

Title III, Part B of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Public Law 94–163 (42 U.S.C. 6291–6309, as codified) established the Energy Conservation Program for Consumer Products Other Than Automobiles,[10] a program covering most major household appliances (collectively referred to as ''covered products''), which includes battery chargers and EPSs. (42 U.S.C. 6295(u)) (DOE notes that under 42 U.S.C. 6295(m), the agency must periodically review its already established energy conservation standards for a covered product. Under this requirement, the next review that DOE would need to conduct must occur no later than six years from the issuance of a final rule establishing or amending a standard for a covered product.)

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. 6293) 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)) Similarly, DOE must use these test procedures to determine whether the products comply with standards adopted pursuant to EPCA. See 42 U.S.C. 6295(s). As stated below in Section II.B.2 the DOE test procedures for battery chargers and EPSs currently appear at title 10, Code of Federal Regulations (CFR), part 430, subpart B, appendices Y and Z, respectively.

DOE must follow specific statutory criteria when prescribing amended standards for covered products. As indicated above, any 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)) Furthermore, EPCA precludes DOE from adopting 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 and EPSs, if no test procedure has been established for the product, or (2) if DOE determines by rule that the proposed 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 factors:

1. The economic impact of the standard on manufacturers and consumers of the products subject to the standard;
2. The savings in operating costs throughout the estimated average life of the covered products in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses for the covered products that are likely to result from the imposition of the standard;
3. The total projected amount of energy, or as applicable, water, savings likely to result directly from the imposition of the standard;
4. Any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;
5. The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the imposition of the standard;
6. The need for national energy and water conservation; and
7. Other factors the Secretary of Energy (Secretary) considers relevant.

(42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

EPCA, as codified, also contains what is known as an ''anti-backsliding'' provision, which prevents the Secretary from prescribing any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. (42 U.S.C. 6295(o)(1)) Also, the Secretary may not prescribe an amended or new standard if interested persons have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States 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).

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

Additionally, 42 U.S.C. 6295(q)(1) specifies requirements when promulgating a standard for a type or class of covered product that has two or more subcategories. DOE must specify a different standard level than that which applies generally to such type or class of products for any group of covered products that have the same function or intended use if DOE determines that covered 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. 6294(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 of the feature to the consumer 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 section 310(3) of EISA 2007, any final rule for new or amended energy conservation standards promulgated after July 1, 2010, are 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 in under EPCA (42 U.S.C. 6295(o)), incorporate standby mode and off mode energy use into the standard, or, if that is not feasible, adopt a separate standard for such energy use for that product. (42 U.S.C. 6295(gg)(3)(A)–(B)) DOE's current test procedures for battery chargers and EPSs already address standby-mode and off-mode energy use. The standards for EPSs also address this energy use; currently there are no standards for battery chargers. In this rulemaking, DOE intends to incorporate such energy use into any new or amended energy conservation standards it adopts in the final rule.

DOE has also reviewed this regulation pursuant to Executive Order 13563, issued on January 18, 2011 (76 FR 3281 (Jan. 21, 2011)). EO 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 today's NOPR is consistent with these principles, including the requirement that, to the extent permitted by law, benefits justify costs and that net benefits are maximized.

Consistent with EO 13563, and the range of impacts analyzed in this rulemaking, the energy efficiency standards proposed herein by DOE achieves maximum net benefits.

B. Background

1. Current Standards

Section 301 of EISA 2007 established minimum energy conservation standards for Class A EPSs, which became effective on July 1, 2008. (42 U.S.C. 6295(u)(3)(A)) These standards provided an active mode efficiency level and a no-load power consumption rate. The current standards are set forth in Table II.1 and Table II.2, respectively.

Table II-1 Federal Active Mode Energy Efficiency Standards for Class A External Power Supplies

Nameplate Output Power	Active Mode Minimum Efficiency (decimal equivalent of a percentage)
< 1 Watt	$0.5*(\mathit{nameplate\_output})$
1 – 51 Watts	$0.5+ 0.09*\mathbf{ln}(\mathit{nameplate\_output})$
> 51 Watts	0.85

Table II-2 Federal No-Load Mode Energy Efficiency Standards for Class A External Power Supplies

Nameplate Output Power	No-Load Mode Maximum Power Consumption
≤ 250 Watts	0.5 Watts

Currently, no Federal energy conservation standards apply to non-Class A EPSs or battery chargers.

2. History of Standards Rulemaking for Battery Chargers and External Power Supplies

Section 135 of the Energy Policy Act of 2005 (EPACT 2005), Public Law 109–58 (Aug. 8, 2005), amended sections 321 and 325 of EPCA by defining the terms ''battery charger'' and ''external power supply.'' That provision also directed DOE to prescribe definitions and test procedures related to the energy consumption of battery chargers and external power supplies and to issue a final rule that determines whether energy conservation standards shall be issued for battery chargers and external power supplies or classes of battery chargers and external power supplies. (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 definitions and test procedures for battery chargers and EPSs. As stated above, the test procedures for these products are found in 10 CFR Part 430, Subpart B, Appendix Y (''Uniform Test Method for Measuring the Energy Consumption of Battery Chargers'') and 10 CFR Part 430, Subpart B, Appendix Z (''Uniform Test Method for Measuring the Energy Consumption of External Power Supplies'').

On December 19, 2007, Congress enacted EISA 2007, which, among other things, amended sections 321, 323, and 325 of EPCA. As part of these amendments, EISA 2007 altered the EPS definition. Under the definition previously set by EPACT 2005, the statute defined an EPS as an external power supply circuit ''used to convert household electric current into DC current or lower-voltage AC current to operate a consumer product.'' (42 U.S.C. 6291(36)(A)) Section 301 of EISA 2007 amended that definition by creating a subset of EPSs called ''Class A External Power Supplies.'' This new subset of products consisted of those EPSs that can convert to only 1 AC or DC output voltage at a time and have a nameplate output power of no more than 250 watts (W). The definition excludes any device requiring Federal Food and Drug Administration (FDA) listing and approval as a medical device in accordance with section 513 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360c) or one that powers the charger of a detachable battery pack or charges the battery of a product that is fully or primarily motor operated. (42 U.S.C. 6291(36)(C)) Section 301 of EISA 2007 also established energy conservation standards for Class A EPSs that became effective on July 1, 2008, and directed DOE to conduct an energy conservation standards rulemaking to review those standards.

Additionally, section 309 of EISA 2007 amended section 325(u)(1)(E) of EPCA (42 U.S.C. 6295(u)(1)(E)) 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. DOE is bundling this battery charger rulemaking proceeding with the requirement to review and consider amending the energy conservation standards for Class A EPSs. The new rulemaking requirements contained in sections 301 and 309 of EISA 2007 effectively superseded the prior determination analysis that EPACT 2005 required DOE to conduct.

Section 309 of EISA 2007 also instructed DOE to issue a final rule to determine whether DOE should issue energy conservation standards for external power supplies or classes of external power supplies no later than two years after EISA 2007's enactment. (42 U.S.C. 6295(u)(1)(E)(i)(I)) Because Congress already set standards for Class A devices, DOE interpreted this determination requirement as applying solely to assessing whether energy conservation standards are warranted for EPSs that fall outside of the Class A definition (i.e. non-Class A EPSs). Non-Class A EPSs include those devices that have a nameplate output power greater than 250 watts, are able to convert to more than one AC or DC output voltage simultaneously, and are specifically excluded from coverage under the Class A EPS definition in EISA 2007 by virtue of their application—*e.g.,* EPSs used with medical devices.[11] DOE determined that standards are warranted for non-Class A EPSs. See 75 FR 27170 (May 14, 2010). Given the similarities between battery chargers and non-Class A and Class A EPSs, DOE is handling all three product groups in a single standards rulemaking.

Finally, section 310 of EISA 2007 established definitions for active, standby, and off modes, and directed DOE to amend its existing test procedures for battery chargers and EPSs to measure the energy consumed in standby mode and off mode. (42

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[11] To help ensure that the standards Congress set were not applied in an overly broad fashion, DOE applied the statutory exclusion not only to those EPSs that require FDA listing and approval but also to any EPS that provides power to a medical device.

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 for battery chargers and made certain amendments to the test procedure for EPSs. 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 *https://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/bceps_frameworkdocument.pdf.* The framework document explained the issues, analyses, and process DOE anticipated using to develop energy efficiency 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 EPSs. 74 FR 26816 (June 4, 2009)

DOE held a public meeting on July 16, 2009, to discuss the analyses and issues identified in the framework document. At the meeting, DOE described the different analyses it would conduct, the methods proposed for conducting them, and the relationships among the various analyses. Manufacturers, trade associations, environmental advocates, regulators, and other interested parties attended the meeting. The comments received at the public meeting and during the subsequent comment period helped DOE identify and resolve issues involved in this rulemaking.

Following the framework document public meeting, DOE published on November 3, 2009, a Notice of Proposed Determination to examine the feasibility and related economic costs and benefits of setting energy conservation standards for non-Class A EPSs. 74 FR 56928. This notice was followed by a final determination published on May 14, 2010, 75 FR 27170, which concluded that energy conservation standards for non-Class A EPSs appear to be technologically feasible and economically justified, and would be likely to result in significant energy savings. Consequently, DOE decided to include non-Class A EPSs in the present energy conservation standards rulemaking for battery chargers and EPSs.

DOE then 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. This process culminated in DOE's announcement in the **Federal Register** on September 15, 2010, of the preliminary analysis public meeting, at which DOE discussed and received comments on the following matters: the product classes DOE analyzed; the analytical framework, models, and tools that DOE was using to evaluate potential standards; the results of the preliminary analyses performed by DOE; and potential standard levels under consideration. 75 FR 56021 (the September 2010 notice). DOE also invited written comments on these subjects and announced the availability on its Web site of a preliminary technical support document (preliminary TSD) it had prepared to inform interested parties and enable them to provide comments.[12] *Id.* Finally, DOE stated its interest in receiving views concerning other relevant issues that participants believed would affect energy conservation standards for battery chargers and EPSs, or that DOE should address in this NOPR. *Id.* at 56024.

The preliminary TSD provides an overview of the activities DOE undertook in developing standards for battery chargers and EPSs, and discusses the comments DOE received in response to the framework document. It also describes the analytical framework that DOE used (and continues to use) in this rulemaking, including a description of the methodology, the analytical tools, and the relationships among the various analyses that are part of the rulemaking. The preliminary TSD presents and describes in detail each analysis DOE had performed up to that point, including descriptions of inputs, sources, methodologies, and results. These analyses were as follows:

- A *market and technology assessment* addressed the scope of this rulemaking, identified the potential classes for battery chargers and EPSs, characterized the markets for these products, and reviewed techniques and approaches for improving their efficiency;
- A *screening analysis* reviewed technology options to improve the efficiency of battery chargers and EPSs, and weighed these options against DOE's four prescribed screening criteria: (1) Technological feasibility, (2) practicability to manufacture, install, and service, (3) impacts on equipment utility or equipment availability, (4) adverse impacts on health or safety;
- An *engineering analysis* estimated the increases in manufacturer selling prices (MSPs) associated with more energy-efficient battery chargers and EPSs;
- An *energy use analysis* estimated the annual energy use in the field of battery chargers and EPSs as a function of efficiency levels;
- A *markups analysis* converted estimated manufacturer selling price (MSP) increases derived from the engineering analysis to consumer prices;
- A *life-cycle cost analysis* calculated, at the consumer level, the discounted savings in operating costs throughout the estimated average life of the product, compared to any increase in installed costs likely to result directly from the imposition of a given standard;
- A *payback period (PBP) analysis* estimated the amount of time it would take consumers to recover the higher expense of purchasing more energy efficient products through lower operating costs;
- A *shipments analysis* estimated shipments of battery chargers and EPSs over the 30-year analysis period (2013–2042), which were used in performing the national impact analysis (NIA);
- A *national impact analysis* assessed the national energy savings (NES), and the national net present value of total consumer costs and savings, expected to result from specific, potential energy conservation standards for battery chargers and EPSs; and
- A *preliminary manufacturer impact analysis* took the initial steps in evaluating the effects new or amended efficiency standards may have on manufacturers.

In the September 2010 notice, DOE summarized the nature and function of the following analyses: (1) Engineering, (2) energy use analysis, (3) markups to determine installed prices, (4) LCC and PBP analyses, and (5) national impact analysis. *Id.* at 56023–56024.

DOE held a public meeting on October 13, 2010, to discuss its preliminary analysis. At this meeting, DOE presented the methodologies and results of the analyses set forth in the preliminary TSD. Major topics discussed at the meeting included, among others, the regulation of EPSs for motorized applications and applications

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[12] The preliminary TSD is available at: *http://www1.eere.energy.gov/buildings/appliance_standards/residential/battery_external_preliminary analysis_tsd.html.*

with detachable batteries (MADB EPSs), criteria for establishing separate product classes, and assumptions made by DOE on the usage of certain products. The comments received since publication of the September 2010 notice, including those received at the preliminary analysis public meeting, have contributed to DOE's proposed resolution of the issues noted by interested parties. This NOPR quotes and summarizes many of these comments, and responds to the issues they raised.[13]

DOE received written comments on the preliminary analysis from four industry groups (the Association of Home Appliance Manufacturers (AHAM, No. 42); the Consumer Electronics Association (CEA, No. 46), the Power Tool Institute, Inc. (PTI, No. 45); and the Wireless Power Consortium (WPC, No. 40)), six manufacturers (Cobra Electronics Corp. (Cobra, No. 51); Lester Electrical of Nebraska, Inc. (Lester) (Lester, No. 50); Motorola, Inc. (Motorola, No. 48); Philips Electronics North America Corp. (Philips, No. 41); Stanley Black & Decker (SBD, No. 44); and Wahl Clipper Corporation (Wahl, No. 53)), and several energy efficiency advocates, including a number of utilities (Pacific Gas and Electric Company, San Diego Gas and Electric Company, Southern California Gas Company, and Southern California Edison, collectively organized as the California Investor Owned Utilities (California IOUs, No. 43); Northeast Energy Efficiency Partnerships (NEEP, No. 49); and a joint comment from Pacific Gas and Electric Company, Southern California Gas Company, San Diego Gas and Electric Company, Southern California Edison, Appliance Standards Awareness Project, Northeast Energy Efficiency Partnerships, Northwest Energy Efficiency Alliance, American Council for an Energy-Efficient Economy, and Natural Resources Defense Council (PG&E, *et al.,* No. 47)). These commenters, along with those that provided oral comments at the preliminary analysis public meeting, are summarized in Table II–2.

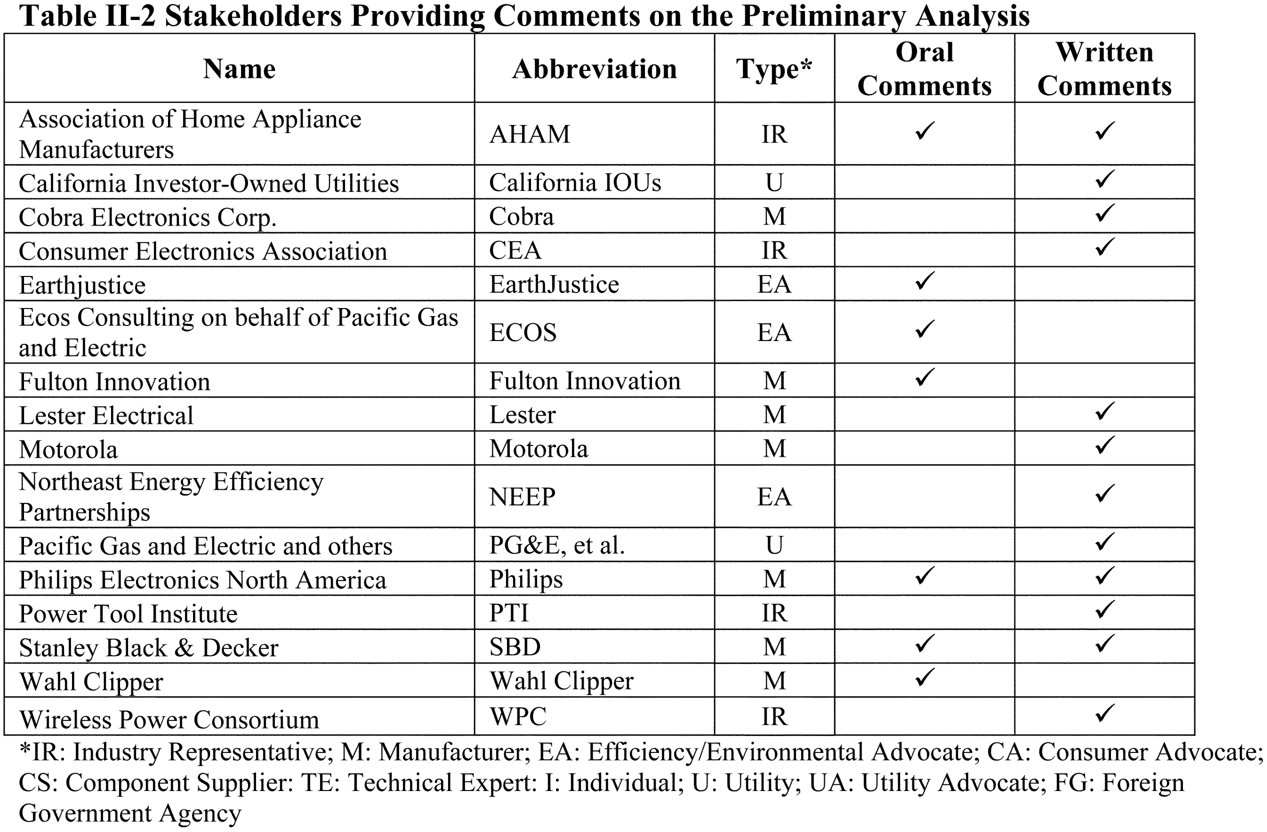

Table II-2 Stakeholders Providing Comments on the Preliminary Analysis

Name	Abbreviation	Type*	Oral Comments	Written Comments
Association of Home Appliance Manufacturers	AHAM	IR	✓	✓
California Investor-Owned Utilities	California IOUs	U		✓
Cobra Electronics Corp.	Cobra	M		✓
Consumer Electronics Association	CEA	IR		✓
Earthjustice	EarthJustice	EA	✓	
Ecos Consulting on behalf of Pacific Gas and Electric	ECOS	EA	✓	
Fulton Innovation	Fulton Innovation	M	✓	
Lester Electrical	Lester	M		✓
Motorola	Motorola	M		✓
Northeast Energy Efficiency Partnerships	NEEP	EA		✓
Pacific Gas and Electric and others	PG&E, et al.	U		✓
Philips Electronics North America	Philips	M	✓	✓
Power Tool Institute	PTI	IR		✓
Stanley Black & Decker	SBD	M	✓	✓
Wahl Clipper	Wahl Clipper	M	✓	
Wireless Power Consortium	WPC	IR		✓

*IR: Industry Representative; M: Manufacturer; EA: Efficiency/Environmental Advocate; CA: Consumer Advocate; CS: Component Supplier: TE: Technical Expert: I: Individual; U: Utility; UA: Utility Advocate; FG: Foreign Government Agency

Following the close of the formal public comment period, DOE also received a clarification statement regarding an earlier submission to which ASAP joined with other commenters (ASAP, No. 55) and a proposal for DOE to adopt an efficiency marking protocol for battery chargers from the Natural Resources Defense Council (NRDC, No. 56).

III. General Discussion

The following section discusses various technical aspects related to this proposed rulemaking. In particular, it addresses aspects involving the test procedures for battery chargers and EPSs, the technological feasibility of potential standards to assign to these products, and the potential energy savings and economic justification for prescribing the proposed amended standards for battery chargers and EPSs.

A. Test Procedures

To help analyze the proposal for the products covered under today's rulemaking, DOE applied the recently amended test procedures for EPSs and battery chargers. The following sections explain how DOE applied these

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[13] A parenthetical reference at the end of a quotation or paraphrase provides the location of the item in the public record.

procedures in evaluating the standards that are being proposed.

1. External Power Supply Test Procedures

DOE used its recently modified EPS test procedure as the basis for evaluating EPS efficiency in the NOPR. This procedure, which was recently codified in appendix Z to subpart B of 10 CFR part 430 (''Uniform Test Method for Measuring the Energy Consumption of EPSs''), includes a means to account for the energy consumption from multiple-voltage EPSs and clarifies the manner in which to test those devices that communicate with their loads. See 76 FR 31750, 31782–31783 (June 1, 2011). The term ''load communication'' refers to the ability of an EPS to identify whether a given load is compatible with the product that is being powered. See id. at 31752–31753.

The amended test procedure produces two key outputs relevant to today's proposal. In particular, the procedure provides measurements for active mode efficiency and no-load mode power consumption. For single output voltage EPSs, active-mode conversion efficiency is the ratio of output power to input power. DOE averages the efficiency at four loading conditions—25, 50, 75, and 100 percent of maximum rated output current. For multiple-voltage EPSs, the test procedure produces these same four efficiency measurements, but does not average them. For both single-voltage and multiple-voltage EPSs, DOE measures the power consumption of the EPS when disconnected from the consumer product, which is termed no-load power consumption. If the EPS has an on-off switch, the switch is placed in the ''on'' position when making this measurement.

2. Battery Charger Test Procedures

The initial battery charger test procedure, 71 FR 71340, 71368 (Dec. 8, 2006), included a means to measure battery charger energy consumption in ''maintenance'' and ''no-battery'' modes. These are non-active modes of operation for a battery charger and neither mode is the primary (i.e. active) mode of operation for a battery charger. A battery charger is in maintenance mode when the battery it is designed to charge is fully charged, but is still plugged into the charger—i.e. the charger is maintaining the charge in the battery. Standby mode, also known as no-battery mode, occurs when a battery charger is plugged into the wall (or power source), but the battery has been removed. The test procedure was amended to include measurements (or metrics) to account for the energy consumption that takes place in a battery charger during all modes of operation—active (i.e. the energy consumed by a battery charger while charging a battery), maintenance (i.e. the energy consumed to maintain the charge of a battery that has already been fully charged), standby (the energy consumed when a battery charger is plugged in, but the battery is removed from the device), and off (i.e. the energy consumed while a charger is plugged in but is switched off) modes. 76 FR 31750.

In analyzing the various products in preparation of the preliminary analysis, DOE relied on a test procedure that was largely based on a procedure that had been developed by the California Energy Commission (CEC). That procedure also served as the basis for DOE's 2010 proposal to amend the procedure to account for active mode energy consumption during testing. 75 FR 16958 (April 2, 2010).

The proposed procedure DOE employed had two key differences from the CEC procedure. First, it employed a shortened test procedure for battery chargers whose output power to the battery stabilizes within 24 hours. Second, the procedure employed a reversed charge/discharge testing order from that specified in the CEC procedure. DOE proposed switching the order such that the proposal used a preparatory charge, followed by a measured discharge, followed by a measured charge. The final rule dropped this approach in favor of the order prescribed in the CEC procedure—i.e. preparatory discharge, a measured charge, and a measured discharge. DOE applied this amended test procedure when analyzing the potential energy efficiency levels for battery chargers.

B. Technological Feasibility

The following sections address the manner in which DOE assessed the technological feasibility of potential standard levels. Energy conservation standards promulgated by DOE must be technologically feasible. Separate analyses were conducted for EPSs and battery chargers.

1. General

In each standards rulemaking, DOE conducts a screening analysis based on information gathered on all current technology options and prototype designs that have the potential to improve product or equipment efficiency. To conduct the analysis, DOE develops a list of design options for consideration in consultation with manufacturers, design engineers, and other interested parties. DOE then determines which of these means for improving efficiency are technologically feasible. DOE considers a design option to be technologically feasible if it is currently in use by the relevant industry, or if a working prototype exists. See 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(i), which provides that ''[t]echnologies incorporated in commercially available products or in working prototypes will be considered technologically feasible.''

Once DOE has determined that particular design options are technologically feasible, it evaluates each of these design options using 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. (10 CFR part 430, subpart C, appendix A, section 4(a)(4)). Section IV.B of this notice discusses the results of the screening analysis for battery chargers and EPSs, particularly the designs DOE considered, those it screened out, and those that are the basis for the trial standard levels (TSLs) in this rulemaking.

For further details on the screening analysis for this rulemaking, see chapter 4 of the TSD.

Additionally, DOE notes that it has received no interested party comments regarding patented technologies and proprietary designs that would prohibit all manufacturers from achieving the energy conservation standards proposed in today's rule. At this time, DOE believes that the proposed standards for the products covered as part of this rulemaking will not mandate the use of any such technologies, but requests additional information regarding proprietary designs and patented 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 level, as required by section 325(o) of EPCA, by interviewing manufacturers, vetting their data with subject matter experts, and presenting the results for public comment. (42 U.S.C. 6295(o)).

a. External Power Supply Max-Tech Levels

DOE conducted several rounds of interviews with manufacturers of EPSs, integrated circuits for EPSs, and applications using EPSs. All of the manufacturers interviewed identified ways that EPSs could be modified to achieve efficiencies higher than those available with current products. These manufacturers also described the costs of achieving those efficiency improvements, which DOE examines in detail in chapter 5 of the TSD. DOE independently verified the accuracy of the information described by manufacturers.[14] Verifying this information required examining and testing products at the best-in-market efficiency level and determining what design options could still be added to improve their efficiency. By comparing the improved best-in-market designs (using predicted performance and cost) to the estimates provided by manufacturers, DOE was able to assess the reasonableness of the max-tech levels developed.

DOE solicited comment on its review of the max-tech CSLs prepared for the preliminary analysis—particularly with respect to its initial view that 2.5W EPSs may be able to achieve a max-tech efficiency of 80% rather than the lower efficiency suggested by manufacturers (See Chapter 5 of the TSD for details on how DOE aggregated manufacturer data). During interviews conducted in preparation for the NOPR, manufacturers confirmed that an 80% efficiency level is achievable for 2.5W EPSs, but not without a decrease in utility. Manufacturers stated that reaching that efficiency level would require an increase in the form factor (i.e. the geometry of the design), which would make these devices larger. The increased size of the EPS would, in the manufacturers' views, constitute a decreased utility that would be undesirable to consumers because of demands for smaller and lighter products. In light of this possibility, DOE used a max-tech efficiency value of 74.8%, which represents the average max-tech efficiency level predicted by manufacturers, to characterize CSL 4. The aggregated responses from manufacturers are discussed in chapter 5 of the TSD.

DOE created the max-tech (CSL 4) equations for average efficiency and no-load power using curve-fits (i.e. creating a continuous mathematical expression to represent the trend of the data as accurately as possible) of the aggregated manufacturer data (see chapter 5 of the TSD for details on curve fits). DOE created the equations for no-load power based on a curve fit of the no-load power among the four representative units. For both the average efficiency and no-load power CSL equations, DOE used equations similar to those for CSL 1, involving linear and logarithmic terms in the nameplate output power. DOE chose the divisions at 1 watt and 49 watts in the CSL 4 equations to ensure consistency with the nameplate output power divisions between the equations for CSL 1.

In the determination for non-Class A EPSs, DOE created CSLs based on test and teardown data as well as manufacturer interview data consistent with the Class A EPS methodology. See 75 FR 27170, 27174–27175. DOE also stated in Chapter 5 of the preliminary analysis TSD that it might further evaluate additional CSLs should that become necessary pending later analysis, including revising the max-tech CSLs for all the representative units.

For the NOPR, DOE has chosen to add a new max-tech CSL for high-power EPSs while the max-tech for multiple-voltage EPSs remains unchanged from the preliminary analysis. Based on its analysis, DOE ascertained that 345W EPSs are able to achieve comparable efficiencies to 120W EPSs because efficiency tends to improve with higher nameplate output power before leveling off regardless of output power. Because of the diminishing returns of this trend, there would be no appreciable difference in the achievable efficiency of a 120W EPS and a 345W EPS. Therefore, DOE scaled its 120W EPS cost-efficiency curve using its voltage scaling method, outlined in Chapter 5 of the TSD, to generate the max-tech CSL for 345W EPSs. The max-tech no-load metric was chosen by assuming that three 120W EPSs could theoretically be connected to deliver 345 watts to a load (i.e. three 120W EPSs yield a 360W load). Consequently, in analyzing the potential cost-efficiency curves for these products, the no-load metric DOE created for CSL 4 is three times greater than the no load used for the 120W equivalent CSL.

b. Battery Charger Max-Tech Levels

The preliminary analysis did not include max-tech efficiency levels for five of the ten product classes that are being addressed today. DOE omitted levels for these product classes because manufacturers did not provide information on levels of performance that would be technologically feasible and more efficient than the current best-in-market devices. DOE's preliminary analyses typically rely heavily on manufacturer input in framing potential max-tech levels for discussion and comment.

In preparing today's NOPR, which includes max-tech levels for the ten 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. DOE once again 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 affects they would likely have on the various battery charger performance parameters. The table below shows the reduction in energy consumption when increasing efficiency from the baseline to the max-tech efficiency level.

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[14] In confirming this information, DOE obtained technical assistance from two subject matter experts—Robert Gourlay of RDG Engineering in Northridge, CA and Jon Wexler, an independent and solo consultant in Los Angeles, CA. These two experts were selected after having been found through the Institute of Electrical and Electronics Engineers (IEEE). Together, they have over 30 years of combined experience with power supply design. The experts relied on their years of experience to evaluate the validity of both the design and the general cost of the max-tech efficiency levels provided by manufacturers.

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)	0.81	91
3 (Low-Energy, Medium-Voltage)	0.75	94
4 (Low-Energy, High-Voltage)	3.01	92
5 (Medium-Energy, Low-Voltage)	15.35	82
6 (Medium-Energy, High-Voltage)	16.79	86
7 (High-Energy)	131.44	46
8 (DC to DC, <9V Input)	0.19	79
9 (DC to DC, ≥9V Input)	0.13	83
10a (AC Output, No AVR)	4.95	92
10b (AC Output, AVR)	8.58	92

Additional discussion of DOE's max-tech efficiency levels and comments received in response to the preliminary analysis can be found in the discussion of candidate standard levels in section IV.C.2.d. Specific details regarding which design options were considered for the max-tech efficiency levels (and all other CSLs) can be found in Chapter 5 of the accompanying TSD.

C. Energy Savings

The following discussion addresses the various steps DOE used to assess the potential energy savings that DOE projects will likely accrue from the various standard levels that were examined.

1. Determination of Savings

DOE used its NIA spreadsheet model to estimate energy savings from amended standards for the battery chargers and EPS products that are the subject of this rulemaking.[15] For each TSL, DOE forecasted energy savings beginning in 2013, the year that manufacturers would be required to comply with amended standards, and ending in the last year products shipped in 2042 would be retired. DOE quantified the energy savings attributable to each TSL as the difference in energy consumption between the standards case and the base case. The base case represents the forecast of energy consumption in the absence of amended mandatory efficiency standards and considers market demand for more-efficient products.

The NIA spreadsheet model calculates the electricity savings in ''site energy'' expressed in kilowatt-hours (kWh). Site energy is the energy directly consumed by battery chargers and EPSs at the locations where they are used. DOE reports national energy savings on an annual basis in terms of the aggregated source (primary) energy savings, which is the savings in the energy that is used to generate and transmit the site energy. (See chapter 10 of the TSD.) To convert site energy to source energy, DOE derived annual conversion factors from the model used to prepare the Energy Information Administration's (EIA) *Annual Energy Outlook 2010 (AEO2010).*

2. Significance of Savings

As noted above, 42 U.S.C. 6295(o)(3)(B) any standard that DOE sets must result in ''significant'' energy savings. While the term ''significant'' is not defined in the Act, the U.S. Court of Appeals, 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 are nontrivial, and, therefore, DOE considers them ''significant'' within the meaning of section 325 of EPCA.

D. Economic Justification

This section summarizes the manner in which DOE estimated the economic impacts for the various potential standards that it evaluated. Among the aspects considered by DOE were the economic impacts on both manufacturers and consumers, life cycle costs, the amount of projected energy savings, product utility and performance, impacts on competition, and the general need to conserve energy.

1. Specific Criteria

As noted in section II.B, 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 new and amended standards on manufacturers, DOE first determines the quantitative impacts using an annual cash-flow approach. This step includes both a short-term assessment—based on the cost and capital requirements during the period between the issuance of a regulation and when entities must comply with the regulation—and a long-term assessment over a 30-year analysis period. The industry-wide impacts analyzed include INPV (which values the industry on the basis of expected future cash flows), cash flows by year, changes in revenue and income, and 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 different DOE regulations and other regulatory requirements on manufacturers.

For individual consumers, measures of economic impact include the changes in LCC and the PBP associated with new or amended standards. The LCC, specified separately in EPCA as one of the seven factors to be considered in determining the economic justification for a new or amended standard, 42 U.S.C. 6295(o)(2)(B)(i)(II), is discussed in the following section. For consumers

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[15] The NIA spreadsheet model is described in section IV.G of this notice.

in the aggregate, DOE also calculates the national net present value of the economic impacts on consumers over the forecast period used in a particular rulemaking.

b. Life-Cycle Costs

The LCC is the sum of the purchase price of a product (including its installation) and the operating expense (including energy and maintenance expenditures) discounted over the lifetime of the product. For each battery charger product class and EPS representative unit, DOE calculated both LCC and LCC savings for various efficiency levels. The LCC analysis required a variety of inputs, such as product prices, electricity prices, product lifetimes, base case efficiency distributions, annual unit energy consumption, and discount rates.

To characterize variability in electricity pricing, DOE established regional differences in electricity prices. To account for uncertainty and variability in other inputs, such as discount rates, DOE used a distribution of values with probabilities assigned to each value. DOE then sampled the values of these inputs from the probability distributions for each consumer. The analysis produced a range of LCCs. A distinct advantage of this approach is that DOE can identify the percentage of consumers achieving LCC savings due to an increased energy conservation standard, in addition to the average LCC savings. DOE presents only average LCC savings in this NOPR; however, additional details showing the distribution of results can be found in chapter 8 and appendix 8B of the TSD.

In the LCC analysis, DOE determined the input values for a wide array of end-use applications that are powered by battery chargers or EPSs. There are typically multiple applications within every representative unit and product class that DOE analyzed. As such, DOE considered a wide array of input values for each unit analyzed. The lifetime, markups, base case market efficiency distribution, and unit energy consumption all vary based on the application. In the analysis, DOE sampled an application based on its shipment-weighting within the representative unit or product class. When an application was sampled, its unique inputs were selected for calculating the LCC and PBP. For further detail regarding application sampling, see appendix 8C of the TSD.

In its written comments, AHAM stated that the MIA and LCC calculations should be the most important considerations when determining where to set the standard level. (AHAM, No. 42 at p. 15) DOE considered many criteria when selecting the proposed standard level, including impacts on manufacturers, consumers, the Nation, and environmental impacts. DOE weighed the impacts from each of these analyses in determining the proposed standard level.

c. Energy Savings

While 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)) DOE uses the NIA spreadsheet results in its consideration of total projected energy savings.

d. Lessening of Utility or Performance of Products

In establishing classes of products, and in evaluating design options and the impact of potential standard levels, DOE sought to develop standards for EPSs and battery chargers that would not lessen the utility or performance of these products. None of the TSLs presented in today's NOPR would substantially reduce the utility or performance of the products under consideration in the rulemaking. DOE received no comments that standards for battery chargers and EPSs would increase their size and reduce their convenience, increase the length of time to charge a product, shorten the intervals between chargers, or any other significant adverse impacts on consumer utility. However, based on DOE's preliminary examination of the information before it, including interviews with manufacturers, manufacturers may reduce the availability of features that increase energy use, such as LED indicator lights, in an effort to meet any standard levels promulgated as a result of this rulemaking. (42 U.S.C. 6295(o)(2)(B)(i)(IV)) Manufacturers indicated that these changes would only be made if their customers would not be averse to the change in utility. DOE requests interested party feedback, including any substantive data, regarding today's proposed standard levels and the potential for lessening of utility or performance related features.

e. Impact of Any Lessening of Competition

EPCA directs DOE to consider any lessening of competition that is likely to result from standards. It also directs the Attorney General of the United States (Attorney General) to determine the impact, if any, of any lessening of competition likely to result from a proposed standard and to transmit such determination to the Secretary within 60 days of the publication of a proposed rule, together with an analysis of the nature and extent of the impact. (42 U.S.C. 6295(o)(2)(B)(i)(V) and (B)(ii)) DOE has transmitted a copy of today's proposed rule to the Attorney General and has requested that the Department of Justice (DOJ) provide its determination on this issue. DOE will address the Attorney General's determination, if any, in the final rule.

f. Need for National Energy Conservation

Certain benefits of the proposed standards are likely to be reflected in improvements to the security and reliability of the Nation's energy system. Reductions in the demand for electricity may also 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.

Energy savings from the proposed standards are also likely to result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with energy production. DOE reports the environmental effects from the proposed standards for battery chargers and EPSs, and from each TSL it considered, in the environmental assessment contained in chapter 15 of the TSD. DOE also reports estimates of the economic value of emissions reductions resulting from the considered TSLs in chapter 16 of the TSD.

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 of 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 payback period of potential standards for consumers. These analyses include, but are not limited to, the 3-year payback period contemplated under the rebuttable presumption test. However, DOE routinely conducts an economic analysis that considers the full range of impacts to the consumer, manufacturer, Nation, and environment, as required under 42 U.S.C. 6295(o)(2)(B)(i). 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. The rebuttable presumption payback calculation is discussed in section V.B.1.c of this NOPR and chapter 8 of the TSD.

IV. Methodology and Discussion

DOE used three spreadsheet tools to estimate the impact of today's proposed standards. The first spreadsheet calculates LCCs and payback periods of potential standards. The second provides shipments forecasts, and then calculates national energy savings and net present value impacts of potential standards. Finally, DOE assessed manufacturer impacts, largely through use of the Government Regulatory Impact Model (GRIM). All three spreadsheet tools will be made available online at the rulemaking Web site: *http://www1.eere.energy.gov/buildings/appliance_standards/residential/battery_external.html.*

Additionally, DOE estimated the impacts on utilities and the environment that would be likely to result from the setting of standards for battery chargers and EPSs. DOE used a version of EIA's National Energy Modeling System (NEMS) for the utility and environmental analyses. The NEMS model simulates the energy sector of the U.S. economy. EIA uses NEMS to prepare its *Annual Energy Outlook,* a widely known energy forecast for the United States. The version of NEMS used for appliance standards analysis is called NEMS–BT,[16] and is based on the *AEO* version with minor modifications.[17] NEMS–BT offers a sophisticated picture of the effect of standards because it accounts for the interactions between the various energy supply and demand sectors and the economy as a whole.

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 TSD for further detail.

1. Products Included in This Rulemaking

This section addresses the scope of coverage for today's proposal, stating which products would be subject to new or amended standards. The numerous comments DOE received on the scope of today's proposal are also summarized and addressed in this section.

a. External Power Supplies

The term ''external power supply'' refers to an external power supply circuit that is used to convert household electric current into DC current or lower-voltage AC current to operate a consumer product. (42 U.S.C. 6291(36)(A)) EPCA, as amended by EISA 2007, also prescribes the criteria for a subcategory of EPSs—those classified as Class A EPSs (or in context, ''Class A''). A Class A EPS is a device that:

1. Is designed to convert line voltage AC input into lower voltage AC or DC output;
2. is able to convert to only one AC or DC output voltage at a time;
3. is sold with, or intended to be used with, a separate end-use product that constitutes the primary load;
4. is contained in a separate physical enclosure from the end-use product;
5. is connected to the end-use product via a removable or hard-wired male/female electrical connection, cable, cord, or other wiring; and
6. has nameplate output power that is less than or equal to 250 watts.

See 42 U.S.C. 6291(36)(C)(i).

The Class A definition excludes any device that either (a) requires Federal Food and Drug Administration listing and approval as a medical device in accordance with section 513 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360c) or (b) powers the charger of a detachable battery pack or charges the battery of a product that is fully or primarily motor operated. See 42 U.S.C. 6291(36)(C)(ii).

Based on DOE's examination of product information, all EPSs appear to share four of the six criteria under the Class A definition in that all are:

- Designed to convert line voltage AC input into lower voltage AC or DC output;
- Sold with, or intended to be used with, a separate end-use product that constitutes the primary load;
- Contained in a separate physical enclosure from the end-use product; and
- Connected to the end-use product via a removable or hard-wired male/female electrical connection, cable, cord, or other wiring.

DOE refers to an EPS that falls outside of Class A as a non-Class A EPS (or, in context, ''non-Class A''). Examples of such devices include EPSs that can convert power to more than one output voltage at a time (multiple voltage), EPSs that have nameplate output power exceeding 250 watts (high-power), EPSs used to power medical devices, and EPSs that provide power to the battery chargers of *m*otorized *a*pplications and *d*etachable *b*attery packs (MADB). After examining the potential for energy savings that could result from standards for non-Class A devices, DOE concluded that standards for these devices would be likely to result in significant energy savings and be technologically feasible and economically justified. 75 FR 27170 (May 14, 2010). Thus, DOE is examining the possibility of setting standards for all types of EPSs within the scope of today's notice.

In the preliminary analysis, DOE treated only those wall adapters that lacked charge control as EPSs; those with charge control were not considered to be EPSs. (Charge control relates to regulating the amount of current being delivered to a battery.) Under that approach, a given wall adapter without charge control capability could be considered both as an EPS and as a part of a battery charger. If that approach were adopted, such a wall adapter would be subject to whatever EPS standard that DOE may set and would also, indirectly, help the battery charger of which it is a part to meet whatever battery charger standard that DOE may set. In essence, the EPS would need to satisfy a prescribed level of efficiency, which could create certain design restrictions on manufacturers seeking to optimize the overall efficiency of the battery charger.

In the following paragraphs, DOE summarizes and addresses the comments it received on (1) whether to

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[16] BT stands for DOE's Building Technologies Program.

[17] The EIA allows the use of the name ''NEMS'' to describe only an *AEO* version of the model without any modification to code or data. Because the present analysis entails some minor code modifications and runs the model under various policy scenarios that deviate from *AEO* assumptions, the name ''NEMS–BT'' refers to the model as used here. For more information on NEMS, refer to *The National Energy Modeling System: An Overview,* DOE/EIA–0581 (98) (Feb.1998), available at: *http://tonto.eia.doe.gov/FTPROOT/forecasting/058198.pdf.*

set EPS standards for wall adapters that are part of battery chargers, (2) whether the absence of charge control circuitry should be the basis for regulating such wall adapters, and (3) if so, appropriate methods for determining whether a given wall adapter contains charge control. DOE received a few comments urging DOE to regulate these types of EPSs—which are part of a battery charger system—as part of the overall battery charger and also as an EPS to help ensure that whatever EPS is used in such a charger system meets a minimum level of efficiency. Several other parties, however, objected to requiring that these EPSs also meet separate EPS standards. Comments focused mainly on MADB EPSs, but some pertained to EPSs generally. In response to these comments, DOE is proposing a new approach, namely, to evaluate whether an EPS can directly operate an end-use consumer product and to create a new product class for those EPSs that cannot directly operate an end-use consumer product. DOE is considering this approach in light of the substantial resistance by the industry to the initial approach presented during the preliminary analysis phase.

Energy efficiency advocates favored requiring certain EPSs that are part of battery chargers to also meet separate EPS standards—in particular, for those EPSs that do not perform charge control functions. PG&E, et al. expressed their strong support for this approach and cited research showing that improving the efficiency of a power supply helps improve the efficiency of a battery charger. In addition, PG&E commented that a single EPS definition (rather than one for Class A and another for non-Class A) would reduce the complexity of compliance and enforcement as well as the potential for loopholes. (PG&E, et al., No. 47 at p. 3–4) NEEP also expressed its support for this approach and added that DOE's initial research shows that there are a limited number of cases where EPSs would be regulated under both standards. (NEEP, No. 49 at pp. 1–2) The California IOUs and PG&E, et al. expressed their support for using the ENERGY STAR EPS definition to determine whether a wall adapter is an EPS. (California IOUs, No. 43 at p. 9; PG&E, *et al.,* No. 47 at p. 4)

AHAM, PTI, and Wahl Clipper agreed with DOE and the efficiency advocates that MADB wall adapters should be regulated, but not under multiple efficiency requirements. Instead, they urged DOE to regulate these items as battery charger components but not as EPSs. (AHAM, No. 42 at pp. 2, 3, 13; PTI, No. 45 at p. 4; Wahl, No. 53 at p. 1) PTI argued that a MADB wall adapter cannot be an EPS because it is not used ''to operate a consumer product.'' According to PTI, a MADB wall adapter operates a battery charger, but a battery charger is not a consumer product because battery chargers are not themselves ''distributed in commerce for personal use or consumption by individuals.'' Thus, in its view, MADB wall adapters are not EPSs. (PTI, No. 45 at pp. 3–4; Pub. Mtg. Tr., No. 57 at p. 74) AHAM argued that subjecting a product to multiple energy efficiency requirements (1) ''makes no sense,'' (2) could cause manufacturers to be in ''constant redesign mode'' if EPS and battery charger standards change at different times, and (3) would be an undue burden. (AHAM, No. 42 at pp. 4–5) AHAM contended further that the EPS active mode test is inappropriate and inaccurate for MADB wall adapters, as they are never used in the manner tested under that procedure. Consequently, in AHAM's view, requiring that these types of wall adapters be tested under the EPS test procedure would not enable DOE to meet its obligation to test products in a manner representative of their actual use. (AHAM, No. 42 at p. 6) Wahl Clipper echoed AHAM's concerns that the EPS test procedure is inappropriate for MADB wall adapters and noted that unsynchronized battery charger and EPS standards would force manufacturers to constantly redesign their products. Wahl Clipper added that manufacturers ''do not know if future standards levels will make it impossible to meet both regulations at the same time since there is no correlation between the two regulations.'' (Wahl, No. 53 at p. 1)

Others had similar concerns about setting standards for Class A devices that are part of battery chargers. CEA, Cobra Electronics, and Motorola objected to regulating any wall adapter as both an EPS and a component of a battery charger. These parties drew attention to the burden that multiple energy efficiency requirements would impose on manufacturers—small businesses in particular. CEA commented that its ''foremost concern is DOE's contemplation of a 'double jeopardy' regulatory situation whereby a single charging device would be subject to two different test procedures and two different sets of regulatory requirements,'' and added that such a situation would be ''unreasonable and unnecessary—and would be particularly onerous for small businesses.'' (CEA, No. 46 at pp. 1–2) Cobra Electronics, which markets and sells two-way radios and mobile navigation devices, commented that ''having to be regulated under two standards for a product which is infrequently used is an unreasonable burden for small companies when added to the burden of other recent regulations.'' (Cobra, No. 51 at p. 1) Motorola also agreed with CEA that the energy efficiency of EPSs should not be regulated in two different product categories (battery chargers and EPSs) and added that ''given the likely high performance standards that will be set for battery chargers, it would be nearly impossible for an external power supply to comprise part of a [standards-compliant] battery charger if it were not itself highly efficient.'' (Motorola, No. 48 at pp. 1–2)

AHAM also asserted that DOE risks overestimating energy savings if it does not determine how to remove the overlap between battery charger and EPS energy savings. AHAM emphasized the importance of accurately quantifying the extent to which energy savings from battery charger and EPS standards might overlap so that DOE can accurately project the potential energy savings from potential standards. (AHAM, Pub. Mtg. Tr., No. 57 at p. 112)

After carefully considering all of these comments, DOE has tentatively decided to adopt a broad scope and to propose an approach in which EPS standards could apply to all devices that meet the EPS definition prescribed by EPCA. See 42 U.S.C. 6291(36)(A). Those standards prescribed by Congress, namely, those for Class A devices, will remain in effect, and DOE, despite the objections raised by CEA and others, has no authority to remove these standards, although these standards could be amended to increase their stringency. With regard to non-Class A EPSs that are components of battery chargers, DOE has the option to propose new efficiency standards for these devices, including those devices that perform charge control functions.

To help it ascertain whether a given wall adapter performs charge control functions, DOE sought comment during the preliminary analysis phase on seven methods it presented to determine whether charge control is present in a wall adapter. See Preliminary TSD, appendix 3–C (detailing the methods DOE considered for determining whether a wall adapter contains charge control). In the preliminary analysis, DOE used a method it called ''Energy Star Inspection,'' which is based on parts (f) and (g) of the ENERGY STAR program's definition of an EPS. (''ENERGY STAR Program Requirements for Single Voltage External Ac-Dc and Ac-Ac Power Supplies, Eligibility Criteria (Version

2.0)'' [18]) This method considers certain easily observable physical characteristics of the wall adapter. Under this approach, a wall adapter that meets either of the following two criteria would be exempt from having to satisfy separate EPS standards and would instead be treated simply as a battery charger component: (1) The wall adapter has batteries or battery packs that physically attach directly (including those that are removable) to the power supply unit; or (2) the wall adapter has a battery chemistry or type selector switch AND an indicator light or state of charge meter.

As noted above, DOE received comments from the California IOUs and PG&E that supported using this method. PTI contended that DOE neglected to include MADB wall adapters in its preliminary assessment of the seven methods and requested that DOE include these products in any future analysis of possible charge control criteria. (PTI, No. 45 at p. 4) AHAM viewed the presence of charge control in a wall adapter as irrelevant. In its view, DOE should ask whether a given wall adapter is a MADB device, as all MADB wall adapters should be excluded from any EPS standards. (AHAM, No. 42 at p. 12) DOE received no other comments on the appropriateness of the Energy Star Inspection method or any of the six other methods it considered for identifying charge control in wall adapters.

At this time, DOE does not believe that such an exclusion from the EPS scope of coverage is warranted. It is DOE's understanding that most, if not all, of the MADB wall adapters that DOE proposes to add to the EPS scope of coverage are already subject to, and satisfy, the EPS standards currently in place in California. The California standard applies the same efficiency level that already applies to Class A EPSs nationwide. See California Energy Commission, ''2009 Appliance Efficiency Regulations,'' August 2009, CEC–400–2009–013, Table U–1 on p. 134. This efficiency level is referred to as Level IV in the International Efficiency Marking Protocol for External Power Supplies.[19] Comments from manufacturers and the California IOUs also support this finding. (California IOUs, No. 43 at p. 9) DOE is not aware of any products powered by battery chargers and EPSs that are not designed, manufactured, and packaged for distribution throughout the country.

It is DOE's understanding that products that use EPSs are designed, manufactured and packaged for distribution throughout the United States. Assuming that this understanding is correct, that fact indicates it is highly unlikely that manufacturers are producing one set of products for California and another set for the remaining states.

Notably, California's EPS standards apply only to devices that meet the ENERGY STAR definition of an EPS,[20] but do not meet the Class A definition established by EISA 2007. (California Energy Commission, ''2009 Appliance Efficiency Regulations,'' August 2009, CEC–400–2009–013) This situation stems in large part from California's adoption of the ENERGY STAR definition of an EPS when it first established energy conservation standards for these devices. Once Congress subsequently established standards for Class A EPSs, these Class A devices were removed from the scope of the California standards, leaving behind a set of devices California now refers to as ''state-regulated EPSs.'' As a result, these state-regulated EPSs are those devices that meet the ENERGY STAR definition of an EPS but do not fall under the Class A definition—specifically medical and MADB EPSs. (Multiple-voltage and high-power EPSs do not meet the ENERGY STAR definition but satisfy the Federal definition of an EPS.)

Due to differences between the ENERGY STAR and Federal statutory definitions of an EPS, there could be MADB devices that meet the Federal statutory definition that are not state-regulated. For example, a MADB EPS that has a battery type selector switch and an indicator light, and thus does not meet the ENERGY STAR definition of an EPS, would not be covered either by the current Federal or California standards. However, as a practical matter, DOE has not identified any MADB products that meet the Federal statutory definition of an EPS but do not also meet the ENERGY STAR definition. Thus, DOE is unaware of any MADB products that are not already subject to California energy efficiency standards that are within the EPS scope of coverage being contemplated today. DOE seeks comment on the accuracy of this belief and specific examples of such products, if they exist.

As noted above, some parties commented that requiring wall adapters that are part of battery chargers to be tested according to the EPS test procedure would impose an undue burden on manufacturers and would be inappropriate and result in inaccurate projections of estimated energy savings. In response to these comments, DOE notes that Congress prescribed the definitions of what constitutes an EPS. It did not provide for any exceptions that would exclude those EPSs that are components of another product. Given this situation, DOE must assume that Congress was aware of the fact that some battery chargers use EPSs and that it structured these statutory provisions to allow for the possibility that all EPSs would be required to meet some minimum level of efficiency that would also improve the efficiency of those products that used these more efficient devices.

As to how to measure the energy performance of these devices, DOE believes that these wall adapters can be evaluated using the existing EPS test procedure. See 10 CFR part 430, subpart B, appendix Z (detailing the procedure to follow when measuring the energy consumption of an EPS). In fact, this test procedure already is used to demonstrate compliance with existing Federal standards, in the case of Class A EPSs, and California standards, in the case of most MADB EPSs.[21] The test procedure is designed to assess the energy performance of an EPS while in active mode by measuring its active-mode efficiency at 25, 50, 75, and 100 percent of nameplate output current and then computing the simple arithmetic average of these four values. DOE believes that this test procedure yields a meaningful and representative measure of an EPS's active-mode efficiency because, along with the no-load mode power measurement, it

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[18] *http://www.energystar.gov/ia/partners/product_specs/program_reqs/eps_prog_req.pdf.*

[19] U.S. EPA, ''International Efficiency Marking Protocol for External Power Supplies,'' October 2008, available at Docket No. 62.

[20] For the purposes of EPA's ENERGY STAR specification, an external power supply: (a) Is designed to convert line voltage ac input into lower voltage ac or dc output; (b) is able to convert to only one output voltage at a time; (c) is sold with, or intended to be used with, a separate end-use product that constitutes the primary load; (d) is contained in a separate physical enclosure1 from the end-use product; (e) is connected to the end-use product via a removable or hard-wired male/female electrical connection, cable, cord or other wiring; (f) does not have batteries or battery packs that physically attach directly (including those that are removable) to the power supply unit; (g) does not have a battery chemistry or type selector switch AND an indicator light or state of charge meter (*e.g.,* a product with a type selector switch AND a state of charge meter is excluded from this specification; a product with only an indicator light is still covered by this specification); and (h) has nameplate output power less than or equal to 250 watts. (See *http://www.energystar.gov/ia/partners/product_specs/program_reqs/eps_prog_req.pdf.*)

[21] California has adopted the Federal EPS test procedure as part of its regulatory requirements. (California Code of Regulations, Title 20, Section 1604).

covers the full range of outputs the device may be called on to provide in the field. This is true of EPSs that are not part of battery chargers as well as those that are. Thus, the EPS test procedure is appropriately applied to all EPSs, including those that are part of battery chargers.

Regarding PTI's argument that MADB wall adapters cannot, by definition, be EPSs because they operate battery chargers (which, in its view, are not consumer products), DOE disagrees. First, a battery charger is a consumer product by virtue of its inclusion by Congress under Part A of EPCA, 42 U.S.C. 6291(32), which addresses the regulation of consumer products. A consumer product is 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. See 42 U.S.C. 6291(1). The fact that a battery charger is a device that charges batteries for consumer products does not imply that chargers are not themselves consumer products, particularly since the definition contemplates the inclusion of those devices ''in other consumer products, '' which indicates that Congress viewed battery chargers as a separate, and individual, consumer product.

Second, EPSs are also consumer products for similar reasons.

Third, a MADB wall adapter satisfies the EPS definition since it ''convert[s] household electric current * * * *to operate a consumer product.''* See 42 U.S.C. 6291(36)(A) (emphasis added). Whether the MADB wall adapter is considered to operate a battery charger, which is a consumer product, or is considered to enable the end-use consumer product to operate (by supplying energy to the battery, which in turn operates the end-use product), a MADB wall adapter falls squarely within the EPS definition because it is taking household electric current to operate a consumer product. Accordingly, in DOE's view, MADB wall adapters are EPSs.

However, in view of the concerns raised by industry commenters, DOE believes there may be merit in distinguishing between a direct operation EPS and an indirect operation EPS. In particular, some EPSs are able to directly power an end-use consumer product (e.g., a wireless Internet router), while others cannot. This distinction may be necessary because DOE believes that less stringent EPS standards may be appropriate for indirect operation EPSs, which cannot directly operate an end-use consumer product. As explained later, DOE is proposing a means to differentiate between these two types of EPSs and to set different efficiency standards for them. DOE's proposed approach to regulating these products is described in more detail in sections IV.A.3 and V.C below.

DOE notes that while Congress amended EPCA to exempt certain EPSs used in security and life safety alarms and surveillance systems from the no-load mode power requirements that apply generally to Class A EPSs manufactured prior to July 1, 2017, see Public Law 111–360 (Jan. 4, 2011), such systems would be subject to the proposed active mode standards under consideration in this NOPR. See 42 U.S.C. 6295(u)(3)(E)(ii) (exempting security and life safety alarms and surveillance systems solely from no-load requirements).

DOE further notes that it has recently identified an important emerging EPS application: solid-state lighting (SSL). SSL technology is used in both the residential and commercial sectors for desk lamps, under-cabinet lighting, accent lighting, and many other purposes. Most of the SSL luminaires (fixtures) DOE has identified have integral power supplies, but some use power supplies that appear to meet the EPS definition. Some of these EPSs plug into an outlet, while others are hard wired into the electrical system. DOE has not yet identified any relevant technical differences between these EPSs and those for laptops, cell phones, and other electronic equipment that it has analyzed in detail as part of today's notice. DOE did not include SSL technology in its NOPR analysis because so few SSL products with EPSs were sold in 2009, the base year for shipments. However, because of the rapid proliferation of these products, DOE may consider revising its analysis to include SSL products in determining the final standards for EPSs. DOE invites comment on SSL EPSs, specifically on whether there are any differences between SSL EPSs and other EPSs that might warrant treating them as a separate product class.

b. Battery Chargers

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)) All devices that meet this definition are within the scope of this rulemaking.

Like EPSs, battery chargers are used in conjunction with other end-use consumer products, such as cell phones and digital cameras. However, unlike EPSs, the battery charger definition prescribed by Congress is not limited solely to products powered from AC mains, i.e., those products that are plugged into a wall outlet. Further, battery chargers may be wholly embedded in another consumer product, wholly separate from another consumer product, or partially inside and partially outside another consumer product.

The California IOUs commented that they ''agree with DOE's wide-reaching consumer battery charger scope proposed in the preliminary [TSD],'' as they believe ''it will ultimately enable DOE to identify more cost-effective savings opportunities.'' (California IOUs, No. 43 at p. 2) Several other parties requested that DOE exclude golf car chargers and in-vehicle chargers from potential battery charger regulations.

Lester argued that ''golf cars do not meet the definition of a consumer product'' because they are primarily purchased by businesses rather than individuals, adding that the leading golf car manufacturer in the United States sells the vast majority of its golf cars to businesses rather than individuals—specifically 96 percent in 2009 and 97.5 percent in 2010. (Lester, No. 50 at p. 1)

As indicated above, the statutory definition of ''consumer product'' is a broad one. The extent of that breadth indicates that Congress had contemplated that this definition would encompass a wide variety of products. DOE's research indicates that approximately 10.6 percent of all new battery-powered golf cars sold each year in the United States are sold to individuals.[22] While DOE has no reason to question Lester's claim that the leading golf car manufacturer sells almost all of its golf cars to businesses, there are clearly manufacturers that sell a significant number of golf cars to individuals. Further, there is no identifiable difference between battery chargers for golf cars sold to individuals and those for golf cars sold to golf courses and other businesses. Thus, DOE continues to believe that golf cars are a type of consumer product. The distinction between consumer products and industrial equipment has been previously addressed by DOE. See *http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/cce_faq.pdf.*

Lester also commented that in certain industrial applications the benefits of less energy-efficient, transformer-based

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[22] International Market Solutions, *Golf Car-Type Vehicles and the Emerging Market for Small, Task-Oriented Vehicles in the United States; Trends 2000–2006, Forecasts to 2012,* December 2007. For more information about this report or to purchase a copy, email *icaworld@optonline.net.*

battery chargers outweigh those of more energy-efficient, switch mode battery chargers and that business managers are skilled in making the proper choice of battery charger based on a consideration of all the relevant factors. (Lester, No. 50 at pp. 2–3) In this context, Lester argued that businesses that purchase golf cars should be allowed to make their own decisions regarding the energy performance of the battery chargers they purchase, implying that there is no need for energy conservation standards for this product.

DOE notes that, in general, the energy conservation standards that it sets must satisfy a series of criteria. See generally 42 U.S.C. 6295(o). Among these criteria is the need to ensure the continued utility of the regulated product. Consistent with this requirement, DOE will take this factor into account when setting standards for battery chargers.

CEA commented that because in-vehicle chargers do not consume energy from the utility grid, they should not be covered by DOE. (CEA, No. 46 at p. 3) Motorola made similar statements and concluded that electronics that do not connect to the utility grid should be excluded from coverage. Motorola added that since DOE could not demonstrate cost savings associated with the potential efficiency standards that were under consideration for these products, these devices should not be regulated. (Motorola, No. 48 at pp. 2, 3) Cobra also expressed concerns over this product class and stated that quantifying the effect of battery chargers that obtain energy from 12V car batteries seems inaccurate and urged DOE to drop this product class from consideration. Cobra added that it was too difficult to accurately assess the economic impact of standards on 12V in-vehicle chargers because of difficulties inherent in accurately estimating gasoline savings. (Cobra, No. 51 at p. 3)

DOE is aware that consumer products ''designed solely for use in recreational vehicles and other mobile equipment'' are, by law, specifically excluded from coverage as consumer products. (42 U.S.C. 6292) Thus, a battery charger designed solely for use in recreational vehicles (RVs) and other mobile equipment would not be subject to battery charger standards. DOE has identified several consumer products—most prominently portable GPS navigators—that are commonly sold with 12V power adapters. However, DOE is not aware of any battery-operated consumer products that operate within a vehicle that cannot also be charged by alternate means, specifically from a 5V USB power source or from mains through a wall adapter. (For example, a GPS device may be plugged into a home computer via a USB port to receive power and to download data updates to the device's memory.) In other words, these products are not designed solely for use in recreational vehicles and other mobile equipment. DOE seeks comment on whether any products exist that can only be operated on 12V. DOE also seeks comment on whether a device that can be powered only from a 12V power outlet can be assumed to be designed solely for use in recreational vehicles (RVs) and other mobile equipment, or whether other 12V power sources exist that could power battery chargers. Lastly, DOE seeks comment on whether there are battery chargers with DC inputs other than 5V and 12V.

DOE also considered whether the above exclusion also applies to battery chargers that charge mobile equipment such as golf cars, wheelchairs, and electric scooters. DOE has preliminarily determined that this exclusion does not apply to those types of battery chargers, for two reasons. First, the statute, by specifying that a device be ''designed solely for use in'' a recreational vehicle or mobile equipment, appears to exclude only those devices that *obtain power from* recreational vehicles and other mobile equipment, not those that *provide power to* recreational vehicles and other mobile equipment. For example, a refrigerator designed solely for use in an RV obtains its power from the RV and, thus, is not a covered product, whereas a battery charger that is designed solely to charge the batteries of an electric bicycle obtains its power from another power source external to the bicycle (e.g., AC mains) and, thus, is a covered product. Second, EPCA excludes from coverage those consumer products ''designed solely for use *in* recreational vehicles and other mobile equipment.'' DOE has found that many battery chargers that charge mobile equipment are not contained entirely within that equipment, but rather operate only partly within, or entirely outside of, that equipment. (Examples of such chargers include those for many wheelchairs and lawn mowers.) In DOE's view, such a device is not operated solely *in* the mobile equipment and, thus, is not excluded from coverage. DOE welcomes comment on whether its understanding of how these devices operate is accurate.

As to the general concern regarding the calculation of potential benefits and savings from standards for in-vehicle chargers, DOE notes that it is no longer considering these savings in order to avoid any potential conflict with the exclusions set out in EPCA.

c. Wireless Power

The Wireless Power Consortium (WPC), which represents companies engaged in the emerging technology of wireless transfer of energy to both power and charge consumer products, commented that it does not believe that a ''wireless power transducer is either an EPS or a battery charger'' and recommended that a new category of inductive power supply be introduced for power supplies having inductive output. WPC explained that it is possible for the various components needed for these products, such as the transmitter transducers and receiver transducers, to be manufactured by different companies and sold separately. WPC further noted that it has not yet been determined how to address the independence of transmitter and receiver transducers in regards to overall system efficiency. As a result, ''requirements for efficiency should be deferred until the technology is better understood and methods for accurately measuring the efficiency are developed.'' (WPC, No. 42 at p. 2) Similarly, CEA requested that DOE categorize wireless power systems independently of battery chargers or EPSs to avoid regulatory mandates that could harm innovation in the emerging area of wireless power. CEA cited the technology's ability to charge or interact with multiple devices for multiple purposes simultaneously and to provide real-time power to appliances without batteries at a variety of power levels and transmitting efficiencies. (CEA, No. 46 at pp. 2–3) Philips, in reference to wireless power, expressed concern that DOE ''might inadvertently take regulatory action that could have the unintended effect of stifling this new technology.'' (Philips, No. 41 at p. 3).

DOE has observed that a number of new products have entered the marketplace in recent years that use wireless power technology in order to charge small consumer electronics products such as digital music players and mobile phones. Some of these products transfer power using induction while others use conduction or a galvanic (*i.e.,* current-carrying) connection. Products are also sold in a variety of different configurations, as noted in WPC's comment, with some transmitters and receivers sold separately, while others are sold together as a system.

There are a number of different types of products under the broad umbrella of ''wireless power,'' including both battery chargers and EPSs. DOE analyzed one type, namely inductive battery chargers for wet environments (product class 1), and is proposing standards for these products today. In the preliminary analysis, DOE did not differentiate any other wireless power battery chargers from their conventional wired counterparts. DOE continues to believe that wireless power products that meet the definition of a battery charger, whether inductive or galvanic, are covered products.

However, DOE also agrees with CEA that the ability to charge multiple devices simultaneously and wirelessly offers a unique utility to consumers that could adversely and inadvertently be affected by standards. Because of this fact, and the immaturity of the technology, which collectively explain the absence of energy efficiency performance data on these products, DOE is not proposing standards for these types of products. Instead, DOE is proposing to create a separate product class for these products and to defer analysis of these products to a later standards rulemaking. Therefore, in today's rulemaking, DOE has reserved a section in the CFR for an 11th battery charger product class for products that use wireless power, in a dry environment, to charge consumer products.

With regard to the applicability of EPS standards to wireless power products, DOE reiterates that, by definition, an EPS ''is used to convert household electric current into DC current or lower-voltage AC current to operate a consumer product.'' (42 U.S.C. 6291(36)(A)) Some wireless power transmitter pads are sold by themselves and, thus, are consumer products in their own right. Other wireless power transmitter pads are sold along with a power receiver. Such a product constitutes a battery charger or a large portion of a battery charger, which also is a consumer product. Hence, in both cases, a wall adapter that provides power to the wireless power transmitter pad is an EPS.

d. Unique Products

Through additional market study of battery chargers and external power supplies since the preliminary analysis, DOE has found certain ''unique'' products that exhibit characteristics spanning several of the proposed BCEPS product classes, which make them difficult to classify within the scope of this rulemaking. These products possess traits inherent to both battery chargers and external power supplies and/or were designed for multiple simultaneous end-use consumer applications. In one example, a product DOE examined supplied power to an answering machine equipped with two charging stations for a wireless headset and a cordless handset. The power converter itself provided two separate outputs at the same nameplate output voltage, but with different current limits on each. One output was dedicated to charging the wireless headset and one output was used to power the answering machine and charge the cordless handset. Under the definitions DOE has used to classify battery chargers and EPSs to this point, this product could be considered a multiple-voltage EPS, a multi-port battery charger, or even a distinct single-voltage EPS and a battery charger depending on how the terms are applied.

DOE has invested considerable effort in properly analyzing the design tendencies of battery chargers and EPSs and believes that the vast majority of these products can be classified under the definitions of this proposed rule. DOE also believes that manufacturers, who are most familiar with how their products function and their intended use, should be able to appropriately determine what type of product they are selling and therefore which standard is appropriate based on DOE's proposed definitions. DOE requests any interested party information regarding products that may seem to fall into multiple product classes.

2. Market Assessment

a. Market Survey

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

DOE began the development of the preliminary analysis by analyzing online and brick-and-mortar retail outlets to determine which applications use battery chargers and EPSs and which battery charger and EPS technologies are most prevalent. Because the market for battery charger and EPS applications continues evolving, DOE updated the market survey to identify new applications and determine whether any relevant attributes of existing applications had changed significantly between the preliminary analysis and NOPR phases of the rulemaking.

In order to more accurately characterize the market for battery chargers and EPSs, DOE analyzed the following new applications: Media tablets, mobile Internet hotspots, smartphones, and wireless charging stations. To simplify the analysis, DOE removed external media drives, radio-controlled cars (hobby grade), and electronic pest repellents, all of which had low or unsupported shipments estimates. Battery chargers and EPSs for such applications and any other applications not explicitly analyzed in the market assessment would still be subject to the standards proposed in today's notice as long as they meet the definition of a covered product outlined in sections A.1.a and A.1.b, above. DOE also combined Wi-Fi access points with LAN equipment and merged weed trimmers and hedge trimmers into a single application (rechargeable garden care products). Finally, DOE identified EPS applications that now also commonly contain rechargeable batteries and use battery chargers, including LAN equipment and video game consoles. Chapter 3 of the TSD discusses all of these market assessment updates in further detail.

As noted in section IV.A.1.a above, DOE is considering including EPSs for SSL luminaires when it updates its analysis prior to issuing a final rule. DOE welcomes comment on the size of the market for these products, what proportion of SSL luminaires use EPSs, the efficiency of those EPSs, and usage patterns.

The California IOUs suggested that DOE consider two additional products for inclusion in battery charger product class 10 (AC output): emergency uninterruptible power supplies (UPSs) for cordless phones and emergency backup for security systems. (California IOUs, No. 43 at p. 7) Battery charger product class 10 is reserved for products that output AC power from the battery. UPSs were the only applications that met this criterion. Due to the small number of UPSs for cordless phones shipped annually, DOE did not include this application in its quantitative analysis for product class 10, despite its inclusion in this class. DOE recognizes that many home security systems contain rechargeable emergency backup batteries; however, because those backup batteries output DC power in order to operate the electronics in the security system, DOE placed these chargers in product class 2. Although DOE recognizes that there are battery charger and EPS applications that it did not analyze, it tentatively believes that it has included within its analysis all major applications and, thus, has accurately characterized battery charger and EPS energy consumption and savings potential for each product class.

b. Non-Class A External Power Supplies

In addition, DOE expanded its analysis of applications that use non-Class A EPSs, including multiple-voltage and high-power EPSs, those EPSs that are used with medical devices, and EPSs used with (1) motor-operated battery charger applications and (2) the chargers of detachable batteries (i.e. collectively, MADB devices). In the preliminary analysis, DOE relied upon market information it had collected prior to publishing the notice of proposed determination for non-Class A EPSs in November 2009. Because updated information was available following the preliminary analysis, DOE revisited non-Class A EPSs while conducting its NOPR-phase market survey.

DOE found that multiple-voltage EPSs are used in fewer applications today than they were at the time of the first survey. Specifically, DOE removed inkjet imaging equipment from the multiple-voltage EPS product class, leaving the Xbox 360 (a video game console) as the only application for these devices.

DOE also reclassified medical EPSs based on the power requirements stated on retailer Web sites and updated lifetime and shipments estimates for medical devices. Philips commented that medical devices are expected to last longer than other consumer products and suggested using expected lifetimes of six to ten years for these products. (Philips, No. 41 at pp. 2–3) In the preliminary analysis, DOE estimated the product lifetimes for all medical devices analyzed to be greater than six years based on input from medical EPS manufacturers. Philips' comment, combined with independent market research, helped DOE to confirm its preliminary estimates for the NOPR. All of DOE's shipment and lifetime assumptions are documented in the market workbook that accompanies chapter 3 of the TSD.

c. Application Shipments

DOE relied on published market research to estimate base-year shipments for all applications. The base-year was changed from 2008 to 2009 for the NOPR, and application shipments were updated wherever supporting data were available. DOE estimated that in 2009 a total of 345 million EPSs and 437 million battery chargers shipped for final sale in the United States. Philips commented that DOE understated the shipments estimate for products in battery charger product class 1—inductive chargers for use in wet environments. In the preliminary analysis DOE assumed annual shipments of 5.35 million units, but Philips recommended using an estimate that is ''closer to 15 million'' units. (Philips, No. 41 at p. 2) Philips later explained how it derived this estimate from proprietary market data and its knowledge of the toothbrush market. In the NOPR-stage analysis, DOE used the shipments estimate recommended by Philips.

One significant update to the market assessment methodology was to estimate the proportion of battery chargers and EPSs used exclusively in the commercial sector. Commercial users pay commercial electricity rates, which are lower than residential electricity rates, and, therefore, the cost savings they would enjoy from an energy conservation standard would be lower. DOE identified applications that were likely to be used in office buildings, restaurants, or commercial construction sites, for example, in order to more accurately estimate energy cost savings in the life-cycle cost (LCC) analysis and national impact analysis. Data on commercial shipments were not readily available for most applications; therefore, DOE assumed similar commercial market shares among similar office and telecommunications applications. In the case of power tools, DOE assumed that commercial and residential spaces have similar repair and maintenance needs and, thus, used the ratio of commercial to residential floor space in the United States as a proxy for each sector's share of total power tool shipments. DOE seeks comment on which battery charger and EPS applications are used in the commercial sector, what fraction of shipments are to the commercial sector, and how product lifetimes and usage may differ between residential and commercial settings. (See Issue 2 under ''Issues on Which DOE Seeks Comment'' in section VII.E of this notice.) See chapter 3 of the TSD for more information on DOE's commercial sector market share estimates.

d. Efficiency Distributions

In the preliminary analysis, DOE estimated separate base-case market efficiency distributions for each battery charger product class and a single efficiency distribution for all Class A EPSs analyzed in the LCC and national impact analyses. AHAM commented that there are currently more EPSs in the market with efficiencies at levels higher than the EISA standard than what DOE estimated in the preliminary analysis; however, AHAM did not provide any specific data to support its claim. (AHAM, Pub. Mtg. Tr., No. 57 at p. 121) On the other hand, Cobra Electronics commented that most manufacturers of lower cost products use linear EPSs that just meet the current Federal standard rather than more efficient switch mode power supplies because of the higher costs involved with using that more efficient technology. (Cobra, No. 51 at p. 3) DOE incorporated these stakeholder comments into its updated efficiency distribution estimates but largely relied upon product testing and other market research to estimate base-case efficiency distributions. Further detail is contained in TSD chapter 3 and the accompanying analytical spreadsheet models.

In preparing today's NOPR, DOE revised its methodology for calculating efficiency distributions from test data. Instead of weighting results for each individual tested unit based on the shipments of the associated application, DOE gave equal weight to the results for each unit. For battery chargers and EPSs, DOE compared each test result to the proposed compliance curves for each candidate standard level (CSL). DOE then divided the number of units at a given CSL by the total number of tested units to estimate the percentage of units in the market. For select applications, DOE adjusted these distributions to reflect additional data or other market research about these applications. For EPSs, DOE also calculated the distribution of tested units within the ranges of nameplate output power corresponding to the representative units of analysis. Finally, DOE continued to calculate the distribution of tested units within each battery charger product class. DOE assigned an efficiency distribution profile to each EPS and battery charger application based on application-specific data where possible. For applications that DOE did not test, DOE relied on product class (for battery chargers) or representative unit (for EPSs) distributions for use in the energy use analysis and LCC analysis. DOE calculated a shipment-weighted average efficiency distribution for each product class for use in the national impact analysis. For more detail, see sections IV.E, IV.F, and IV.G below, which discuss the energy use, life-cycle cost, and national impact analyses, respectively.

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 justifies different standard levels, such as features affecting consumer utility. (42 U.S.C. 6295(q)) DOE then conducts its analysis and considers establishing or amending standards to provide separate standard levels for each product class.

At the preliminary analysis public meeting, DOE presented its rationale for creating 15 product classes for EPSs and 10 product classes for battery chargers. The product classes established for EPSs and battery chargers were 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. External Power Supply Product Classes

In the preliminary analysis, DOE raised the possibility of creating product classes based on nameplate output power and nameplate output voltage. This approach was based on the framework set by EISA 2007 and ENERGY STAR 2.0, which, collectively, grouped EPSs in this manner. DOE also divided EPS product classes based on whether a device met the Class A definition, its application type (motorized or medical), its output power, its output current type, its output voltages, and the battery type (detachable) of the associated application.

For Class A EPSs, the preliminary analysis divided these products into product classes A1, A2, A3, and A4 based on ENERGY STAR 2.0 criteria, which classify EPSs based on the type of power conversion (i.e., AC to DC or AC to AC) used and nameplate output voltage (i.e., low-voltage or basic-voltage). Each of these four product classes (A1–A4) from the preliminary analysis was created using these same criteria. The Class A EPS product classes were defined using the identical power conversion type and nameplate output voltage parameters as the ENERGY STAR program for EPSs.

Consistent with this initial approach, DOE is proposing to adopt the ENERGY STAR definition for low-voltage EPSs. DOE received no comments on these class structures when it first raised them during the preliminary analysis phase. As a result, DOE is proposing to adopt these class structures as part of today's proposal. Particularly, if a device has a nameplate output voltage of less than 6 volts and its nameplate output current is greater than or equal to 550 milliamps, DOE is proposing to classify that device as a low-voltage EPS. Additionally, a product that does not meet the criteria for being a low-voltage EPS would be classified as a basic-voltage EPS. DOE is also proposing definitions for AC to DC and AC to AC EPSs. If an EPS converts household electrical current to a lower voltage DC, DOE is proposing to classify that product as an AC to DC EPS. Similarly, DOE is proposing to classify a device that converts household electrical current to a lower voltage AC output as an AC to AC EPS.

DOE's preliminary analysis also explained how DOE was planning to organize non-Class A EPSs, which include medical, MADB, multiple-voltage, and high-power (nameplate output power >250 Watts) EPSs, into product classes. In the preliminary analysis, DOE created product classes M1, M2, M3, and M4 for medical EPSs and B1, B2, B3, and B4 for MADB EPSs. As with Class A EPSs, DOE considered four product classes for these two groups of devices based on combinations of power conversion type and voltage level. Additionally, for MADB products, DOE determined whether a wall adapter for a MADB application lacked charge control, as defined in appendix 3C of the preliminary TSD, and therefore was a MADB EPS. For multiple-voltage EPSs, DOE considered the creation of two product classes—X1 and X2—and for high-power EPSs, it considered only one, H1. In response to the preliminary analysis, DOE received comments on the product class definitions presented for MADB and multiple-voltage EPSs. The issues raised are discussed below.

Indirect Versus Direct Operation External Power Supplies

As noted in section IV.A.1, interested parties raised concerns with DOE's proposed approach in the preliminary analysis regarding MADB EPSs. Based on these comments, DOE revised its approach and is no longer using the charge control method it had considered using during the preliminary analysis. Instead, DOE is proposing a simpler approach, which would require a manufacturer to determine whether an EPS can only ''indirectly operate'' an application.

DOE is proposing to define an indirect operation EPS as an EPS that cannot power a consumer product (other than a battery charger) without the assistance of a battery. In other words, if an end-use product only functions when drawing power from a battery, the EPS associated with that product is classified as an indirect operation EPS. Because the EPS must first deliver power and charge the battery before the end-use product can function as intended, DOE considers this device an indirect operation EPS and has defined a separate product class, N, for all such devices. Conversely, if the battery's charge status does not impact the end-use product's ability to operate as intended and the end-use product can function using only power from the EPS, DOE is proposing to treat that wall adapter as a direct operation EPS.

DOE's initial approach for determining whether a given EPS has direct operation capability involved removing the battery from the application and attempting to operate the application using only power from the EPS. While this approach gave the most definitive EPS classifications, this procedure had the potential of creating complications during testing since it can frequently necessitate the removal of integral batteries prior to testing. The removal of such batteries can often require access to internal circuitry via sealed moldings capable of shattering and damaging the application.

DOE then developed a new method of testing to help minimize both the risk of damage to the application and the accompanying complexity associated with the removal of the internal batteries while ensuring testing accuracy. This approach would require product testers to determine whether an EPS can operate an end-use product once the associated battery has been fully discharged. Based on product testing results, DOE believes that direct operation EPSs will be able to power the application regardless of the state of the battery while indirect-operation EPSs will need to charge the battery before the application can be used as intended. Comparing the time required for an application to operate once power is applied during fully discharged and fully charged battery conditions would provide a reliable indication of whether a given EPS is an indirect or direct operation device. Recording the time for the application to reach its intended functionality is necessary because certain applications, such as smartphones, contain firmware that can delay the EPS from operating the end-use product as expected. If the application takes significantly longer to operate once the battery has been fully discharged, DOE would view this EPS as one that indirectly operates the end-use consumer product and classify it as part of product class N. Using this methodology, DOE was also able to evaluate a given product's EPS as it was intended to be used while limiting the burden of the test. The full procedure is detailed in Appendix 3C of the TSD and in the rule language section of today's notice.

Product class N that DOE is proposing in today's notice contains both Class A and non-Class A EPSs. DOE believes that these two groups of devices are technically equivalent, i.e., there is no difference in performance-related features between the two groups that would justify different standard levels for the two groups. (42 U.S.C. 6295(q)) Because of this technical equivalency, DOE grouped these EPSs into one product class for analysis. DOE seeks comment on whether there are any performance-related features characteristic of either Class A or non-Class A devices (but not both) in product class N that would help justify analyzing the two groups separately.

If a product is capable of directly operating its end-use consumer product, other characteristics must be examined to determine the appropriate product class. In its preliminary analysis, DOE separated product classes based on combinations of their power conversion type and voltage level. DOE is proposing to use these class definitions based on those combinations but with one change. As shown in Table IV–1, DOE used four product classes for each combination of power conversion type and voltage level in the preliminary analysis for Class A EPSs, MADB EPSs, and medical EPSs. DOE also considered applying the results of the Class A engineering analysis directly to medical and MADB EPSs, meaning there would be no difference in the cost-efficiency curves or the product class divisions for Class A, medical, or MADB EPSs. DOE believed this was a valid approach because the costs associated with improving the efficiency of a medical or MADB EPS were identical to those associated with the same improvements in a comparable Class A EPS as all three types are technically equivalent. Due to these similarities, DOE believed that Class A, medical, and MADB EPSs should be evaluated identically. Interested parties did not comment on this simplified approach after it was presented during the preliminary analysis public meeting.

Today's NOPR proposes eliminating the disaggregation of Class A, medical, and MADB EPSs in its product class definitions. This consolidation would reduce the number of product classes covering these products from 12 in the preliminary analysis to five (B, C, D, E, and N) in the NOPR. Under this consolidated approach, product class B includes direct operation EPSs that are AC/DC and basic-voltage (i.e. do not qualify as low-voltage); product class C includes direct operation EPSs that are AC/DC and low-voltage (i.e. nameplate output voltage less than 6 volts and nameplate output current greater than or equal to 550 milliamps.); product class D includes direct operation EPSs that are AC/AC and basic-voltage; product class E includes direct operation EPSs that are AC/AC and low-voltage; and product class N includes all indirect operation EPSs.

TABLE IV—1 PRELIMINARY ANALYSIS PRODUCT CLASSES

		Voltage level	
		Basic (not low-voltage)	Low (<6V, ≥550mA outputs)
Power Conversion Type	AC input, DC output	A1, B1, M1 (now B)	A2, B2, M2 (now C).
	AC input, AC output	A3, B3, M3 (now D)	A4, B4, M4 (now E).

Multiple-Voltage External Power Supplies

In the preliminary analysis, DOE considered combining product classes X1 (<100 Watts) and X2 (≥100 Watts) into one product class for all multiple-voltage EPSs. DOE is proposing to define multiple-voltage EPS as devices that convert household electric current into multiple simultaneous output currents. The California IOUs were in favor of creating a single product class for multiple-voltage EPSs because ''the types of products that may occupy this category in the future are unknown.'' (California IOUs, No. 43 at p. 9). DOE's initial approach was based on the view that these product classes corresponded to the two main products already in the market in 2008: multi-function devices in X1 and video game consoles in X2. As of 2010, multi-function devices no longer use multiple-voltage EPSs, leaving only one main product category and the need for only one product class. Therefore, DOE has consolidated product classes X1 and X2 into product class X for all multiple-voltage EPSs, which are EPSs that can directly operate a consumer product and simultaneously produce multiple output voltages.

High-Power External Power Supplies

DOE examined only one product class for high-power EPSs during the preliminary analysis because only one relevant consumer application existed at the time the analysis was prepared. DOE received no comments on this proposal from interested parties and, therefore, maintained one product class for high-power EPSs in the NOPR. This product class includes EPSs that can directly operate a consumer product and have a nameplate output power greater than 250 watts. To maintain consistency in the naming convention for the NOPR, product class H1 is now product class H. All product classes developed for the NOPR are shown in Table IV–2.

TABLE IV—2 EXTERNAL POWER SUPPLY PRODUCT CLASSES USED IN THE NOPR

Product class description	Preliminary analysis external power supply product classes	NOPR external power supply product classes
AC/DC Basic-Voltage	A1, M1, B1 (some)	B
AC/DC Low-Voltage	A2, M2, B2 (some)	C
AC/AC Basic-Voltage	A3, M3, B3 (some)	D
AC/AC Low-Voltage	A4, M4, B4 (some)	E
Multiple Voltage	X1, X2	X
High-Power	H1	H

TABLE IV—2 EXTERNAL POWER SUPPLY PRODUCT CLASSES USED IN THE NOPR—Continued

Product class description	Preliminary analysis external power supply product classes	NOPR external power supply product classes
Indirect Operation	B1, B2, B3, B4 (most)	N

b. Battery Charger Product Classes

In the preliminary analysis, DOE used five electrical characteristics to disaggregate product classes—battery voltage, battery energy, input and output characteristics (e.g. inductive charging capabilities),[23] input voltage type (line AC or low-voltage DC), and AC output. DOE explained its reasoning for using this approach in the preliminary analysis. This reasoning is also detailed in chapter 3 of the TSD.

First, DOE explained that battery voltage greatly affects consumer utility because the electronics of a portable consumer product are designed to require a particular battery voltage. If a change occurs in battery voltage, it is possible that the end-use application will be rendered inoperable. Furthermore, battery chargers that charge lower-voltage (voltage equals the product of current (I) and resistance (R)) batteries tend to be less efficient because they use higher currents, which increase I^2R losses for the same given output power. (I^2R, the product of current and voltage, equates to power and refers to losses directly related to current flow.) These devices could be disproportionately affected by an equally stringent standard level across all voltages. Consequently, DOE opted to use battery voltage as a characteristic for setting product classes. See preliminary analysis TSD Chapter 3.

Second, while battery voltage specifies which consumer product applications can be used with a particular battery (and its corresponding battery charger), battery energy describes the total amount of work that the battery can perform, regardless of the application, and is also a measure of utility. Furthermore, because a battery charger must provide enough output power to replenish the energy discharged during use, the capacity and physical size of the battery charger depend on the amount of battery energy.[24] By using battery energy as a proxy for output power, only a single criterion, rather than two, is required for classifying battery chargers. This approach has the benefit of simplifying any energy conservation standards that DOE may set while sufficiently accounting for any differences in battery charger capacity or utility in the standards analysis. Additional details on this approach can be found in TSD chapter 3.

Third, input and output characteristics are important because input voltage can have an impact on efficiency and dictate where a battery charger may be used, this impact may affect end user utility. With respect to inductive chargers, the utility offered by this characteristic is providing reliable and safe electrical power to a device during operation. 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. DOE also identified numerous battery chargers that do not include a wall adapter, connecting instead to a personal computer's USB port or a car's cigarette lighter receptacle. Because input voltage can impact battery charger performance and determine where the battery charger can be used, which affects the utility of the product, DOE defined product classes using this criterion in the preliminary TSD. In response to the preliminary analysis and during manufacturer interviews, DOE received numerous comments regarding these product classes, discussed below, and the results of which are summarized in Table IV–3.

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[23] 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.

[24] The minimum output power is a product of battery energy and charge rate. However, while charge rates rarely fall outside the range of 1 °C to 10 °C, the battery energy of consumer battery chargers can span over 5 orders of magnitude from 1 watt-hour to over 10,000 watt-hours. Therefore, the output power is more dependent on battery energy than charge rates.

Table IV-3 Battery Charger Product Classes

Product Class #	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	-	Basic (i.e. no Automatic Voltage Regulation)
10b		-	Contains Automatic Voltage Regulation

During the preliminary analysis public meeting, Philips questioned whether DOE could consider product classes based on usage, topology (i.e., the general circuit layout), or price. (Philips, Pub. Mtg. Tr., No. 37 at pp. 126–130) Philips and AHAM stated that they believed DOE could disaggregate infrequently used products into a separate product class and urged DOE to do so. (Philips, No. 43 at p. 3; AHAM, Pub. Mtg. Tr., No. 37 at pp 154–156) AHAM added that, in its view, DOE has always established new product classes based on characteristics, designs, or functions that affect energy use. (AHAM, No. 44 at p. 6) CEA expressed similar concerns as Philips and AHAM, suggesting that DOE did not adequately deal with infrequently charged battery chargers. (CEA, No. 48 at p. 2) Earthjustice disagreed with AHAM's suggestion and stated that usage is not a feature of a battery charger, but rather a characteristic of the end user of the application that the battery charger accompanies. (Earthjustice, Pub. Mtg. Tr., No., No. 37 at p. 131) Fulton Innovation inquired whether topology is considered as part of the utility of a product and, hence, a factor for setting product classes. (Fulton Innovation, Pub. Mtg. Tr., No., 37 at pp. 134–135) Finally, Stanley Black and Decker asked whether pricing could be considered a utility-related feature to use in defining product classes. (SBD, Pub. Mtg. Tr., No., 37 at pp. 133–134)

DOE does not consider usage, topology, and pricing as utility-related features for determining separate product classes. These factors were considered separately, however, in setting potential energy efficiency levels for these products. Usage defines how a battery charger is used, which is inherently tied to the end-use product with which the battery charger is packaged. While changes in usage will affect the energy use of a battery charger, they do not affect the actual performance of the battery charger, which is the relevant factor DOE must consider when establishing a separate class for these products. See 42 U.S.C. 6295(q). Product usage is fundamental to the analyses that DOE performs for battery chargers, particularly for the LCC and NIA. For each application, DOE estimates the time spent in each mode of operation in order to estimate unit energy consumption. Further details on usage and DOE's assumptions are presented in the energy usage section, IV.E, of today's notice.

Although DOE does not explicitly define product classes for battery chargers based on topology, it considered topologies when it presented its initial product classes. Primarily, DOE uses battery energy as a defining characteristic for battery charger product classes. Because of the extremely wide range of different battery energies, DOE needed to establish meaningful ranges of battery energies for each product class. As outlined in the preliminary analysis TSD (Chapter 3), when battery energy changes, the topologies, or general circuit designs that are most appropriate also change. Therefore, as part of today's NOPR, DOE examined the potential impacts on topologies when it defined the ranges of battery energies that were considered.

Finally, price was also not included in the definitions of DOE's battery charger product class because it is not a utility-related feature for the purposes of EPCA. DOE understands commenters concerns that some products are marketed at various price points and that energy efficiency standards have the potential to raise those price points or eliminate some all together. However, price does not directly affect device performance. DOE acknowledges that price is an important consideration for consumers and although price is not considered when setting product classes, DOE does account for such consumer impacts in the LCC and PBP analyses conducted in support of this rulemaking.

Medical and Single-Cell Battery Chargers

Interested parties also advocated separating out particular products into their own classes. Philips suggested that DOE consider creating a separate product class for medical battery chargers, as is done for EPSs. (Philips, No. 43 at p. 2) They mentioned that medical battery chargers cannot use off the shelf consumer grade battery chargers and must undergo a special regulatory process that adds testing requirements and costs. (Philips, No. 43 at p. 3) At the public meeting, Wahl Clipper suggested that DOE should have an additional product class for applications that use single-cell batteries. (Wahl Clipper, Pub. Mtg. Tr., No. 37 at p. 158) Neither commenter provided any data supporting their views.

While DOE appreciates the suggestions from Philips and Wahl about segregating out additional product classes from DOE's current definitions, DOE is not inclined to adopt them at this time based on the current information before it. As with EPSs, DOE believes that even though medical battery chargers must adhere to more stringent requirements than other battery chargers, the cost-efficiency relationship will not be appreciably different to merit separate standards and product classes. In the preliminary analysis, DOE found that there was virtually no difference in the cost effectiveness of improving medical EPS efficiency versus improving Class A EPS efficiency. Moreover, DOE is unaware of any capacity or performance-related feature present in medical battery chargers that would permit the creation of a special class for these devices for purposes of setting separate energy conservation standards. As a result, despite the additional safety testing that medical EPSs may have to go through for certification, DOE has tentatively consolidated the two groups and no longer distinguishes between them in its product class definitions for today's proposal. Based on the information that DOE receives during the course of the comment period, it may reconsider this approach for the final rule.

As for the single-cell batteries that Wahl Clipper referenced, DOE believes that its proposed scaling methodology sufficiently addresses Wahl Clipper's concerns and allows chargers that use single-cell batteries to remain in product class 2 (low-energy, low-voltage). As discussed in section IV.C.2.j, when battery energy approaches zero, DOE levels off unit energy consumption (UEC) requirements to prevent the adoption of overly stringent requirements that could eliminate such products. (UEC is a relevant factor because it is the metric which DOE is proposing to regulate for these devices.)

Motorized Application Detachable Battery (MADB) Battery Chargers

PTI also submitted comments in which it recommended that DOE revise its 10 battery charger product classes presented in the preliminary analysis. PTI stated that because the statute provides language for DOE to separate MADB's when referring to EPS's, DOE should extend this distinction to battery chargers and separate MADB battery chargers from consumer electronics battery chargers. PTI claimed that even though MADB and consumer electronics battery chargers share a common range of battery voltages and energies, the two are vastly different in other ways and urged DOE to create different classes for MADB and non-MADB products across the same battery voltages and energies. PTI added that part of the problem with grouping the two product types together is that consumer electronics promote features such as smaller size and weight and longer run-time—all of which are added benefits related to improving a product's energy efficiency. (PTI, No. 47 at p. 13) In other words, in their view, consumer electronics have already begun to move towards more efficient battery chargers and manufacturers have been able to pass along the additional costs to consumers because the use of more efficient chargers has led to the addition of desirable features, such as reduced notebook computer weight. (PTI, No. 47 at pp. 13)

PTI also disagreed with DOE's initial plan to group power tools with consumer electronics because shipments of consumer electronics, such as laptops, greatly outnumber MADB product shipments. Because a shipment-weighted average is employed by DOE in its analysis, the calculated effects would be dominated by the effects of the products that have the greatest number of shipments. (PTI, No. 47 at p. 6) Since the shipment quantities of consumer electronic products far outnumber those for MADB products, PTI asserted that the calculations derived by DOE would be dominated by the inclusion of consumer electronics products and skew the overall effects projected to occur with a given standard for these products. (PTI, No. 47 at pp. 6 and 13)

In addition, in PTI's view, the incremental cost estimates to achieve higher efficiencies which have been included in the life cycle cost analysis, are a much smaller percentage of the higher-priced products than they would be for many do-it-yourself power tools. (PTI, No. 47 at p. 13) As a result, PTI asserted that do-it-yourself power tool users are likely to be more sensitive to price changes even though the incremental change may be similar to higher priced products, such as consumer electronics. PTI added that manufacturers, and ultimately consumers, would be better served by a class that included only appliances or, alternatively, have appliances more fairly represented in the averages. In its view, making this change would generate CSLs that more appropriately address the realizable efficiency improvements and strike a better balance between the realities of power tool manufacturers and the energy savings gained by the consumer. (PTI, No. 47 at p. 13) Therefore, PTI recommended that DOE should calculate CSL and LCC information based on sub-classifications of product classes 3 (AC in/DC out, <100 Wh, 4–10 V battery chargers) and 4 (AC in/DC out, <100Wh, >10V battery chargers) for MADB and non-MADB devices. (PTI, No. 47 at p. 7)

Conversely, the California IOUs supported DOE's decision to group both power tools (i.e. MADB battery chargers) and laptops (i.e. consumer electronics battery chargers) in the same product classes for the purposes of this analysis (California IOUs, No. 45 at p. 6) They also expressed support for DOE's proposal in the preliminary analysis that usage profiles should not be used when creating product classes. (California IOUs, No. 45 at p. 8) In separate comments, Pacific Gas and Electric and others urged DOE to reduce the number of product classes from 10 to 4, and reorganize product classes 2 through 7 (AC in/DC out battery chargers) into one new product class. (PG&E, et al., No. 49 at pp. 2–3)

After considering these comments, DOE re-examined the UEC data from its engineering analysis for product classes 3 and 4. DOE found that when MADB applications were removed from product classes 3 and 4, the UECs generated for the removed group of MADB applications were not significantly different (<10 percent) than those DOE had presented for the product class as a whole. Relative to the reductions in UEC when incrementing CSLs, DOE considered these differences much less significant than it initially suspected. Furthermore, for the NOPR analysis, DOE altered some of its assumptions for the LCC analysis. In the preliminary analysis, DOE assumed the same efficiency distribution for all applications within a product class. For example, in product class 4, laptops were assumed to have the same percentage of their shipments at CSL 0, 1, and 2 as power tools and all other applications in that product class. As mentioned by manufacturers and determined by DOE's testing program for battery chargers, some products, mainly consumer electronics, have already begun increasing the efficiency of their products because doing so is desirable to the end user. As a result, DOE has altered its assumption that all applications within a product class have the same distribution of efficiency. Instead, DOE now makes more tailored assumptions about efficiency distributions for different applications based on information provided by manufacturers, publicly available data, and DOE's own test results.

This new assumption will alter the economics of DOE's standards analysis and more accurately illustrate the effects on consumers for the varying consumer types in each product class. Additionally, the individual LCC results for each application are available in appendix 8B of the TSD. Similarly, just as DOE is not persuaded to disaggregate certain product classes, DOE is also not persuaded to aggregate any additional product classes, as suggested by PG&E. DOE initially considered using separate product classes in the preliminary analysis because the different battery voltage and energy ratings that define these classes imply a certain utility and deviation from those ratings will likely lead to different cost-efficiency relationships and efficiency levels. These differences will also lead to different effects on consumers, which will likely support different energy conservation standard levels.

Uninterruptible Power Supply (UPS) Battery Chargers

Uninterruptible power supplies are used only for emergency situations when power is lost and users need time to safely shut down their electronic devices. Consequently, these devices generally do not fully charge a completely depleted battery. Additionally, these devices typically use integral batteries and generally remain on continuously. Because of its role in providing power in emergency situations, the battery chargers within these devices primarily remain in maintenance mode, which constitutes the most relevant portion of its energy consumption.

During manufacturer interviews with UPS producers, DOE discussed additional functionality as it pertains to these devices. Manufacturers suggested that DOE classify UPSs into three different categories: Basic UPSs, UPSs that have automatic voltage regulation (AVR), and UPSs that are extended-run capable (i.e., the ability to attach a second battery to increase battery capacity within the UPS). After further investigation, DOE decided that two of these categories were appropriate and warranted separate standards, but the third category (extended-run UPSs), as it was simply representative of a change in battery capacity, could be accounted for through its scaling methodology.

AVR UPSs use circuitry that monitors input voltage from the wall and ensures that all products plugged into the UPS see a steady flow of voltage despite any fluctuations at the wall. This circuitry provides added utility to the consumer by preventing any spikes or dips in voltage, but it comes at the expense of additional power consumption by the UPS. This additional power consumption of the UPS is always on when the device is plugged in and it is indistinguishable from the power consumption due to the battery charger within the UPS.

To account for these characteristics, DOE is proposing to divide preliminary analysis product class 10 into two product classes, one for basic UPSs and one for UPSs that contain AVR circuitry. Even though DOE is proposing two product classes for these categories of UPSs, DOE believes that the underlying engineering analysis and other downstream analyses for both product classes is the same. DOE believes that this is an appropriate assumption because the addition of AVR is irrelevant to UPS battery charger power consumption, yet it cannot be disaggregated from UPS battery charger power consumption due to the integrated nature of the circuitry components within a UPS. In other words, there is no technical reason why the battery charger within a basic UPS should be different from the battery charger within a UPS with AVR functionality. However, when the latter is tested via DOE's battery charger test procedure, it will demonstrate a higher maintenance mode power consumption and will not be able to meet as stringent an energy efficiency standard as a basic UPS. Consequently, for all of DOE's analyses in today's NOPR, battery chargers for UPSs are examined as an aggregated product class, product class 10, rather than separately, however the proposed standard for each product class is different. DOE seeks comment on its analytical approach and whether separate classes are appropriate in this context.

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 EPSs and battery chargers. Chapter 3 of the TSD provides additional detail and descriptions of the basic construction and operation of EPSs and battery chargers, followed by a discussion of technology options to improve their efficiency and power consumption in various modes.

a. EPS Efficiency Metrics

On December 8, 2006, DOE codified a test procedure final rule for single output-voltage EPSs in Appendix Z to Subpart B of 10 CFR Part 430 (''Uniform Test Method for Measuring the Energy Consumption of External Power Supplies.'') See 71 FR 71340. On June 1, 2011, DOE added a test procedure to cover multiple output-voltage EPSs in Appendix Z to Subpart B of 10 CFR Part 430 (''Uniform Test Method for Measuring the Energy Consumption of External Power Supplies.'') 76 FR 31750. DOE's test procedure, based on the CEC EPS test procedure, yields two measurements: Active mode efficiency and no-load mode (standby mode) power consumption.

Active-mode efficiency is the ratio of output power to input power. For single-voltage EPSs, the DOE test procedure averages the efficiency at four loading conditions—25, 50, 75, and 100 percent of maximum rated output current—to assess the performance of an EPS when powering diverse loads. For multiple-voltage EPSs, the test procedure provides those four metrics individually, which DOE is considering averaging when setting the efficiency level measurements for these types of devices. The test procedure also specifies how to measure the power consumption of the EPS when disconnected from the consumer product, which is termed ''no-load'' power consumption because the EPS outputs zero percent of the maximum rated output current to the application.

To develop the analysis and to help establish a framework for setting EPS standards, DOE considered both combining average active-mode efficiency and no-load power into a single metric, such as unit energy consumption (i.e. UEC), and maintaining separate metrics for each. For the preliminary analysis, DOE chose to evaluate EPSs using the two metrics separately. Today's NOPR proposes continuing to use this method when setting standards for these products. Using a single metric that combines active-mode efficiency and no-load power consumption to determine the standard may inadvertently permit the ''backsliding'' of the standards established by EISA 2007. Specifically, because a combined metric would regulate the overall energy consumption of the EPS as the aggregation of active-mode efficiency and no-load power, that approach could permit the performance of one metric to drop below the EISA 2007 level if it is sufficiently offset by an improvement in the other metric. Such a result would, in DOE's view, constitute a backsliding of the standards and would violate EPCA's prohibition from setting such a level. DOE's proposed approach seeks to avoid this result.

The DOE test procedure for multiple-voltage EPSs yields five values: no-load power consumption as well as efficiency at 25, 50, 75, and 100 percent of maximum load. See 76 FR 31750 (June 1, 2011)(noting DOE's recently added procedures for multiple voltage EPSs codified at section 4.2 of appendix Z of subpart B to part 430 of the CFR). In the preliminary analysis, DOE examined the possibility of averaging the four efficiency values to create an average efficiency metric for multiple-voltage EPSs, similar to the approach followed for single-voltage EPSs. Alternatively, DOE introduced the idea of averaging the efficiency measurements at 50 percent and 75 percent of maximum load because the only known application that currently uses a multiple voltage EPS, a video game console, operates most often between those loading conditions. DOE sought comment from interested parties on these two approaches.

The California IOUs commented that the test metric should be an ''average of 25%, 50%, 75%, and 100% of rated output power, similar to the approach taken for single voltage EPSs.'' The California IOUs viewed this approach as best rather than basing the multiple-voltage test procedure on the loading profile of a single application which could decrease the applicability of any standard since ''the types of products that may occupy this category in the future are unknown''. (California IOUs, No. 43 at p. 9)

Though it is aware of only one consumer product using multiple-voltage EPSs, DOE believes that evaluating multiple-voltage EPSs using an average-efficiency metric (based on the efficiencies at 25%, 50%, 75%, and 100% of each output's normalized maximum nameplate output power) would allow a future standard to be applicable to a diverse range of products as it would not be based solely on the loading profile of a single EPS application. Therefore, DOE evaluated multiple-voltage EPSs using no-load mode power consumption and an average active-mode efficiency metric based on the measured efficiencies at 25%, 50%, 75%, and 100% of rated output power in developing the proposed energy conservation standards for these products. DOE requests feedback on this proposed approach to determining the average efficiency for multiple-voltage EPSs.

b. EPS Technology Options

DOE considered seven technology options, fully detailed in Chapter 3 of the TSD, which may improve the efficiency of EPSs: (1) Improved Transformers, (2) Switched-Mode Power Supplies, (3) Low-Power Integrated Circuits, (4) Schottky Diodes and Synchronous Rectification, (5) Low-Loss Transistors, (6) Resonant Switching, and (7) Resonant (''Lossless'') Snubbers.

AHAM and PTI commented during the preliminary analysis that ''[DOE] has not justified the value of decreasing the no-load levels at each [initially considered] CSL'' (AHAM, No. 42 at p. 7; PTI, No. 45 at p. 5). NEEP suggested that DOE should consider whether technology options are applicable across product classes (NEEP, No. 49 at 2).

During its analysis, DOE found that some technology options affect both efficiency and no-load performance and that the individual contributions from these options cannot be separated from each other in a cost analysis. Given this trend, DOE generated a ''matched pairs'' approach for creating the EPS CSLs where select test units were used in characterizing the relationship of average active-mode efficiency and no-load power dissipation. In the matched pairs approach, EPS energy consumption improves either through higher active mode efficiency, lower no-load mode power consumption, or both. If DOE allowed one metric to decrease in stringency between CSLs, then the cost-efficiency results might have shown cost reductions at higher CSLs and skew the true costs associated with increasing the efficiency of EPSs. To avoid this result, DOE is using an approach that increases the stringency of both metrics for each CSL considered in today's NOPR.

Regarding NEEP's suggestion, DOE notes that in developing the engineering analysis, DOE considered all technology options when developing CSLs for all four EPS representative units. DOE considered the same efficiency improvements during its analysis for non-Class A EPSs as it did for Class A EPSs. Where representative units were not explicitly analyzed (i.e. product classes C, D, and E), DOE extended its analysis from a directly analyzed class. As a result, all design options that could apply to these products were implicitly considered because the proposed efficiency levels of the analyzed product class will be scaled to other product classes, an approach supported by interested parties. The equations were structured based on the relationship of the other Class A product classes to the representative product class such that the technology options not implemented by the other classes were accounted for in the proposed efficiency equations. For example, AC–AC EPSs (product classes A2 and A4 in the preliminary analysis) tend to have higher no load power dissipation because they do not use switched-mode methods (see Chapter 3 of the TSD for a full technical description). Therefore, DOE used higher no load power metrics when generating CSLs for these product classes than the CSLs from the representative product class A1. DOE will continue to examine all technology options and apply them wherever possible across all product classes as part of the NOPR analysis.

c. High-Power EPSs

In the non-Class A determination analysis TSD, DOE examined the specific design options of high-power EPSs as they relate to ham radios, the sole consumer application for these EPSs. DOE found that high-power EPSs are unique because both linear and switched-mode versions are available as cost-effective options, but the linear EPSs are more expensive and inherently limited in their achievable efficiency despite sharing some of the same possible efficiency improvements as EPSs in other product classes. Interested parties have expressed concern that setting an efficiency standard higher than a linear EPS can achieve would reduce the utility of these devices because ham radios are sensitive to the electromagnetic interference (EMI) generated by switched-mode EPSs.

However, DOE believes there is no reduction in utility because EPSs used in telecommunication applications are required to meet the EMI regulations of the Federal Communications Commission (47 CFR 15, subpart B) regardless of the underlying technology. DOE used this assumption when constructing its engineering analysis for the NOPR but seeks comment on possible issues with EMI and/or radio frequency interference associated with switch-mode power supplies (SMPS) used with amateur radios, including design options for reducing or eliminating interference.

d. Power Factor

Power factor is a relative measure of transmission losses between the power plant and a consumer product. DOE examined the issue of power factor in section 3.6 of the framework document for the BCEPS rulemaking and noted that certain ENERGY STAR specifications limit power factor. DOE also noted in that same section the role of power factor in higher-power EPSs—namely, that at higher powers, problems associated with power factor (e.g. power dissipation in the wiring) become more pronounced.

PTI commented that DOE should preempt other jurisdictions from regulating power factor by addressing power factor as a metric, but not to specify a limit in the energy-efficiency standard. (PTI, No. 45 at p. 12) PTI stated that regulating power factor will add cost to the product because of the need for additional power factor correction circuitry. It also explained that losses due to power factor are a consequence of the power cables used by the local utility, which are beyond the control of the manufacturer. (PTI, No. 45 at pp. 10–11)

DOE notes that regulating power factor includes substantial challenges, such as quantifying transmission losses that depend on the length of the transmission wires, which differ for each residential consumer. Further, DOE has not yet conclusively analyzed the benefits and burdens from regulating power factor. While DOE plans to continue analyzing power factor and the merits of its inclusion as part of a future rulemaking, it is DOE's view that the above factors weigh in favor of not setting a power factor-based standard at this time.

e. Battery Charger Modes of Operation and Performance Parameters

For the preliminary analysis, DOE found that there are five modes of operation in which a battery charger can operate at any given time. These modes of operation are: Active (or charge) mode, maintenance mode, no-battery (or standby) mode, off mode, and unplugged mode. These five modes are briefly described below:[25]

Active (or charge) 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.

Maintenance mode: 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 (or standby) mode: In no-battery mode, the battery is not connected to the charger but the battery charger itself is still plugged into mains.

Off mode: In off mode, the charger remains connected to mains power but the battery is removed and all manual on-off switches are turned off.

Unplugged mode: In unplugged mode, the battery charger is disconnected from mains and not consuming any electrical power.

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. (76 FR 31750) The following items are pertinent performance parameters from those tests.

24-Hour Energy: This quantity is defined as the power consumption integrated with respect to time of a full 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.

Maintenance Mode Power: This 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: This is a measurement of the average power consumed while a battery charger is in no-battery or standby mode (only if applicable).

Off-Mode Power: This is a measurement of 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).

Unplugged Mode Power: 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.

f. Battery Charger Technology Options

Since most consumer battery chargers contain an AC to DC power conversion stage, similar to that found in an EPS, all of the technology options discussed in section IV.A.4.b also apply to battery chargers. The technology options used to decrease EPS no-load power will impact 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 impact energy consumption in active and maintenance modes.

Technology options that DOE considered for battery chargers in the preliminary analysis and again for the NOPR include: Improved transformer cores, termination, elimination/limitation of maintenance mode current, elimination of no-battery mode current, switched-mode power supplies, low-power integrated circuits, Schottky diodes and synchronous rectification, phase control to limit input power. An in-depth discussion of these technology options can be found in TSD chapter 3.

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 significant adverse impact on the utility of the product to significant subgroups of consumers, or would result in the unavailability of any covered product type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as products generally available in the United States at the time, it will not 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 10 CFR part 430, subpart C, appendix A, (4)(a)(4) and (5)(b).

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[25] 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.

For EPSs, DOE did not screen out any technology options after considering the four criteria. For battery chargers, DOE screened out:

1. Non-inductive chargers for use in wet environments because of adverse impacts on safety;
2. Capacitive reactance because of adverse impacts on safety; and
3. Lowering charging current or increasing battery voltage because of adverse impacts on product utility to consumers.

DOE received no comments in response to its preliminary screening analysis. Therefore, DOE is using the same screening analysis for the NOPR.

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

C. Engineering Analysis

In the engineering analysis (detailed in chapter 5 of the TSD), DOE presents a relationship between the manufacturer selling price (MSP) and increases in battery charger and EPS efficiency. The efficiency values range from that of an inefficient battery charger or EPS 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) Test and teardowns, which involves testing products for efficiency and determining cost from a detailed bill of materials 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 or EPS from the cost of the associated end-use product.

1. Engineering Analysis for External Power Supplies

a. Representative Product Classes and Representative Units

DOE is applying the same methodology in the NOPR as it used in the preliminary analysis to identify representative product classes and representative units. In the preliminary analysis, DOE selected product class A1 (AC to DC conversion, basic- voltage EPSs) for further analysis as the representative product class because it constituted the majority of EPS shipments and national energy consumption related to EPSs. Within product class A1, DOE focused on four representative units with output power levels at 2.5 watts, 18 watts, 60 watts, and 120 watts because most consumer applications use EPSs with these, or similar, nameplate output power ratings. In the NOPR, DOE is choosing to focus on representative product class B (AC to DC conversion, basic-voltage EPSs), which contains certain product classes from the preliminary analysis—most Class A EPSs from product class A1, most medical EPSs from product class M1, and some MADB EPSs from product class B1 (which are EPSs that can directly power an application). The NOPR analysis also focuses on the same four representative units as the preliminary analysis with output powers at 2.5 watts, 18 watts, 60 watts, and 120 watts in product class B and scales those results to product classes C, D, and E as suggested by interested parties.

Interested parties supported DOE's approach in creating and analyzing representative product classes and representative units in the preliminary analysis. The California IOUs agreed with using product class A1 as the representative product class and scaling to other product classes because of the inherent similarities of the A1 devices to those in the other product classes (California IOUs, No. 43 at p. 8). Although no specific data were provided, the California IOUs also commented in support of the four representative units within the product class noting that their own research[26] into the power supply market corroborates DOE's selections (California IOUs, No. 43 at p. 8). DOE did not receive comments disputing its selections for the four representative units.

DOE is proposing to continue using the same representative product class and representative unit methodology, and will scale results for the other EPS product classes. As noted previously, DOE has incorporated EPSs from product class A1 into product class B. Within product class B (preliminary analysis product class A1) DOE will focus on the four representative units with output powers at 2.5 watts, 18 watts, 60 watts, and 120 watts because products with these ratings constitute a significant portion of shipments and energy consumption. Interested parties also supported this approach.

b. EPS Candidate Standard Levels (CSLs)

DOE is applying the same methodology to establish CSLs in the NOPR as it used in the preliminary analysis. DOE created CSLs as pairs of EPS efficiency metrics for each representative unit with increasingly stringent standards having higher-numbered CSLs. The CSLs were generally based on (1) voluntary (e.g. ENERGY STAR) specifications or mandatory (i.e. those established by EISA 2007) standards that either require or encourage manufacturers to develop products at particular efficiency levels; (2) the most efficient products available in the market; and (3) the maximum technologically feasible (''max tech'') level. These CSLs are summarized for each representative unit in Table IV–4. In section IV.C.1.e, DOE discusses how it developed equations to apply the CSLs from the representative units to all EPSs.

TABLE IV–4—SUMMARY OF EPS CSLS FOR PRODUCT CLASSES B, C, D, AND E

CSL	Reference	Basis
0	EISA 2007	EISA 2007 equations for efficiency and no-load power.
1	ENERGY STAR 2.0	ENERGY STAR 2.0 equations for efficiency and no-load power.
2	Intermediate	Interpolation between test data points.
3	Best in Market	Most efficient test data points.
4	Max Tech	Maximum technologically feasible efficiency.

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[26] *http://www.energy.ca.gov/appliances/archive/2004rulemaking/documents/case_studies/CASE_Power_Supplies.pdf.*

DOE evaluated EPSs using the two EPS efficiency metrics, no-load power consumption and active-mode average efficiency, which it grouped into ''matched pairs.'' Under the matched pairs approach, each CSL would increase in stringency in at least one of the metrics and no metric would ever be lowered in moving to a higher CSL. DOE's goal in using this approach was to ensure that when it associated costs with the CSLs, that the costs would reflect the complete costs of increased efficiency. If DOE followed an approach that permitted a decrease in stringency for a given metric, the result might be a projected reduction in EPS cost, which would mask the full cost of increasing EPS efficiency.

DOE received considerable support from interested parties on its matched pairs approach for EPS CSLs. However, interested parties, including the California IOUs, also cautioned DOE to avoid setting levels for no-load power that were too stringent when compared to active-mode efficiency improvements. (California IOUs, No. 43 at p. 8). The California IOUs added that ''PG&E research suggests that improvements in active mode yield much higher energy savings than small, incremental improvements in no-load mode.'' Id. PG&E added that DOE should verify that the no-load levels for the EPS CSLs are not too stringent, which could lead to higher costs since the majority of the projected savings for EPSs would likely come from improving active-mode efficiency (PG&E, Pub. Mtg. Tr., No. 57 at pp. 198–199).

DOE received two additional comments regarding its CSLs. The California IOUs supported DOE's CSL selections, particularly those that were developed based on test data. (California IOUs, No. 43 at p. 8). Additionally, AHAM stated that DOE should ''consider whether the CSLs also apply to units that are less than 2.5W,'' in particular 2.4W and 1.2W EPSs because they believe that ''the CSL for this class does not apply to these smaller wattage products'' (AHAM, No. 42 at p. 13).

DOE considered interested party comments when revising the CSLs for the NOPR. DOE's approach maintains the same efficiency levels for all CSLs but alters the max-tech efficiency level based on new data gleaned from manufacturer interviews, which indicated that manufacturers could achieve higher max-tech levels than were previously considered during the preliminary analysis. No load requirements were carefully considered consistent with commenter suggestions to not aggressively increase these levels.

Further, DOE has tentatively decided to maintain its best-in-market CSL based on test data and also considered whether the CSLs for the 2.5W EPS should apply to lower-power EPSs. DOE continues to believe that the CSLs apply to these lower power devices because the scaling equations developed by DOE incorporate the test results and data of EPSs with nameplate output power ratings less than 2.5W. For both metrics and at each CSL, DOE has developed standards equations that are functions of nameplate output power. To accommodate the design trend of decreasing efficiency with decreasing output power, the 2.5W CSLs are used as lower power reference points for the standard equations. All of the direct operation CSLs were created using a combination of existing standards and were corroborated with test data. In cases where DOE tested EPSs with nameplate output powers less than 2.5 watts, it scaled the results to the representative unit (2.5 W) and adjusted the efficiency accordingly. Hence, the 2.5W CSLs are supported by data from EPSs with output powers equal to 2.5 watts and scaled EPSs with output power ranges below 2.5 watts. DOE used this methodology in generating the CSLs for all of the other direct operation representative units where the CSLs were not only based on units tested at the nominal output power rating but also on scaled results of EPSs with nameplate output powers slightly above and slightly below the representative unit value. For additional detail regarding DOE's scaling methodology see chapter 5 of the TSD.

DOE maintained the same CSLs for multiple-voltage EPSs in product class X as it proposed in the preliminary analysis because it received no comments and has no new information that would otherwise merit a change in the CSLs for this product class. The CSLs are shown in Table IV–5.

TABLE IV–5—SUMMARY OF EPS CSLS FOR PRODUCT CLASS X

CSL	Reference	Basis
0	Market Bottom	Test data of the least efficient unit in the market.
1	Mid Market	Test data of the typical unit in the market.
2	Best-in-Market	Manufacturer's data.
3	Max Tech	Maximum technologically feasible efficiency.

DOE structured the CSLs for high-power EPSs based on products available in the market and by scaling CSLs for 120-watt EPSs. The two least efficient CSLs are based on units DOE tested for the non-Class A EPS determination analysis. CSL 0 corresponds to test results from a linear EPS for amateur radio equipment while CSL 1 corresponds to test results from a switched-mode EPS for the same application. During interviews for the determination analysis, high-power EPS manufacturers indicated that CSL 2 was what they believed to be the max-tech efficiency for high-power EPSs. As outlined in section III.B.2.a, DOE believes that the efficiencies of the 120W EPSs indicate a potential for 345W EPSs to achieve higher efficiencies than CSL 2 since achievable efficiency tends to remain the same for EPSs with a nameplate output power above 49 watts. DOE characterized these higher efficiencies by modeling a 360W EPS composed of three 120W EPSs connected in parallel. This theoretical EPS would have the same average efficiency as a 120W EPS, scaled for nameplate output voltage, and three times the no-load power consumption. DOE developed CSL 3 and CSL 4 for the 345W representative EPSs based on the efficiency of the theoretical 360W EPS. DOE received no comments concerning the CSLs for high-power EPSs during the preliminary analysis (CSL 0, CSL 1 and CSL 2). DOE seeks comment on its proposed methodology for establishing higher-efficiency CSLs (CSL 3 and CSL 4). The CSLs for product class H are listed in Table IV–6.

TABLE IV–6—SUMMARY OF EPS CSLS FOR PRODUCT CLASS H

CSL	Reference	Basis
0	Line Frequency	Test data of a low-efficiency unit in the market.
1	Switched-Mode Low Level	Test data of a high-efficiency unit in the market.
2	Switched-Mode High Level	Manufacturers' theoretical maximum efficiency.
3	Scaled Best-in-Market	Scaled from 120W EPS CSL 3.
4	Scaled Max Tech	Scaled from 120W EPS CSL 4.

c. EPS Engineering Analysis Methodology

In the preliminary analysis, DOE presented two sets of cost-efficiency curves: One based on manufacturer data that showed an increasing trend between cost and efficiency and a second set based on test and teardown data that, while inconclusive, generally showed a decreasing relationship between cost and efficiency. DOE sought interested party comment on this discrepancy.

Commenters had mixed opinions on which results DOE should use as the basis for its analysis. AHAM commented that ''based on what was presented that the Department should use the manufacturer's data'' rather than the test and teardown data that DOE developed stating that ''there is no incentive for manufacturers to not give out all necessary information to the Department''. (AHAM, No. 42 at p. 13) However, IOUs encouraged DOE to continue to pursue teardowns because the test and teardown results in the preliminary analysis, in their view, may be as accurate as manufacturer data since ''costs are rapidly declining for highly efficient power supplies.'' (California IOUs, No. 43 at p. 9). NEEP stated that DOE should ''corroborate the cost-efficiency curve data provided to them by manufacturers.'' In other words, DOE should re-evaluate the manufacturer's results and consider consulting independent sources to establish a more direct relationship between efficiency and cost. (NEEP, No. 49 at p. 4). DOE considered these opinions and sought additional information.

In preparing the NOPR analysis, DOE conducted an additional round of manufacturer interviews to address the differences between the two cost-efficiency curves in the preliminary analysis. Based on the interviews, DOE believes that the discrepancy between the preliminary analysis curves was due to an ongoing shift in the market that was not reflected in the data. Specifically, the manufacturers stated during these interviews that the EPS market has a trend of increasing efficiency and decreasing cost with each design cycle and the DOE-tested units may have been from different design cycles.[27] By contrast, the manufacturers' data on which DOE had initially relied reflected the cost-efficiency relationship during a single design cycle. In general, manufacturers agreed that, in their current design cycle, EPSs are designed to be more efficient than the ENERGY STAR level. Thus, DOE's revised cost-efficiency curves reflect this improved understanding across all the representative units using updated data obtained from interviews with EPS manufacturers and component suppliers.

In the preliminary analysis, DOE evaluated switched-mode power supplies (i.e. power supplies that use controlled switching of a power source to regulate the flow of current to a load), but not linear power supplies. Linear power supplies are power supplies that use a transformer and a linear regulator to provide power to a load. These devices are typically less cost effective as a method to improve energy efficiency and inherently limited in their achievable efficiencies—these limitations stem from the conversion stage delivering current at a higher voltage than needed by the consumer product and dropping the excess voltage across the regulator to achieve the lower regulated output voltage. The power lost in the regulator is the product of the voltage drop and the load current and is dissipated as heat. Switched-mode power supplies do not have the same limitations with respect to the level of efficiency they can achieve because the design relies on transferring power through the controlled modulation of energy stored in the magnetic and electric fields of passive components. As a result, there are fewer resistive losses in the conversion stage and the voltage is regulated using controlled switching instead of intentionally dissipating excess voltage in the form of heat, Cobra Electronics noted this omission. (Cobra, No. 51 at p. 3) DOE has since re-evaluated the analysis and found that linear power supplies are a cost-effective option for 2.5 W EPSs at the lower stringency CSLs, but not in meeting other CSLs or in satisfying CSLs for other representative units. As a result, the NOPR cost-efficiency curves for the 2.5W representative unit include linear supplies as part of the analysis.

Today's proposed rule is based on a slightly revised version of the initial methodology DOE considered when aggregating manufacturer results for the 2.5W and 18W representative units. In the preliminary analysis, DOE used a 3D-aggregation method[28] based on cost, efficiency, and no-load power to generate cost-efficiency curves for all representative units. The same 3D-aggregation methodology was applied to the NOPR analysis with the exception of the 2.5W and 18W representative units, for which DOE used a 2D aggregation approach.[29] DOE used a 2D aggregation method because that method more accurately captures the cost-efficiency relationship for these EPSs. Generally, DOE believes that 3D aggregation typically yields the best curve fit for the dataset, so long as there are sufficient data. However, for the 2.5W and 18W EPSs, DOE had less data for which it could generate curve fits. DOE initially ran a 3D regression for the 2.5W and 18W representative units, but found that variations in the data for no-load power caused the correlation of the resulting curve to be low. Upon further inspection, DOE believes that the 2D curve fit more accurately reflects the less-robust underlying dataset for these two EPSs because the costs represent incremental improvements to meet specific CSLs and, thus, the large variations in the no-load power data provided by manufacturers do not degrade the correlation of the curve fit. Therefore, DOE switched to a 2D aggregation that described efficiency and cost, which generated a curve with higher correlation and more appropriate

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[27] Original design dates are difficult to determine because the date of release is not often publicized with EPS product data.

[28] DOE's 3D-aggregation method is an approach to developing an equation that describes how MSP for an EPS changes with respect to both average efficiency and no-load power. That is, MSP is a function of both metrics simultaneously.

[29] DOE's 2D-aggregation method is an approach to developing an equation that describes how MSP for an EPS changes with respect to average efficiency only.

results for these representative units. For the remaining EPSs, DOE continued to apply the 3D-aggregation method because it generated a satisfactory curve fit. For additional details, please see chapter 5 of the TSD.

d. EPS Engineering Results

DOE characterized the cost-efficiency relationship of the four representative units in product class B as shown in Table IV–7, Table IV–8, Table IV–9, and Table IV–10. During interviews, manufacturers indicated that their switched-mode EPSs currently meet CSL1, the ENERGY STAR 2.0 specification. This factor is reflected in the analysis by setting the incremental MSP for the 18W, 60W, and 120W EPSs at $0 at CSL 1, which means that there is no incremental cost above the baseline to achieve CSL 1. Costs for the 2.5W EPS, however, are estimated at $0.15 for CSL 1. This result occurs because of DOE's assumption (based on available information) that the lowest cost solution for improving the efficiency of the 2.5W EPS is through the use of linear EPSs, which are manufactured both at the EISA 2007 level as well as at ENERGY STAR 2.0. Specifically, as commenters suggested, DOE examined linear EPSs and found that they might be a cost-effective solution at CSL 0 and CSL 1 for 2.5W EPSs. Thus, $0.15 indicates the incremental cost for a 2.5W EPS to achieve higher efficiency. For all four representative units, the more stringent CSLs, CSL 2, CSL 3, and CSL 4, correspond to switched-mode EPSs designed during the same design cycle, which would cause their costs to increase with increased efficiency.

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Table IV-7 2.5W EPS Engineering Analysis Results

	CSL 0	CSL 1	CSL 2	CSL 3	CSL 4
Efficiency [%]:	58.3	67.9	71.0	73.5	74.8
No-Load Power [W]:	0.500	0.300	0.130	0.100	0.039
CSL Description:	EISA	ENERGY STAR 2.0	Intermediate	Best-in-Market	Max Tech
Incremental MSP[$]:	0.00	0.15	0.33	0.45	0.52

Table IV-8 18W EPS Engineering Analysis Results

	CSL 0	CSL 1	CSL 2	CSL 3	CSL 4
Efficiency [%]:	76.0	80.3	83.0	85.4	91.1
No-Load Power [W]:	0.500	0.300	0.2	0.1	0.039
CSL Description:	EISA	ENERGY STAR 2.0	Intermediate	Best-in-Market	Max Tech
Incremental MSP[$]:	0.00	0.00	0.17	0.64	2.89

Table IV-9 60W EPS Engineering Analysis Results

	CSL 0	CSL 1	CSL 2	CSL 3	CSL 4
Efficiency [%]:	85.0	87.0	87.0	88.0	92.2
No-Load Power [W]:	0.5	0.5	0.2	0.073	0.05
CSL Description:	EISA	ENERGY STAR 2.0	Intermediate	Best-in-Market	Max Tech
Incremental MSP[$]:	0.00	0.00	0.82	1.29	2.73

Table IV-10 120W EPS Engineering Analysis Results

	CSL 0	CSL 1	CSL 2	CSL 3	CSL 4
Efficiency [%]:	85.0	87.0	88.0	88.4	93.5
No-Load Power [W]:	0.5	0.5	0.23	0.21	0.089
CSL Description:	EISA	ENERGY STAR 2.0	Intermediate	Best-in-Market	Max Tech
Incremental MSP[$]:	0.00	0.00	0.31	0.45	6.41

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Unlike product class B, DOE analyzed a single 203W representative unit for multiple-voltage EPSs. These devices are exclusively used with home video-game consoles, which use one output to power the device and another for standby controls. In Chapter 5 of the preliminary analysis TSD, DOE indicated that, for the NOPR, it was considering using the cost-efficiency relationship for 203W multiple-voltage

EPSs that it developed as part of the non-Class A EPS determination analysis. In the determination analysis, DOE derived costs for CSL 0 and CSL 1 from test and teardown data but costs for CSL 2 and CSL 3 came from manufacturer and component supplier interviews. DOE received no comments on this approach, which was detailed in the preliminary analysis TSD. Hence, DOE is continuing to rely on its determination analysis results to help characterize the cost-efficiency relationship for 203W multiple voltage EPSs, shown in Table IV–11.

Table IV-11 203W EPS Engineering Analysis Results

	CSL 0	CSL 1	CSL 2	CSL 3
Efficiency [%]:	82.4	86.4	86.4	88.5
No-Load Power [W]:	12.3	0.4	0.3	0.3
CSL Description:	Market Baseline	Mid-Market	Best-in-Market	Max Tech
Incremental MSP[$]:	0.00	2.45	2.66	7.71

Similar to the analysis of multiple-voltage EPSs, DOE analyzed one 345W representative unit for high-power EPSs. In Chapter 5 of the preliminary analysis TSD, DOE indicated that it was considering applying the cost-efficiency relationship for 345W high-power single-voltage EPSs that it developed as part of the non-Class A EPS determination analysis to high-power EPSs. In the determination analysis, DOE derived costs for CSL 0 and CSL 1 from test and teardown data, whereas costs for CSL 2 and CSL 3 came from manufacturer and component supplier interviews. DOE did not receive comments on this aspect of its approach in the preliminary analysis TSD. Hence, DOE used the results from the determination analysis to characterize the costs of the less-efficient CSLs for 345W high-power EPSs in today's NOPR (CSL 0 and CSL 1).

However, as noted previously in section IV.C.1.b, DOE also believes that a 345W EPS could achieve higher efficiencies based on its theoretical model of a 360W EPS that exhibits the properties of three 120W EPSs connected in parallel. These higher output devices are typically used with amateur radio equipment, which often transmit at power levels between 100 and 200 watts while simultaneously providing power to other components. DOE developed its costs for the higher-efficiency CSLs (CSL 2, CSL 3, and CSL 4) based on 120W EPS analysis. The complete cost-efficiency relationship for the 345W EPS is shown in Table IV–12.

Table IV-12 345W EPS Engineering Analysis Results

	CSL 0	CSL 1	CSL 2	CSL 3	CSL 4
Efficiency [%]:	62.4	81.3	84.6	87.5	92.0
No-Load Power [W]:	15.43	6.01	0.5	0.5	0.266
CSL Description:	Market Baseline	Low Market	Mid-Market	Scaled Best-in-Market	Scaled Max Tech
Absolute MSP[$]:	132.68	104.52	104.52	107.30	143.92

e. EPS Equation Scaling

During the preliminary analysis phase, DOE presented an approach to derive the average efficiency and no-load efficiency requirements for each CSL over the full range of output power for Class B EPSs. Mathematical equations define each CSL as a pair of relationships—(1) average active-mode efficiency to nameplate output power and (2) no-load mode power consumption to nameplate output power. These equations allow DOE to describe a CSL for any nameplate output power and are the basis of its proposed standards. A complete description of the equations can be found in chapter 5 of the TSD.

For the baseline CSL and CSL1, DOE relied on equations from EISA 2007 and ENERGY STAR 2.0, respectively, rather than developing new equations. Both equations are defined over ranges of output power, although the divisions between ranges are slightly different. EISA 2007 created divisions by establishing separate efficiency equations at the 1 watt and 51 watt levels—ENERGY STAR 2.0 creates a similar dividing line at 1 watt and 49 watts. See 42 U.S.C. 6295(u)(3)(A) (denoting nameplate output divisions at under 1 watt, 1 watt to not more than 51 watts, and over 51 watts) and ''ENERGY STAR Program Requirements for Single Voltage External Ac-Dc and Ac-Ac Power Supplies'' (denoting nameplate output divisions at less than or equal to 1 watt, 1 watt to not more than 49 watts, and over 49 watts). DOE developed equations for all other CSLs and for consistency and simplicity used the ENERGY STAR 2.0 divisions at 1 watt and 49 watts for all CSLs. These divisions were created in conjunction with the EPS product classes discussed in section IV.A.3.a as part of a complete analysis by the EPA. Given that it is considering adopting those product classes for direct operation EPSs, DOE believes that utilizing the ENERGY STAR output power divisions for its proposed standards is the most appropriate course of action. Consequently, the proposed standards are structured around these divisions rather than those created by the EISA 2007 standard or the CEC standards for EPSs.

DOE derived CSL 2, CSL 3, and CSL 4 by fitting equations to the efficiency values of their respective data points for each representative unit. DOE used an equation of the form $Y = a*\ln(P_{out}) + b * P_{out} + c$, for each of the nameplate output power ranges, where Y indicates the efficiency requirement; P_{out} indicates the nameplate output power; and a, b, and c indicate the specific parameters defined in the respective CSLs. DOE ensured that the equations met three conditions:

(1) The distance to each point was minimized.

(2) The equation did not exceed the tested efficiencies.

(3) DOE further restricted the parameter choice in order to ensure that the CSL curves adhered to a matched pairs approach fully detailed in chapter 5 of the TSD.

Among the CSLs for product class B, DOE only revised the efficiencies of the max-tech data points at CSL 4. Thus, the remaining CSL equations, other than max-tech, remain unchanged from the equations DOE developed for the preliminary analysis. For the NOPR, DOE derived a revised max-tech scaling equation using the new max-tech data points it developed after obtaining additional data during manufacturer interviews following the preliminary analysis.

As in the preliminary analysis, DOE scaled the CSL equations from product class B to product classes with low-voltage and AC–AC EPSs, which comprise product classes C, D, and E. The scaling for these equations was based on ENERGY STAR 2.0, which separates AC–DC conversion and AC–AC conversion into ''basic-voltage'' and ''low-voltage'' categories. ENERGY STAR 2.0 sets less stringent efficiency levels for low-voltage EPSs because they cannot typically achieve the same efficiencies as basic-voltage EPSs due to inherent design limitations. Similarly, ENERGY STAR 2.0 sets less stringent no-load standards for AC–AC EPSs because they do not use the overhead circuitry found in AC–DC EPSs to limit no-load power dissipation. The power consumed by the additional AC–AC EPS circuitry would actually increase their no-load power metric. DOE used this approach to develop CSLs other than the baseline CSL 0 for product classes C, D, and E. Because the baseline is the EISA 2007 standard that applies to all Class A EPSs, which comprise most of product classes B, C, D, and E, CSL 0 is the same for all product classes.

As described in the preliminary analysis and continued in today's proposal, DOE created less stringent CSLs for product classes C, D, and E. For CSL 1, the equations come directly from the ENERGY STAR 2.0 low-voltage equation. The low-voltage curves for CSL 2, CSL 3, and CSL 4 were created by using their respective CSL 2, CSL 3, and CSL 4 basic-voltage efficiency curves, and altering all equation parameters by the difference in the coefficients between the CSL 1 basic-voltage and low-voltage equations. This approach had the effect of shifting the CSL 2, CSL 3, and CSL 4 low-voltage curves downward from their corresponding basic-voltage CSL 2, CSL 3, and CSL 4 curves, by a similar amount as the shift between the CSL basic-voltage and low-voltage curves.

In the executive summary of the preliminary analysis TSD, DOE asked for comment regarding the various scaling relationships it developed to analyze EPS representative units and generate CSLs for the scaled product classes. The California IOUs commented that they agreed ''with [scaling EPS] CSLs on the basis of nameplate output power'' but added that the standard equation should be based on power alone, not on voltage or cord length because this approach would allow DOE to create a potential standard more transparently than one based on voltage or cord length. In their view, an approach based on either or both of these factors would unnecessarily complicate the analysis without yielding an appreciable benefit with respect to determining an EPS's achievable efficiency. (California IOUs, No. 43 at p. 8).

DOE is proposing to apply the output power scaling method detailed in chapter 5 of the TSD to set the standards for the scaled product classes.

During the preliminary analysis, DOE analyzed the impacts of setting a discrete standard for product class X (multiple-voltage EPSs) as there was only one existing product on the market at that time. Since then, DOE has re-evaluated its data and now believes that the ENERGY STAR 2.0 low-voltage standard equation for AC–DC conversion is a preferable approach to setting standards for multiple-voltage EPSs because lower power EPSs tend to be less efficient. Under this approach, DOE would take into account that trend and any low-power multiple-voltage EPSs that appear on the market would not be relegated to a single efficiency level that was established based on the performance of a 203W unit. As detailed in chapter 5 of the TSD, the ENERGY STAR 2.0 low-voltage equation matches the CSL DOE is proposing for the standard at the representative unit's output power of 203 watts, but also sets less stringent efficiency standards for lower power EPSs. Therefore, the proposed equation accounts for future products requiring multiple-voltage EPSs by setting a continuous standard versus output power while also supporting DOE's analysis of the 203W representative unit in product class X. DOE applied the same constraints when fitting the equation to the test data as it did for product classes B, C, D, and E. DOE seeks comment on this proposed approach in setting a standard for multiple-voltage EPSs.

For product class H (high-power EPSs), DOE proposes to set a discrete standard for all EPSs greater than 250 watts. DOE believes this is appropriate for two main reasons: (1) DOE is aware of only one application for high-power EPSs (i.e., amateur radios) and (2) this approach is consistent with the standard for product class B, which is a discrete level for all EPSs with nameplate output powers greater than 49 watts. In light of these facts, setting a single efficiency level as the standard for all EPSs with output powers greater than 250 watts (i.e., high-power EPSs) appears to be a reasonable approach to ensure a minimal level of energy efficiency while minimizing the overall level of burden on manufacturers. DOE seeks comment on this approach.

2. Engineering Analysis for Battery Chargers

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.

a. 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 to additional battery chargers, 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. The table below shows the representative units for each product class that DOE analyzed.

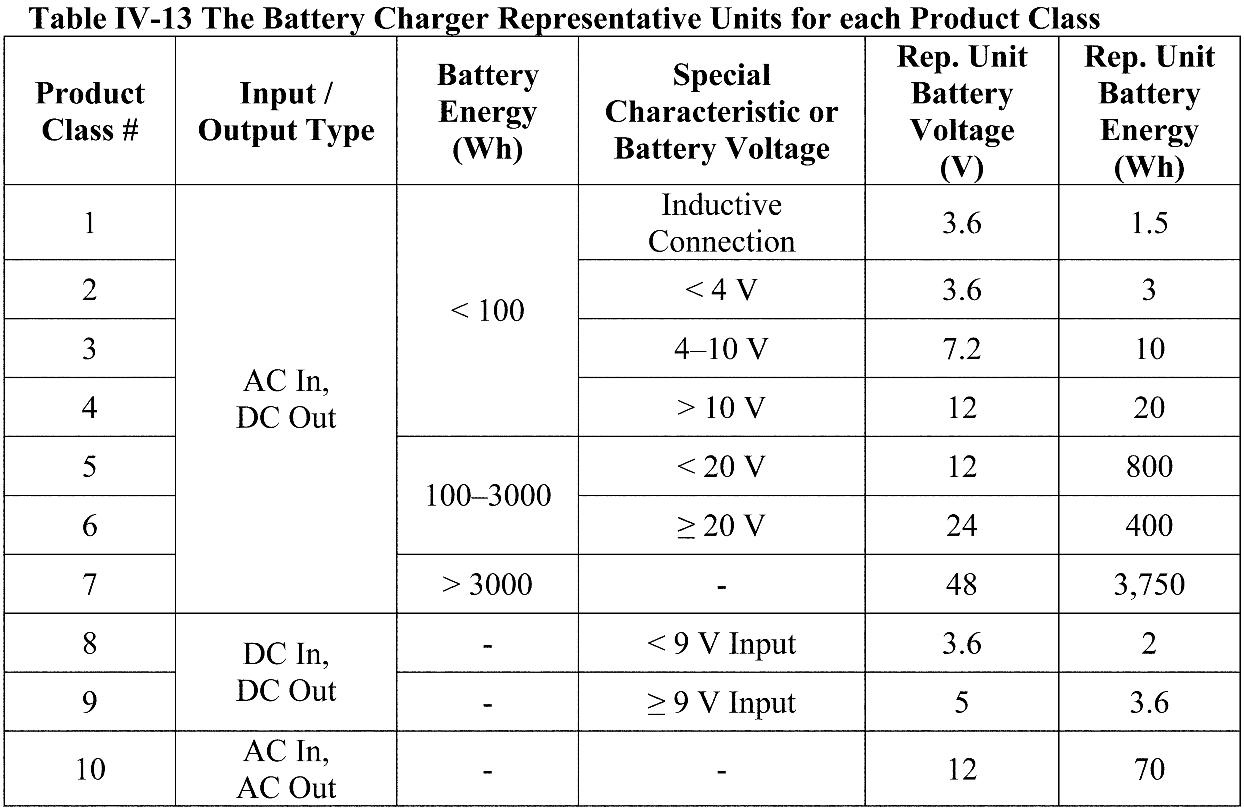

Table IV-13 The Battery Charger Representative Units for each Product Class

Product Class #	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	3.6	3
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
8	DC In, DC Out	-	< 9 V Input	3.6	2
9		-	≥ 9 V Input	5	3.6
10	AC In, AC Out	-	-	12	70

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

b. Battery Charger Efficiency Metrics

In the preliminary analysis, DOE considered using 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 IV.A.4.e.). 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 TSD chapter 7.

The possible use of a UEC metric generated numerous comments. NEEP and PG&E stated that they believed UEC to be an inappropriate metric because of the uncertainties around the usage profiles. (NEEP, No. 51 at p. 3; PG&E, et al., No. 49 at p. 1). NEEP suggested that DOE should regulate 24-hour energy and standby mode power individually rather than use UEC. (NEEP, No. 51 at p. 4). For product classes 1 through 9, PG&E proposed that DOE should have separate standards for 24-hour charge and maintenance energy and no-battery mode power, while for product class 10, DOE should regulate only maintenance mode power. (PG&E, et al., No. 49 at p. 2). PG&E also suggested another alternative in which DOE could use UEC, but that alternative involved giving equal weight to each mode of operation. (PG&E, et al., No. 49 at p. 2). While the ENERGY STAR specification for battery chargers (i.e., a nonactive energy ratio) does not consider active (or charge) mode, the California IOUs agreed with DOE's approach to consider active mode as a component of UEC. (California IOUs, No. 43 at p. 1). Details on UEC are included in the next section of today's notice (IV.C.2.c).

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 believes that its assumptions are accurate and appropriate gauges of product use because calculated weighted averages of usage profiles based on a distribution of user types were used to represent each product class. These assumptions also rely on a variety of sources including information from manufacturers and utilities. Details on DOE's new usage profile assumptions and how they have changed since the preliminary analysis can be found in section IV.E of today's notice and TSD chapter 7.

DOE also appreciates suggestions to regulate only product class 10 (AC in/ AC out) on the basis of maintenance mode power. DOE's proposal follows that suggestion. DOE assumes that UPSs, which comprise all of product class 10 units, are always in maintenance mode and undergo zero charges per year. By following this approach, the calculated energy per year for these devices is simply an allowance of maintenance mode power over a 365-day year. However, by converting maintenance mode power to a UEC, DOE can ensure consistency across all battery charger classes and avoid any potential confusion.[30]

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 of mobile phones if manufacturers improved no-battery mode and house phone battery charger manufacturers improved maintenance mode. Therefore, DOE plans to continue to use UEC as the metric for battery chargers.

c. Calculation of Unit Energy Consumption

As discussed in IV.C.2.b, 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:

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

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[31]

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. DOE seeks comment on all of these equations and its proposed approach.

Active (or Charge) Mode Energy per Day

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

In the first portion of the equation, shown above, 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 (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 active mode energy per day. Details on DOE's usage profile assumptions can be found in section IV.E of today's notice and TSD chapter 7.

Maintenance Mode Energy per Day

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

In the second segment of DOE's equation, shown above, maintenance mode power, time spent in active and maintenance mode per day, 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 by 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.

Standby (or No-Battery) Mode Energy per Day

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

In the third part of DOE's UEC equation, shown above, the measured value of standby mode power is multiplied by the estimated time in

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[30] If DOE were to establish an energy conservation standard for UPSs in terms of maintenance mode power, manufacturers of other products could be confused and believe that their product is also subject to a maintenance mode power standard, when in fact, it is a combination of all of their product's performance characteristics.

[31] 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 IV.E. The other values should be determined according to section 5 of appendix Y to subpart B of part 430.

standby mode per day, which results in a value of energy consumed per day in standby mode.

Off-Mode Energy per Day

$$(P_{off}t_{off}) = E_{No_{Battery}Mode}\frac{\square}{day}$$

In the final part of DOE's UEC equation, shown above, 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.

Finally, 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 its NOPR on active mode test procedures for battery chargers and EPSs. 75 FR 16958. In that notice, DOE proposed shortening 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 also received comments opposed to the proposed shortened test procedure. DOE ultimately decided that the duration of the charge test must not be shortened and be a minimum of 24 hours. See 76 FR 31750 (final rule establishing amended test procedure for battery chargers and EPSs). The test that DOE adopted is longer 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.[32]

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 exactly the same and represents the exact same value of unit energy consumption.

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

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 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 the 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. 76 FR 31750, 31780.

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 for 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 is needed in those 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 ($t_{a\&m}$) is solely dedicated to maintenance mode.[33] The primary equation that manufacturers will use to determine their product's unit energy consumption and whether or not their device complies with DOE's standards is below.

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

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[32] 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.

[33] 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.

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.

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

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

d. Battery Charger Candidate Standard Levels (CSLs)

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.[34]

Currently, there are no energy conservation standards for battery chargers. DOE does not believe the ENERGY STAR efficiency level to be widely applicable, primarily because these levels are limited to chargers used for motor-operated applications and contain no provisions to cover active mode energy consumption. Because of this situation, DOE based the CSLs for its battery charger engineering analysis on the efficiencies obtainable through the design options presented previously (see IV.A.4.f). 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 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 efficiencies beyond the best currently available in the market. Therefore, DOE projected the efficiency of a max-tech unit by estimating through extrapolation from its analysis of the analyzed CSL 2 unit the impacts of adding any remaining energy efficiency design options.

DOE received a number of comments from interested parties regarding the CSLs developed for the preliminary analysis. The California IOUs suggested that DOE consider CSLs between the best-in-market and max-tech levels. (California IOUs, No. 43 at pp. 3, 5) NEEP made a similar suggestion, stating that DOE should have an additional CSL between the intermediate and max-tech CSLs. (NEEP, No. 51 at p. 4) The California IOUs added that DOE should consider the efficiency levels proposed at a standards-related workshop held in California on October 11, 2010.[35] (California IOUs, No. 43 at p. 2)

In response to these suggestions on the preliminary analysis, DOE considered the levels proposed at the California workshop. At that workshop, California proposed using separate metrics for 24-hour energy, maintenance mode power, and standby mode power. Subsequently, California modified its approach to battery charger standards and combined the requirements for maintenance mode power and standby mode power into one metric. Using its usage profiles to translate these standards into a value of UEC, DOE compared its CSLs with the levels adopted by California. DOE found that, in most cases, when California's proposed standard was calculated into a value of UEC (using DOE's usage profile assumptions), it generally corresponded closely with one of DOE's CSLs for each product class. Therefore, in most instances, little valuable resolution could be added to DOE's cost-efficiency curves.

Although this was the case for most product classes, it was not the case for all of them. For product class 2, DOE adopted the suggestion from the California IOUs and added a level between CSL 1 and CSL 2 because the magnitude of the gap between UEC values was large enough to permit an additional CSL that could provide more cost effective savings. Please see TSD chapter 5 for product class 2 test results that illustrate this gap.

Table IV–14 below shows which CSL aligns most closely with the California proposal for each product class.

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[34] 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 typically is the most expensive design option considered in the engineering analysis.

[35] PG&E, Analysis of Standards Options for Battery Charger Systems, October 1, 2010 (*http://www.energy.ca.gov/appliances/battery_chargers/documents/2010-10-11_workshop/2010-10-11_Battery_Charger_Title_20_CASE_Report_v2-2-2.pdf*).

TABLE IV–14—CSLS EQUIVALENT TO CALIFORNIA PROPOSED STANDARDS

Product class	CSL equivalent to CEC standard
1 (Low-Energy, Inductive)	CSL 0
2 (Low-Energy, Low-Voltage)	CSL 2
3 (Low-Energy, Medium-Voltage)	CSL 2
4 (Low-Energy, High-Voltage)	CSL 2
5 (Medium-Energy, Low-Voltage)	CSL 3
6 (Medium-Energy, High-Voltage)	CSL 3
7 (High-Energy)	CSL 1
8 (DC Input <9 V)	CSL 0
10 (AC Output)	CSL 3

In addition, DOE received comments on specific CSLs for specific product classes. For product class 1 (low-energy, inductive) in particular, the California IOUs encouraged DOE to consider a CSL higher than CSL 3 because, in their view, CSL 3 was shown to be cost effective, leaving a possibility of additional cost-effective savings at higher efficiencies. (California IOUs, No. 43 at p. 5) For product class 2 (low-energy, low-voltage), the California IOUs asserted that DOE's baseline CSL should be lower because the test results presented in the preliminary analysis TSD showed products with UEC levels higher than the baseline value selected by DOE. (California IOUs, No. 43 at p. 6) PTI expressed concern over the max-tech level for product class 4, stating that it would be achievable only by using a lithium-based (i.e. Lithium-ion or ''Li-ion'') battery technology, which is currently used in laptop computer applications. (PTI, No. 47 at p. 8) Finally, when developing a max-tech level for product classes 2, 3 (low-energy, medium voltage), 4 (low-energy, high-voltage), 8 (low-energy, low DC input), and 9 (low-energy, high DC input), the California IOUs suggested that DOE speak to integrated circuit component suppliers. (California IOUs, No. 43 at p. 5)

Based on all of these comments, DOE conducted further analysis and review. For product class 1, DOE conducted additional interviews with manufacturers of these products and has revised its engineering analysis accordingly. DOE believes that the new MSPs, which are shown in section IV.C.2.i, more accurately depict the relationship between cost and efficiency for electric toothbrushes, which is the predominant application in that class.

For product class 2, DOE understands the concerns about creating an accurate baseline UEC for these devices. However, the baseline level that DOE has developed for today's NOPR is representative of the worst performing products tested by DOE. All of the units that showed higher values of energy consumption were products that Ecos, an independent consulting firm and test lab that assisted the CEC when developing a battery charger test procedure, tested and provided to DOE. DOE believes that this factor may be partially explained by timing. Since many of the units tested by Ecos that performed poorly were older test units, it is likely that these devices did not incorporate EPSs that meet the EISA 2007 regulations that went into effect in 2008. Therefore, DOE believes that its current CSL 0 for product class 2 is appropriate and provides a reasonable picture of the current battery charger market.

In response to PTI's comment, DOE clarifies that its preliminary analysis did not include an analysis for CSL 3 in product class 4. DOE obtained results only up to CSL 2 for product class 4. DOE notes that one of the units tested and torn down for that CSL was a power tool. For the NOPR, DOE has developed an analysis for CSL 3 in product class 4, which corresponds to that class's maximum technology level.

Finally, in developing the max-tech levels in the NOPR engineering analysis, DOE relied on input from manufacturers of battery chargers and original equipment manufacturers (OEMs) of products that use battery chargers. Manufacturers were able to provide DOE with sufficient information to enable the agency to ascertain what level of technology is feasible and is capable of surpassing the efficiency levels of incumbent technology currently available at the high end of the market today. Based on this information, DOE tentatively concluded that based on these discussions with manufacturers and OEMs there was sufficient information to define max-tech levels without interviewing integrated circuit suppliers.

e. Test and Teardowns

As mentioned above, 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 disassemblies 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.4.f.

After the battery charger units corresponding to the CSLs were evaluated, they were torn down by 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, iSuppli 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.

Interested parties offered some feedback regarding DOE's test and teardowns after the preliminary analysis. Stanley Black and Decker suggested that DOE should validate iSuppli's results by having them teardown products whose true costs are known—i.e. those instances where a manufacturer may have supplied data under a non-disclosure agreement. (B&D, Pub. Mtg. Tr., No. 37 at p. 234) AHAM recommended that DOE look at low cost products in product class 4 (e.g. notebook computers and large power tools). Wahl Clipper recommended that DOE estimate costs at lower volume levels than those used in the preliminary analysis—it offered 20,000 units per year as one alternative—because the effects on cost might be greater when components are purchased in lower volumes. (Wahl Clipper, Pub. Mtg. Tr., No. 37 at p. 206) The California IOUs made a number of recommendations to DOE. First, they suggested that DOE use PG&E's battery charger test data and that DOE gather more teardown data. (California IOUs, No. 43 at p. 2) Second, they supported DOE's decision to leave out packaging costs from the teardown results. In particular, for product class 2 (e.g. mobile and cordless phones), they recommended that DOE conduct teardown analyses of units with slightly higher and lower battery energies. Third, the California IOUs urged DOE to test and tear down a wider array of battery chargers from product classes 5 (e.g. marine chargers) and 7 (e.g. golf cars). They suggested this approach because they claimed that their own test data showed a wider range of efficiencies among battery chargers belonging to these classes. (California IOUs, No. 43 at pp. 4, 6)

For the NOPR, DOE has adopted most of the recommendations raised by commenters and has expanded its test program. DOE has performed additional tests using a variety of products from a number of product classes, including product classes 2, 4, 5, and 7. Further, DOE has performed additional teardown analyses on products from all ten proposed product classes. In total, over 100 new test results have been incorporated into the NOPR analysis. Packaging costs have continued to be excluded because they do not represent costs associated with improving the efficiency of a product. Regarding Wahl Clipper's suggestion to modify the volume assumption to 20,000 in order to determine how costs may change for a lower volume manufacturer, DOE believes that the large number of applications in each product class make it too difficult to select an appropriate low volume level. Additionally, DOE believes that the change in volume that results in higher costs for a manufacturer is likely to have little effect on consumers because the incremental costs from CSL to CSL are likely to be the same regardless of volume.

Finally, DOE verified the accuracy of the iSuppli results by confirming those results with individual manufacturers during interviews. As will be discussed in the following section, DOE performed additional manufacturer interviews for the NOPR and during these interviews, the initial iSuppli results were vetted 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 iSuppli are appropriate.

f. Manufacturer Interviews

The preliminary analysis had, in part, relied on information obtained through interviews with several battery charger manufacturers. These manufacturers consisted of companies that manufacture battery chargers and OEMs of battery-operated products who package battery chargers with their end-use products. DOE followed this approach to obtain data on the possible efficiencies and resultant costs of consumer battery chargers.

DOE received two comments regarding manufacturer interviews. First, PTI recommended that DOE speak with power tool manufacturers individually to obtain detailed information that would otherwise be unavailable through PTI as a trade association. (PTI, No. 47 at p. 12) Second, AHAM requested that the manufacturer interviews also involve discussions about testing costs and non-recurring capital expenditures. (AHAM, No. 44 at p. 13)

In preparing the NOPR, additional interviews were conducted, including those with manufacturers who were previously interviewed and new ones who were not. These interviews served two purposes. First, it gave manufacturers the opportunity to provide feedback on the preliminary analysis engineering analysis results. Aggregated information from these results is provided in TSD chapter 5. Second, these interviews also provided manufacturer inputs and comments in preparing the manufacturer impact analysis, which is discussed in detail in section IV.I.

DOE attempted to obtain teardown results for all of its product classes but encountered difficulties in obtaining useful and accurate teardown results for two of its products classes—namely, product class 1 (e.g. electric toothbrushes) and product class 10 (e.g. uninterruptible power supplies). For these two classes, 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 iSuppli 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.

In the case of UPSs, DOE found that it was difficult to accurately compare product costs because of the varying functionality of these devices. For example, DOE examined multiple UPSs, some of which provided additional utility to end users, such as AVR. As discussed earlier, AVR involves circuitry that monitors input voltage from the wall and ensures that all products plugged into the UPS see a steady flow of voltage despite any fluctuations. This added circuitry was impossible to distinguish from the standard UPS battery charging circuitry, which made it difficult to compare the costs of products that did not provide the same level of utility to the end-user. Furthermore, because the cost versus efficiency data provided by manufacturers showed economically justifiable levels through the max-tech level developed in the preliminary analysis, DOE believed that these data were sufficient to set out the proposed levels without resorting to a more time-consuming tear-down analysis. However, after a second round of interviews with UPS manufacturers for the NOPR and conducting additional analysis (including testing), DOE found that it needed to make a modification to its approach for dealing with battery chargers within UPSs.

When DOE tested UPSs according to the battery charger test procedure, it was unable to obtain maintenance mode power measurements as low (i.e. as good in terms of energy consumption) as those that manufacturers indicated were possible. DOE believes that the discrepancies between its test measurements and the data provided by manufacturers stems from the manner in which the test procedure measures energy consumption. TP measures consumption of unit as a whole—the entire UPS. BC only is using from mfr data. In particular, the DOE test procedure measures the energy consumption of the unit—in this case, the UPS—as a whole. Measuring the energy consumption of the battery charger alone in this instance would involve destructive testing. As a result, the data that DOE derived following its current test procedure for battery chargers includes the energy consumption from other UPS components other than the battery charger itself. For this reason, in this instance, DOE believes that the manufacturer-supplied data is more likely to accurately reflect the actual energy consumption of the battery charger alone. Because manufacturers would be unlikely to over-estimate the potential energy consumption of their products, DOE believes that their estimates of power consumption from the UPS's battery charger are still appropriate estimates. However, DOE still needs to account for the discrepancies between the manufacturer data and the measurements from its test procedure.

For the NOPR, DOE conducted additional testing of UPSs in which it attempted to describe the differences between its test procedure measurement and the values provided by manufacturers. During this round of testing, DOE performed the DOE test procedure, but added another measurement. As mentioned previously, while it is extremely difficult to isolate the power consumption due to battery charging from any other UPS functionality, the input power to the battery itself can be measured. With this measurement, DOE obtained two useful pieces of information. First, it allowed DOE to isolate a portion of battery charging power consumption from all other functions within a UPS and develop a trend line that describes how maintenance mode power will vary as battery energy changes. Second, this measurement, combined with the data from the tested units that corresponded to DOE's best-in-market test results (in terms of maintenance mode power as measured in the DOE test procedure), allowed DOE to develop supplemental values that it could use to increment the data provided by manufacturer such that it correlated to DOE test results. These values essentially operate as a means to account for the additional energy consumption used by a device when providing additional functionality. DOE developed two values, shown in Table IV–15 below, one for basic UPSs and one for UPSs that incorporate AVR. See TSD Chapter 5 for additional details. DOE is proposing to use these two values to develop an appropriate standard for basic UPSs and UPSs with AVR, after DOE proposes selecting an appropriate TSL for product 10.

TABLE IV–15—SUPPLEMENTAL VALUES FOR PRODUCT CLASSES 10A AND 10B

Product class	Maintenance mode supplemental value for proposed standard (W)	UEC supplemental value for proposed standard (kWh/yr)
10a (UPSs without AVR)	0.4	3.45
10b (UPSs with AVR)	0.8	7.08

g. Design Options

Design options are technology options that remain viable for use in the engineering analysis after applying the screening analysis as discussed above in section IV.B.

In response to the preliminary analysis, DOE received comments regarding design options and their application to the overall analysis. The California IOUs indicated that, with respect to the larger battery charger product classes where lead-acid batteries are most common, DOE should apply technologies more common in smaller units, such as switch-mode power supplies, to these devices in the analysis. (California IOUs, No. 43 at p. 5) NEEP made similar suggestions and stated that DOE should examine whether technologies can be applied across multiple product classes. (NEEP, No. 51 at p. 2) However, CEA urged DOE to account for the differences in battery chemistries and determine the appropriateness of given technologies for certain applications. CEA added that DOE must consider how battery technologies could be impacted by new efficiency requirements. (CEA, No. 48 at p. 2) Motorola expressed similar concerns and noted that although certain battery chemistries are less efficient, those chemistries may have other inherently important features like wider temperature range operations and improved cycle-life. Motorola insisted that these things should be considered when DOE conducts its technical and economic analyses. (Motorola, No. 50 at p. 2) Stanley Black and Decker added that DOE should not assume that additional utility is desirable as it will likely cause an increase in cost to the consumer. (SBD, Pub. Mtg. Tr., No. 37 at pp. 147–148) Finally, Lester commented that transformer-based chargers are more reliable, durable and provide batteries with a much longer life expectancy. Lester added that these chargers are often preferable to more efficient switch-mode chargers in industrial applications. (Lester, No. 52 at p. 2) Lester did not include any additional data to corroborate their statements regarding increased durability for battery chargers that are transformer-based and the life expectancy for batteries that use such chargers.

DOE clarifies 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. As most CSLs are based on actual teardowns of units manufactured and sold in today's battery charger market, 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.

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, DOE appreciates the need to consider durability, reliability, and other performance and utility related features that affect consumer behavior. On these issues, DOE seeks information, including substantive data, to help it assess these factors in consumer products.

h. Cost Model

Today's NOPR continues to apply the same approach used in the preliminary analysis to generate the manufacturer selling prices (MSPs) for the engineering analysis. For those product classes other than product classes 1 and 10, DOE's MSPs rely on the teardown results obtained from iSuppli. The bills of materials provided by iSuppli were multiplied by a markup that depended on product class. For those product classes for which DOE could not estimate MSPs using the iSuppli teardowns—product classes 1 and 10—DOE relied on aggregate manufacturer interview data, which projected that economic savings would accrue through the max-tech level in the preliminary analysis.

Additional details regarding the cost model and the markups assumed for each product class are presented in TSD chapter 5.

i. 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 the NOPR analyses. This section illustrates the results that DOE obtained for all 10 product classes in its NOPR engineering analysis.

Table IV-16 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
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

In response to the engineering results that DOE provided in the preliminary analysis for product class 1, DOE received one comment from Philips. Philips publicly submitted estimates of ''what the consumer pays,'' for CSLs 0, 1, 2, and 3 for product class 1. Philips suggested that those values would be $8, $10, $15, and $24, respectively. (Philips, No. 43 at p. 2) In its preliminary analysis, DOE proposed MSPs for product class 1 to be: $2.05, $2.22, $2.45, $2.60, for CSLs 0 through 3 respectively. Although DOE appreciates the feedback provided by Philips, it is vastly different from the information gathered on manufacturer interviews. DOE believes this discrepancy is partially due to a misinterpretation of the term MSP. The values that Philips provided, as it has described them, would correspond to what DOE considers a retail price and not an MSP. DOE has revised its MSPs for product class 1 according to the data obtained from manufacturers on interviews for the NOPR.

Table IV-17 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)	46.5	36.9	19.7	8.2	6.9
Maintenance Mode Power (W)	1.8	1.4	0.5	0.1	0.04
No-Battery Mode Power (W)	0.70	0.30	0.08	0.08	0.05
Off-Mode Power (W)	0.0	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	8.66	6.47	2.86	1.03	0.81
MSP [$]	$0.62	$0.71	$2.13	$3.84	$5.72

DOE did not receive any specific comments on its product class 2 engineering results in the preliminary analysis, but its revised results are presented in Table IV–17.

Table IV-18 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)	123.0	53.6	17.0	15.9
Maintenance Mode Power (W)	4.5	1.8	0.3	0.3
No-Battery Mode Power (W)	3.5	1.0	0.2	0.2
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	11.90	4.68	0.79	0.75
MSP [$]	$0.77	$1.98	$5.47	$5.51

DOE did not receive any specific comments on its product class 3 engineering results in the preliminary analysis, but its revised results are presented in Table IV–18.

Table IV-19 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 Tech
24 Hour Energy (Wh)	167.5	52.6	39.1	27.2
Maintenance Mode Power (W)	5.9	1.4	0.5	0.4
No-Battery Mode Power (W)	2.2	1.4	0.3	0.3
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	37.73	9.91	4.57	3.01
MSP [$]	$3.79	$6.76	$12.71	$18.34

DOE did not receive any specific comments on its product class 4 engineering results in the preliminary analysis, but its revised results are presented in Table IV–19.

Table IV-20 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	1195.5	1180.0
Maintenance Mode Power (W)	21.2	11.9	8.0	0.0
No-Battery Mode Power (W)	20.1	11.6	4.2	0.0
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	84.60	56.09	29.26	15.35
Incremental MSP [$]	$18.48	$21.71	$15.69	$127.00

DOE did not receive any specific comments on its product class 5 engineering results in the preliminary analysis, but its revised results are presented in Table IV–20.

Table IV-21 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	561.0	536.4
Maintenance Mode Power (W)	10.6	6.0	4.0	0.0
No-Battery Mode Power (W)	10.0	5.8	2.1	0.0
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	120.60	81.72	38.33	16.79
Incremental MSP [$]	$18.48	$21.71	$15.69	$127.00

For product class 6, DOE performed additional product testing for the NOPR, 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 TSD. In order 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 wheelchairs, 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[36] will be reduced.

For the NOPR, DOE examined 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–21. 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. Additionally, DOE discussed with manufacturers about how costs may differ in manufacturing a 12 V (product class 5) charger versus a 24 V (product class 6) charger. Manufacturers indicated 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 MSP's for product class 6 that were developed from iSuppli tear down data for product class 5. DOE believes these costs are an accurate representation of the MSPs and seeks comment on its methodology in scaling the results of product class 5 to product class 6, including the decision to hold MSPs constant.

Table IV-22 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 did not receive any specific comments on its product class 7 results in the preliminary analysis, but its revised results are presented in Table IV–22.

Table IV-23 Product Class 8 (Low-Voltage DC Input) Engineering Analysis Results

	CSL 0	CSL 1	CSL 2	CSL 3
CSL Description	Baseline	Intermediate	Best in Market	Max Tech
24 Hour Energy (Wh)	10.4	8.4	3.7	3.1
Maintenance Mode Power (W)	0.3	0.2	0.1	0.04
No-Battery Mode Power (W)	0.0	0.0	0.0	0.0
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	0.90	0.66	0.24	0.19
MSP [$]	$5.90	$3.26	$5.77	$5.95

Product class 8 (e.g. MP3 players and smartphones) consists of devices that charge with a DC input of less than 9 V, which is mostly those products that charge via USB connections. When DOE analyzed this product class it tested and tore down 3 devices, one for CSL 0, 1, and 2; and all of which were MP3 players.

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[36] In electrical circuits, I^2R losses manifests themselves as heat and are the result of high levels of current flow through a device.

DOE's analysis projects a significant drop in MSP from CSL 0 to CSL 1. See Table IV–23. Because of this drop, DOE tentatively believes that at least one of its trial standard levels for this product class meets DOE's criteria for being economically justified and technologically feasible. However, the baseline unit MSP for this analysis may be inflated due to the cost of the particular integrated circuit used in that unit. The integrated circuit used in this device performs additional functions besides battery charging and constitutes a significant portion of the bill of materials generated by iSuppli. DOE was unable to determine what portion of the integrated circuit was dedicated to battery charging and therefore, kept the entire cost of the component in its bill of materials. Because of this factor and the minimal differences in energy consumption between each CSL for product class 8, DOE is considering an alternative approach in addition to its proposed standard. Both the proposed standard and the alternative approach are outlined in 0 and, as with all other product class data, DOE seeks comment on its MSP projections for product class data.

Table IV-24 Product Class 9 (High-Voltage DC Input) Engineering Analysis Results

	CSL 0	CSL 1	CSL 2
CSL Description	Baseline	Intermediate	Best in Market
24 Hour Energy (Wh)	48.1	13.5	8.1
Maintenance Mode Power (W)	1.8	0.2	0.2
No-Battery Mode Power (W)	0.0	0.1	0.1
Off-Mode Power (W)	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	0.79	0.26	0.13
MSP [$]	$1.94	$2.77	$3.02

For the preliminary analysis, DOE scaled the results of other product classes to obtain results for product class 9. The results of DOE's revised analysis, based on test and teardown results, are shown in Table IV–24.

Table IV-25 Product Class 10 (AC Input, AC Output) Engineering Analysis Results

	CSL 0	CSL 1	CSL 2	CSL 3
CSL Description	Baseline	Intermediate	Best in Market	Max Tech
24 Hour Energy (Wh)	-	-	-	-
Maintenance Mode Power (W)	2.2	0.7	0.5	0.2
No-Battery Mode Power (W)	0.0	0.0	0.0	0.0
Off-Mode Power (W)	0.0	0.0	0.0	0.0
Unit Energy Consumption (kWh/yr)	19.27	6.13	4.00	1.50
Incremental Unit Energy Consumption (kWh/yr)	-	13.14	2.13	2.50
MSP [$]	$2.76	$3.93	$4.25	$4.64

As discussed previously, DOE believes that the engineering analysis results it developed in the preliminary analysis using manufacturer-supplied data provide an appropriate estimate of the cost-versus-UEC (or maintenance mode power) relationship for the battery charger embedded within a UPS. Also as discussed previously, DOE believes that this relationship is appropriate for UPSs, regardless of whether they have AVR. Consequently, DOE has used one set of engineering data, presented in Table IV–25 above, in all of the subsequent analyses (e.g. the LCC and NIA). DOE contends that this is an accurate approach because the technologies available in designing a battery charger used within a UPS are the same whether or not that UPS has AVR. The corresponding costs for these technologies would also result in the same MSP for the battery charger as a component of the UPS.

Finally, in the preliminary analysis, DOE developed cost-efficiency curves based on both manufacturer interviews and when possible, test and teardown results. As a result of some differences in these curves, NEEP suggested that DOE should reconcile differences in the results obtained from manufacturer data and from teardowns. (NEEP, No. 51 at p. 4)

The data obtained from teardowns that was available at the time of manufacturer interviews was included in the interview guide and discussed at those meetings. DOE continued to conduct teardowns after those meetings and has added data that will be available for public comment. Through that process, DOE seeks to continue to refine its analysis and to mitigate any differences between the teardown and manufacturer data.

j. Scaling of Battery Charger Candidate Standard Levels

To establish its proposed energy conservation standards for products with all battery energies and battery voltages within a product class, DOE developed 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. DOE had initially raised the possibility of using UEC as a function of battery energy. DOE also indicated that it might base this UEC function on the test data that had been obtained up through the preliminary analysis.[37]

Numerous interested parties submitted comments regarding the potential scaling methodology. AHAM generally supported DOE's proposed approach in which the UEC was scaled with regards to battery energy but suggested that DOE hold UEC constant below a certain value of battery energy because the fixed losses in these low-energy, lower power units begin to dominate and more stringent standards risk becoming overly restrictive on the ability of manufacturers to design useful products for consumers. AHAM also suggested that DOE consider UEC as a function of battery voltage. (AHAM, No. 44 at p. 9) PTI made similar suggestions and commented that it may be appropriate for UEC to remain constant for battery energies below the representative unit value. (PTI, No. 47 at p. 9)

The California IOUs suggested applying a single scaling relationship for active mode energy for product classes 2 through 7. For battery chargers with very high battery energies, such as those used in golf cars, the California IOUs believed that a flat or constant standard might be appropriate. (California IOUs, No. 43 at pp. 3–4) The California IOUs also argued that a potential scaling approach based on the test results of multi-capacity battery chargers would be inaccurate and argued that it should be dropped. They indicated that a scaling relationship based on such products would be demonstrative of products that are capable of using multiple batteries rather than products representative of the bulk of battery chargers, which are designed for a single specific battery. (California IOUs, No. 43 at p. 6) Finally, these commenters asserted that maintenance mode power and no-battery mode power should be regulated independently of battery energy, as many of the same design options are applicable to small and large energy battery chargers. Because of these similarities, the California IOUs asserted that all battery chargers, regardless of battery size, should be capable of the same level of performance in those modes of operation and DOE should assume this value is constant irrespective of battery energy. (California IOUs, No. 43, at p. 7)

DOE considered the comments it received and refined its scaling approach for the NOPR. In particular, DOE evaluated scaling approaches based on the battery voltage and the battery energy and found that the latter is a more appropriate way to model its scaling methodology. When DOE examined its test results, it noted a much weaker correlation between battery voltage and UEC than between battery energy and UEC. See TSD, appendix 5C. DOE also noticed from its test results that the individual performance parameters, such as maintenance mode power, no-battery mode power, and 24-hour energy, could be formulated as functions of battery energy. See TSD, Chapter 5. For this reason, DOE did not follow the recommendation of the California IOUs to leave some performance parameters constant.

Additionally, DOE is proposing to scale UEC as a function of battery energy for golf cars. The TSD shows that, as battery energy increases, so too does the UEC because more energy is needed to charge the larger battery. See TSD, chapter 5 (discussing test results related to product classes 5, 6, and 7 that demonstrate the linear relationship between increasing battery energy and UEC). DOE also found that this trend was true for product class 10 devices (UPSs), which incorporate lead-acid batteries. The details on the scaling methodology for these products are also available in TSD chapter 5.

In contrast, for product classes 1 and 8 DOE is proposing that all devices within those product classes be required to meet one nominal standard. For these product classes, battery energy appeared to have little impact on the UEC's that were calculated. Accordingly, to account for these differences, DOE is tentatively proposing two separate approaches for scaling UEC based on these test results—i.e. one that scales with battery energy and another that remains at a single, nominal level.

DOE's scaling approach for the NOPR relies heavily on the test data that it has gathered throughout the rulemaking process. DOE examined each performance parameter individually and, when possible, looked at groups of product class test results. For example, product classes 2, 3, and 4 are similar products that use similar technologies and span the same battery energy ratings. In these cases, DOE examined all of these test results together. DOE also developed regression equations for each of the performance parameters needed to calculate UEC and ultimately, aggregated those equations with assumptions about usage profiles for each product class. That is, DOE examined test results for maintenance mode power, no-battery mode power, and 24-hour energy individually and relative to battery energy. From these data, DOE derived equations for each parameter as it relates to battery energy. Because each equation was a function of the same parameter, battery energy, each one could be combined with assumptions about product usage to develop a single UEC equation that was also a function of battery energy.

For product classes other than product classes 1, 8, and 10, DOE developed equations that use different slopes for different CSLs. For higher CSL equations in a given product class, the slope of the UEC line becomes smaller, which means that the line describing UEC versus battery energy becomes flatter. DOE found that when it filtered its test results and examined products with similar technologies (e.g. lithium-ion chemistry batteries) spanning a range of battery energy levels, the slope of the line generated for 24-hour energy correlated to the inverse of 24-hour efficiency, which is the ratio of measured battery energy to 24-hour energy, expressed as a percentage. Thus, as products became more efficient, the

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[37] At the preliminary analysis public meeting, DOE handed out a supplemental slide deck, which outlined preliminary ideas to scaling UEC based on test data and with respect to battery energy. See these slides available at: *http://www1.eere.energy.gov/buildings/appliance_standards/residential/battery_external_preliminaryanalysis_public_mtg.html.*

slope of the equation used to describe UEC versus battery energy became flatter.

Finally, DOE adopted the suggestions offered by AHAM and PTI regarding the treatment of small battery energies. 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.

For additional details and the exact CSL equations developed for each product class, please see TSD chapter 5.

D. Markups To Determine Product Price

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 chain, companies mark up the price of the product to cover business costs and profit margin. Given the variety of products that use battery chargers and EPSs, distribution varies depending on the product class and application. As such, DOE assumed that the dominant path to market establishes the retail price and, thus, the composite markup for a given application. The markups applied to end-use products that use battery chargers and EPSs are approximations of the battery charger and EPS markups.

In the case of battery chargers and EPSs, the dominant path to market typically involves an end-use product manufacturer (i.e. 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 or EPSs.

Retail prices for EPSs in product class H (e.g. EPSs for amateur radios) were readily available, as these devices are not typically bundled with a consumer application. Thus, using these retail prices and the component costs determined in its teardown analysis, DOE was able to derive markups for EPSs in product class H.

DOE typically calculates two markups for each product in the markups analysis. These are: 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 results from 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.

In the preliminary analysis public meeting, PTI commented that DOE neglected to take into account situations in which an EPS is purchased by a battery charger manufacturer to be integrated into a battery charger. In these cases, the completed battery charger (with integrated EPS) is sold to an OEM to be packaged with an end-use application. Philips explained that three markups would be applied to the MSP of these EPSs: One by the battery charger manufacturer, one by the OEM, and one by the retailer. (PTI, Pub. Mtg. Tr., No. 57 at p. 316)

DOE agrees that, for situations in which this additional step occurs, the battery charger manufacturer would need to cover its costs and profit margin with a markup. However, given DOE's assumption that the dominant path to market sets the final product price, it is only for those classes of EPS for which this is the most common path to market that the final product price would be affected. DOE believes that this situation would primarily apply to EPSs that exclusively provide power to a stand-alone battery charger, such as EPSs for power tools, garden-care equipment, and other applications with detachable batteries. As explained in section IV.A.1 above, DOE did not quantify savings for EPSs that cannot directly power an end-use consumer product (*i.e.,* EPSs that only provide power to a battery charger), and, therefore, DOE did not quantify markups for these ''indirect operation'' EPSs. The remaining EPSs that power battery chargers can also power an application directly, meaning that the EPS is not exclusively a component of the battery charger. Instead, it is a component of the application itself, *e.g.,* a notebook computer. In those cases, DOE assumes that it is more common that the OEM, rather than the battery charger manufacturer, sources the EPS, making a third markup unnecessary.

AHAM commented that engineering costs to integrate a battery charger into an end-use consumer product are typically higher than those for an EPS, and it may be inappropriate to apply an incremental markup to battery chargers at the OEM stage that is lower than the baseline markup. (AHAM, Pub. Mtg. Tr., No. 57 at p. 325)

To calculate incremental markups, DOE subtracted ''selling, general, and administrative expenses'' (SG&A) from net profit to yield operating profit. Dividing this amount by the revenue value yields an incremental markup. By subtracting SG&A from net profit, DOE assumes that indirect costs (such as indirect labor and overhead) remain constant when a product becomes more efficient and, therefore, do not need to be accounted for in the incremental markup. Given that SG&A does not include research and development (R&D) or engineering costs, any direct labor, R&D, engineering, and other direct expenses that OEMs incur when integrating a more efficient battery charger into an application are assumed to be recovered through the incremental markup.

Chapter 6 of the TSD provides additional detail on the markups analysis.

E. Energy Use Analysis

DOE estimated the annual energy use of products in the field as they are used by consumers. The energy use analysis provides the basis for other analyses, particularly assessments of the energy savings and the savings in consumer operating costs that could result from DOE's adoption of new or amended standards. While the DOE test procedure provides standardized results that can serve as the basis for comparing the performance of different products used under the same conditions, the energy use analysis seeks to capture the range of operating conditions for battery chargers and EPSs in the United States.

Battery chargers and EPSs are power conversion devices that transform input voltage to a suitable voltage for the end-use application or battery they are powering. A portion of the energy that flows into a battery charger or EPS flows out to a battery or end-use product and, thus, cannot be considered to be consumed by the battery charger or EPS. However, to provide the necessary output power, other factors contribute to battery charger and EPS energy consumption—e.g. internal losses and overhead circuitry.[38] Therefore, the

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[38] Internal losses are energy losses that occur during the power conversion process. Overhead circuitry refers to circuits and other components of

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 battery chargers and EPSs. Instead, DOE considered energy consumption to be the energy dissipated by the battery charger or EPS (losses) and not delivered to the end-use product or battery as a more accurate means to determine the energy consumption of these products. Once the energy and power requirements of those end-use products and batteries were determined, DOE considered them fixed, and DOE analyzed only how standards would affect the energy consumption of the battery chargers and EPSs themselves.

DOE applied a single usage profile for each application to calculate the unit energy consumption for battery chargers and EPSs. However, usage varies by application and among users. DOE examined the usage profiles of multiple user types for applications where usage varies widely (for example, a light user and a heavy user or an amateur user and professional user). AHAM suggested that DOE revisit, and possibly revise, its usage profile assumptions for the NOPR stage analyses. (AHAM, No. 42 at p. 8) As new information became available and analytical methodologies were altered, DOE revisited its usage profile assumptions to ensure the accuracy of its NOPR analyses. As part of its NOPR analysis, DOE re-examined its initial usage profiles in the following ways:

- New applications were added or existing applications were combined;
- Existing applications were divided into applications used in a commercial setting and applications used in a residential setting;
- New sources (such as published studies or data from stakeholders) were made available or new data were provided to DOE; and/or
- Tested charge times indicated that DOE's usage profiles were in need of revision.

DOE also explored high- and low-savings scenarios in an LCC sensitivity analysis. Values that varied in this sensitivity analysis included battery charger and EPS usage profiles and EPS loading points. Varying these values allowed DOE to account for uncertainty in the average usage profiles and explore the effect that usage variations might have on energy consumption, life-cycle cost, and payback. Additional information on this sensitivity analysis is contained in appendix 8B to the TSD.

DOE does not assume the existence of a rebound effect, in which consumers would increase use in response to an increase in energy efficiency and resulting decrease in operating costs. For BCs and EPSs, DOE expects that, in light of the small amount of savings expected over the course of the year, the rebound effect is likely to be negligible because consumers are unlikely to notice the decrease in operating costs that would result from new standards for these products.

At the preliminary analysis public meeting, PG&E, through its consultant Ecos, commented that DOE should adopt the simplified approach to battery charger usage profiles being pursued by California. It claimed that the wide variety of end-use applications and end users makes it infeasible to accurately characterize usage for battery chargers. It recommended instead that DOE assign all applications to one of two categories: those that are charged rarely (such as battery chargers for uninterruptible power supplies and other backup batteries) and those that are charged sometimes (all other battery chargers). (Ecos/PG&E, Pub. Mtg. Tr., No. 57 at p. 30) In a joint letter submitted to DOE, energy efficiency advocates echoed these sentiments and suggested that DOE group products into one of two possible general duty cycles: 'charged some of the time' and 'almost always in maintenance mode.''' (PG&E, et al., No. 47 at p. 2) In the preliminary analysis public meeting, PTI commented that taking into account usage profiles to analyze annual energy consumption is the correct approach because it is the only way to express meaningful savings to the public. PTI reiterated its support for DOE's proposed approach in its written comments, claiming that increased detail allows for a more accurate understanding of variations in use and a basis for estimating actual energy consumption. PTI also stated that it ''believe[s] that the subsequent UEC calculation based upon usage patterns provides a meaningful measure of energy use.'' (PTI, Pub. Mtg. Tr., No. 57 at p. 378 and No. 45 at pp. 7–8) AHAM supported the continued use of usage profiles in estimating unit energy consumption and emphasized that, because of their critical nature, usage profiles should be more exact, not simplified. (AHAM, Pub. Mtg. Tr., No. 57 at p. 376 and No. 42 at p. 8)

In developing its usage profiles, DOE relied on empirical data for more than 40 applications. These data primarily consisted of user surveys, metering studies, and stakeholder input. Collectively, the analyzed applications for which DOE has empirical usage data accounted for more than 80 percent of annual aggregate battery charger energy use, because the available data focused mainly on the more common, high-powered, and high-use applications. Usage profiles for the remaining applications were derived from these known usage profiles. DOE recognizes that the calculation of usage profiles is not an exact science, but is confident that energy use and potential savings can be more accurately estimated if application-specific use is taken into account. Therefore, based on data and arguments presented to DOE to date, DOE is proposing to continue to use the same basic approach to battery charger usage profiles that it used in the preliminary analysis.

Philips questioned DOE's initial assumption during the preliminary analysis phase that seldom-used applications, such as beard and mustache trimmers, are plugged in, on average, one hour per day. Instead, Philips stated that such products are rarely charged and the potential energy savings from regulating battery chargers and EPSs that power these products would be very small. (Philips, Pub. Mtg. Tr., No. 57 at pp. 130–131) AHAM commented that many of the products that DOE assumes to be charged for one hour per week, such as personal care products and other portable appliances, are typically charged less frequently. (AHAM, No. 42 at p. 6)

DOE's usage profiles are intended to represent an average usage scenario across all users, rather than any particular type of user. DOE recognizes that while many users likely have these products plugged in for less than one hour per day, others (specifically those with cradle chargers) tend to leave these products plugged in for more than one hour per day. Some users may rarely, if ever, unplug their chargers. Given these possible variations in usage, DOE revisited its assumed usage profiles for personal care products and other infrequently charged products. DOE opted to leave its usage profiles for beard and mustache trimmers and hair clippers unchanged in the reference case, but also to explore high- and low-use scenarios in the LCC sensitivity analyses. Upon further analysis, DOE agrees with AHAM and Philips that some small, portable applications are charged, on average, less frequently than indicated in the preliminary analysis (1 hour per week). Thus, DOE reduced the amount of time in active and maintenance modes to 0.5 hours per week for air mattress pumps, mixers, blenders, handheld GPSs, and residential portable printers. DOE also explored the effects of lower use for

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the EPS, such as monitoring circuits, logic circuits, and LED indicator lights, that consume power but do not directly contribute power to the end-use application.

other applications in the LCC sensitivity analysis.

Philips also suggested the following usage profile for battery chargers in product class 1 (inductive chargers for use in wet environments):

1. Active + Maintenance = 17.25 hr/day
2. Unplugged = 6.48 hr/day
3. No Battery = 0.11 hr/day
4. Off = 0 hr day
5. Charges per day = 0.048 (Philips, No. 41 at p. 2)

DOE's usage profile from its preliminary analysis, which was provided by PG&E (Ecos Consulting, No. 30), assumed that all products in product class 1 are cradle-charged and, thus, are never unplugged. While DOE tentatively agrees with Philips that some users unplug their chargers once the product is charged, PG&E's research suggests that Philips overestimated the number of users who unplug between charges (and by extension, the amount of time the average unit spends unplugged). Thus, for the NOPR, DOE used an average of the usage profiles provided by PG&E and Philips for its reference case usage profile. This resulted in a usage profile that assumed those products spend some time in unplugged mode, but less than the time suggested by Philips. High- and low-use scenarios for the applications in product class 1 were explored in the LCC sensitivity analysis.

Stanley Black & Decker commented that outdoor gardening appliances are typically used seasonally, and that the initial unit energy consumption values for these products that DOE had considered during the preliminary analysis phase should be reduced by half. It added, though, that DOE should maintain its lifetime assumptions from the preliminary analysis. (SBD, No. 44 at p. 1) DOE agrees that these products are typically used seasonally and notes that it had already accounted for seasonal use, as suggested by Stanley Black & Decker, when it created the usage profiles in the preliminary analysis. The usage profile that DOE used in the NOPR-stage analysis continues to apply a seasonal use assumption for these products.

Cobra Electronics claimed that the typical residential two-way radio is charged less than once per week, since residential consumers tend to use these products a few times per year. (Cobra, No. 51 at p. 2) DOE agrees that residential use of two-way radios is likely to be infrequent, but also recognizes that many of the two-way radios used by residential users are also available to commercial users, who charge these products far more frequently. In preparation of the NOPR analysis, DOE analyzed the energy use of the two-way radio application separately for those products charged in a residential setting and those products charged in a commercial setting. DOE assumed that two-way radios charged in a residential setting are charged infrequently, as was suggested by Cobra, while those charged in a commercial setting are charged more frequently.

Lester commented that ''the reduction in energy loss as estimated is overstated for golf cars due to mistaken assumptions about the duty cycle and corresponding energy use.'' (Lester, No. 53 at p. 2) DOE remains confident in its assumptions for golf car use, which are derived from manufacturer input. As it did for two-way radios, DOE divided the golf car application into two distinct applications: golf cars charged in the residential sector, and golf cars charged in the commercial sector. DOE's residential usage profile assumes less time in active use and, therefore, fewer charges per day, while DOE's commercial usage profile assumes heavier use. Given this heavier use, DOE assumed that commercial golf cars spend less time in maintenance mode, as they are typically used more frequently, and for longer durations, than are residential golf cars.

In response to comments from manufacturers that battery chargers in product class 2 that meet the baseline efficiency level may be slow chargers and designed for less frequent use or increased time in maintenance mode, the California IOUs commented that these products may not always be used infrequently, but rather can be used by some segments of the population on a daily basis. (California IOUs, No. 43 at p. 6)

DOE's usage profiles are designed to take into account the average use of all users, subject to the constraints of a given battery charger, such as a slow charge rate or quick discharge rate. DOE believes that it has accurately estimated the usage profiles of handheld vacuum cleaners (which are in no battery mode, on average, six minutes per day), cordless phones (which are in no battery mode, on average, more than two hours per day), and the usage profiles for the remaining applications in its analysis. These usage profiles reflect average use, and, therefore, account for infrequent and frequent users of these applications.

DOE recognizes that there is considerable variation in how individual consumers use battery chargers and EPSs for specific applications. This leads to some uncertainty and disagreement over what an appropriate usage profile is for specific applications, such as power tools, personal care products, and other applications. In all cases, DOE used the best available data to derive reference case usage profiles for each application. For applications with highly variable use, DOE explored high- and low-use scenarios in an LCC sensitivity analysis. DOE continues to seek data and substantiated recommendations that will allow it to further refine its reference case usage profiles. (See Issue 12 under ''Issues on Which DOE Seeks Comment'' in section VII.E of this notice.)

Chapter 7 of the TSD provides additional detail on the energy use analysis.

F. Life-Cycle Cost and Payback Period Analyses

This section describes the LCC and payback period analyses and the spreadsheet model DOE used for analyzing the economic impacts of possible standards on individual consumers. Details of the spreadsheet model, and of all the inputs to the LCC and PBP analyses, are contained in chapter 8 and appendix 8A of the TSD. DOE conducted the LCC and PBP analyses using a spreadsheet model developed in Microsoft Excel. When combined with Crystal Ball (a commercially-available software program), the LCC and PBP model generates a Monte Carlo simulation[39] to perform the analysis by incorporating uncertainty and variability considerations.

The LCC analysis estimates the impact of a standard on consumers by calculating the net cost of a battery charger or EPS under a base-case scenario (in which no new energy conservation standard is in effect) and under a standards-case scenario (in which the proposed energy conservation standard is applied). The base-case scenario is determined by the efficiency level that a sampled consumer currently purchases, which may be above the baseline efficiency level. The life-cycle cost of a particular battery charger or EPS is composed of the total installed cost (which includes manufacturer selling price, distribution chain markups, sales taxes, and any installation cost), operating expenses (energy and any maintenance costs), product lifetime, and discount rate. As noted in the preliminary analysis, DOE considers installation costs to be zero for battery chargers and EPSs.

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[39] Monte Carlo simulations model uncertainty by utilizing probability distributions instead of single values for certain inputs and variables.

The payback period is the change in purchase expense due to a more stringent energy conservation standard, divided by the change in annual operating cost that results from the standard. Stated more simply, the payback period is the time period it takes to recoup the increased purchase cost of a more-efficient product through energy savings. DOE expresses this period in years.

Table IV–26 summarizes the approach and data that DOE used to derive the inputs to the LCC and PBP calculations for the preliminary analysis and the changes made for today's proposed rule. The following sections discuss these inputs and comments DOE received regarding its presentation of the LCC and PBP analyses in the preliminary analysis, as well as DOE's responses thereto.

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Table IV-26 Summary of Inputs and Key Assumptions Used in the Preliminary Analysis and NOPR LCC Analyses

Inputs	September 2010 Preliminary Analysis	Changes for the Proposed Rule
Manufacturer Selling Price	Derived from the Engineering Analysis through manufacturer interviews (battery chargers and EPSs) and test/teardown results (battery chargers only).	Used same methodology, but conducted additional test/teardowns and interviews.
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.	Used same methodology with additional data sources. See chapter 6 of the TSD for details.
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 Cost	Assumed to be zero.	No change.
Maintenance Cost	Assumed to be zero.	Included the cost of repurchasing a battery that fails within the application lifetime. Accounted for the incremental cost of a lithium ion battery over a nickel chemistry battery, only for CSL 2 or higher.
Unit Energy Consumption	Determined for each application based on estimated loading points and usage profiles (for EPSs), and battery characteristics and usage profiles (for battery chargers).	Used same methodology with additional data sources. See chapter 7 of the TSD for details.
Electricity Prices	Price: Based on EIA's 2008 Form EIA-861 data.[3] Variability: Regional energy prices determined for 13 regions.	Price: No change. The 2008 Form EIA-861 is the most current source available. DOE also considered subgroup analyses using electricity prices for low-income consumers and top tier marginal price consumers. Variability: No change.
Electricity Price Trends	Forecasted with EIA's Annual Energy Outlook Early Release 2010.[4]	Updated with EIA's Annual Energy Outlook 2010.[5]
Lifetime	Determined for each application based on multiple data sources.	Used same methodology with additional data sources. See chapter 3 of the TSD for details.
Discount Rate	Residential: Approach based on the finance cost of raising funds to purchase and operate battery chargers or EPSs either through the financial cost of any debt incurred (based on the Federal Reserve's Survey of Consumer Finances data[6] for 1989, 1992, 1995, 1998, 2001, 2004, and 2007) or the opportunity cost of any equity used. Time-series data was based on arithmetic means from 1979-2009. Commercial: Derived discount rates using the cost of capital of publicly-traded firms based on data from Damodaran Online,[7] the Value Line Investment survey,[8] and the Office of	Residential: DOE updated the calculations to consider the geometric means for all time-series data from 1980-2009. Commercial: DOE updated the risk-free rate to use a 40-year average return on 10-year treasury notes, as reported by the U.S. Federal Reserve.[10] DOE updated the equity risk premium to use the geometric average return on the S&P 500 over a 40-year time period.

	Management and Budget (OMB) Circular No. A-94.[9]	
Sectors Analyzed	All reference case results used the residential sector inputs. Commercial sector results were presented in Appendix 8B as a sensitivity analysis.	All reference case results represent a weighted average of the residential and commercial sectors.
Base Case Market Efficiency Distribution	All market efficiency distributions were constant across representative units and product classes. Distributions were derived from test results.	Where possible, DOE derived market efficiency distributions for specific applications within a representative unit or product class.

[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. November, 2010. Washington, D.C. Available at: http://www.eia.doe.gov/cneaf/electricity/page/eia861.html.

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

[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] The Federal Reserve Board, Survey of Consumer Finances 1989, 1992, 1995, 1998, 2001, 2004, 2007. Available at: http://www.federalreserve.gov/pubs/oss/oss2/scfindex.html.

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

[8] Value Line. Value Line Investment Survey. 2010. Available at: http://www.valueline.com.

[9] 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/.

[10] The Federal Reserve Board, Federal Reserve Statistical Release, Selected Interest Rates, Historical Data, Instrument: Treasury Constant Maturities, Maturity: 10-year, Frequency: Annual, Description: Market yield on U.S. Treasury securities at 10-year constant maturity, quoted on investment basis. Available at: http://www.federalreserve.gov/releases/H15/data.htm.

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1. Manufacturer Selling Price

As in the preliminary analysis, DOE used a combination of test and teardown results and manufacturer interview results to develop manufacturer selling prices. DOE conducted tests and teardowns on a large number of additional units and applications for the NOPR, and incorporated these findings into the MSP. Further detail on the MSPs can be found in chapter 5 of the 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, 76 FR 9696) stating that DOE may consider improving regulatory analysis by addressing equipment price trends. In the NODA, DOE proposed that when sufficiently long-term data are available on the cost or price trends for a given product, it would analyze the available 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 EPSs and of sufficient historical Producer Price Index (PPI) data for small electrical appliance manufacturing from the Bureau of Labor Statistics' (BLS),[40] DOE could not use this approach. This situation is partially due to the nature of EPS and battery charger design. EPSs and 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 and EPSs. However, DOE believes that these indexes are sufficiently broad that they may not accurately capture the trend for battery chargers and EPSs. Furthermore, battery chargers and EPSs are not typical consumer products; they are more like a commodity that OEMs purchase.

Given the uncertainty, DOE is not incorporating product price changes into today's NOPR. For the NIA, DOE also analyzed the sensitivity of results to three alternative battery chargers and EPSs price forecasts. Appendix 10–B of the NOPR TSD describes the derivation of alternative price forecasts.

DOE requests comments on the most appropriate trend to use for real battery charger and EPS prices, both in the short run (to 2013) and the long run (2013–2042).

2. 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

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

markups can be found in chapter 6 of the TSD.

3. Sales Tax

As in the preliminary analysis, 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 NOPR, DOE retained this methodology and used updated sales tax data from the Sales Tax Clearinghouse.[41] The U.S. Census Bureau population estimates used in the preliminary analysis are the most current data available.[42]

4. Installation Cost

As detailed in the preliminary analysis, DOE considered installation costs to be zero for battery chargers and EPSs because installation would typically entail a consumer simply unpacking the battery charger or EPS from the box in which it was sold and connecting the device to mains power and its associated product or 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.

5. Maintenance Cost

In the preliminary analysis, DOE did not consider repair or maintenance costs for battery chargers or EPSs. In making this decision, DOE recognized that the service life of a battery charger or EPS typically exceeds that of the consumer product with which it is designed to operate. Thus, a consumer would not incur repair or maintenance costs for a battery charger or EPS. Also, if a battery charger or EPS failed, DOE expects that consumers would typically discard the battery charger or EPS and purchase a replacement. DOE received no comments challenging this assumption and has continued relying on this assumption for purposes of calculating the NOPR's potential costs and benefits.

Although DOE did not assume any repair or maintenance costs would apply generally to battery chargers or EPSs, DOE has considered including a maintenance cost for the replacement of lithium ion batteries in certain battery charger applications. Through conversations with manufacturers, 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. nickel metal-hydride or ''Ni-MH''), as explained in chapter 5 of the TSD. DOE accounted for this marginal cost increase in these applications at CSLs that use 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. Further detail on maintenance costs can be found in chapter 8 of the TSD.

6. Product Price Forecast

As noted in section IV.F., to derive its central estimates DOE assumed no change in battery charger and EPS prices over the 2013–2042 period. In addition, DOE conducted a sensitivity analysis using three alternative price trends based on AEO indexes. These price trends, and the NPV results from the associated sensitivity cases, are described in appendix 10–B of the NOPR TSD.

7. Unit Energy Consumption

The NOPR analysis uses the same approach for determining UECs as the one used in the preliminary analysis. The UEC was determined for each application based on estimated loading points and usage profiles (for EPSs), and battery characteristics and usage profiles (for battery chargers). DOE refined the usage profiles, battery characteristics, and usage profiles for the NOPR. Further detail on the UEC calculations can be found in chapter 7 of the TSD.

8. Electricity 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 data in EIA's Form EIA–861.

In its written comments, NEEP stated that the high electricity prices in the Northeast region of the United States would likely make the LCC and PBP results more attractive for customers in this region. (NEEP, No. 49 at p. 2) Typically, higher energy costs increase a consumer's operating cost savings. As in the preliminary analysis, DOE sampled a regional electricity price for each trial of the Monte Carlo simulation. Additionally, the electricity price for the Northeast region used by DOE's analysis is greater than the national average. DOE estimates a residential electricity price of $0.166/kWh for the New England region and $0.181/kWh for the state of New York, which exceeds the national average of $0.112/kWh. Further detail on regional electricity price sampling is available in chapter 8 of the TSD.

9. Electricity Price Trends

To project electricity prices to the end of the product lifetime in the preliminary analysis, DOE used data from EIA's *Annual Energy Outlook (AEO) 2010 Early Release.*[43] This data source only contained a reference case scenario, which required DOE to separately project the high- and low-economic-growth scenarios using the relationship between the scenarios in the AEO 2009 data.[44] For the NOPR, DOE used the final release of the AEO 2010,[45] which contained reference, high- and low-economic-growth scenarios.

10. Lifetime

DOE considers the lifetime of a battery charger or EPS 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 or EPS is purchased for use with a single associated application, DOE assumed that it will remain in service for as long as the application does. Even though many of the technology options to improve battery charger and EPS efficiencies may result in an increased useful life for the battery charger or EPS, the lifetime of the battery charger or EPS is still directly tied to the lifetime of its associated application. With the exception of EPSs for mobile phones and smartphones (see

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

[42] The U.S. Census Bureau. Annual Estimates of the Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2009. *http://www.census.gov/popest/states/tables/NST–EST2009–01.xls.*

[43] U.S. Department of Energy. Energy Information Administration. Annual Energy Outlook 2010 Early Release. March, 2010. Washington, DC. Available at: *http://www.eia.doe.gov/oiaf/aeo/.*

[44] U.S. Department of Energy. Energy Information Administration. Annual Energy Outlook 2009 with Projections to 2030. March, 2009. Washington, DC. Available at: *http://www.eia.doe.gov/oiaf/aeo/.*

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

below), the typical consumer will not continue to use an EPS or 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. Further detail on product lifetimes and how they relate to applications can be found in chapter 3 of the TSD.

The one exception to the rule that EPSs do not exceed the lifetime of their associated end-use products is the lifetime of EPSs for mobile phones and smartphones. While the typical length of a mobile phone contract is 2 years, and thus many phones are replaced and no longer used after 2 years, DOE assumed that the EPSs for these products will remain in use for an average of 4 years. This assumption is based on an expected standardization of the market around micro-USB plug technology, driven largely by the GSMA Universal Charging Solution.[46] To verify that this evolution towards micro-USB plug technology is in fact taking place, DOE examined more than 30 top-selling basic mobile phone and smartphone models offered online by Amazon.com, Sprint, Verizon Wireless, T-Mobile, and AT&T. DOE found that all of the newest smartphone models other than the Apple iPhone use micro-USB plug technology. While some basic mobile phones continue to use mini-USB or other connector technologies, DOE found more than 15 basic mobile phone models that have adopted the micro-USB technology.

If new EPSs are compatible with a wide range of mobile phone and smartphone models, a consumer may continue to use the EPS from their old phone after upgrading to a new phone. Even though it is currently standard practice to receive a new EPS with a phone upgrade, DOE assumes that in the near future consumers will no longer expect manufacturers to include an EPS with each new phone. DOE requests comment from stakeholders on the reasonableness of this assumption. Tables IV–27 and IV–28 show that assuming a lifetime of 2 years (rather than 4 years) for mobile phone and smartphone EPSs results in lower life-cycle cost savings (or greater net costs) for consumers of those products. However, the net effect on Product Class B as a whole is negligible due to the fact that mobile phones and smartphones together comprise only 7 percent of shipments in Product Class B. LCC results for all other applications in Product Class B are shown in chapter 11 of the TSD.

Table IV-27 EPS Life-Cycle Cost Savings with 4-Year Lifteime Assumptions

	Weighted Average LCC Savings for a Standard at the Given CSL [*2010$*]			
	CSL 1	**CSL 2**	**CSL 3**	**CSL 4**
Mobile Phones	0.06	(0.01)	(0.12)	(0.15)
Smartphones	0.05	(0.02)	(0.13)	(0.16)
Product Class B Shipment-Weighted Average	0.18	0.21	0.16	(0.99)

Table 28 EPS Life-Cycle Cost Savings with Alternative (2-year) Lifetime Assumptions

	Weighted Average LCC Savings for a Standard at the Given CSL [*2010$*]			
	CSL 1	**CSL 2**	**CSL 3**	**CSL 4**
Mobile Phones	(0.02)	(0.19)	(0.34)	(0.40)
Smartphones	(0.02)	(0.18)	(0.31)	(0.38)
Product Class B Shipment-Weighted Average	0.18	0.20	0.15	(1.01)

11. Discount Rate

In the preliminary analysis, DOE 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. 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 and debt using SCF data and other sources. The mean real effective rate across the classes of household debt and equity, weighted by the shares of each class, is 5.6 percent.

For the commercial sector, DOE derived the discount rate from the cost of capital of publicly-traded firms falling in the categories of products that involve the purchase of battery chargers or EPSs. To obtain an average discount rate value for the commercial sector, DOE used the share of each category in total paid employees provided by the U.S. Census Bureau[47] and Federal,[48] State, and local[49] governments. By multiplying the discount rate for each category by its share of paid employees, DOE derived a commercial discount rate of 7.0 percent.

For the NOPR analysis, DOE uses the same methodology employed in the preliminary analysis but has changed the calculations to account for the

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[46] The GSMA Universal Charging Solution is an agreement between 17 mobile operators and manufacturers to have the majority of all new mobile phones support a universal charging connector by January 1, 2012. The press release for the agreement can be accessed here: <*http://www.gsma.com/articles/mobile-industry-unites-to-drive-universal-charging-solution-for-mobile-phones/17752/*>.

[47] U.S. Census Bureau. The 2010 Statistical Abstract. Table 607—Employment by Industry. *http://www.census.gov/compendia/statab/2010/tables/10s0607.xls.*

[48] U.S. Census Bureau. The 2010 Statistical Abstract. Table 484—Federal Civilian Employment and Annual Payroll by Branch. *http://www.census.gov/compendia/statab/2010/tables/10s0484.xls.*

[49] U.S. Census Bureau. Government Employment and Payroll. 2008 State and Local Government. *http://www2.census.gov/govs/apes/08stlall.xls.*

geometric means for all time-series data. Additionally, the analysis now includes updates to the risk-free rate to use a 40-year average return on 10-year U.S. Treasury notes, as reported by the U.S. Federal Reserve,[50] and the equity risk premium—which now uses the geometric average return on the S&P 500 over a 40-year time period. The new discount rates are estimated to be 5.1 percent and 7.1 percent in the residential and commercial sectors, respectively. For further details on discount rates, see chapter 8 and appendix 8D of the TSD.

12. Sectors Analyzed

In the preliminary analysis, DOE analyzed battery chargers and EPSs in the residential sector for the reference case scenario and presented commercial sector results in appendix 8B. DOE developed several inputs specifically for the commercial sector, such as energy prices, energy price trends, and discount rates. Other application-specific inputs—e.g. UEC, markups, and market distribution—were not altered between the residential sector and commercial sector analyses.

The NOPR analysis includes an examination of a weighted average of the residential and commercial sectors as the reference case scenario. Additionally, all application inputs are 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 provides more specificity as to the appropriate input values for each sector, and permits an examination of the LCC results for a given representative unit or product class in total. For further details on sectors analyzed, see chapter 8 of the TSD.

13. Base Case Market Efficiency Distribution

For purposes of conducting the LCC analysis, DOE analyzed candidate standard levels 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 2013 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.

The preliminary analysis contained base case market efficiency distributions for each representative unit or product class. The distributions were based on test results, shipment-weighting of applications, and trends in efficiency that DOE identified. Under this approach, the resulting efficiency distribution could be heavily influenced by one or two very common applications associated with a particular product class or representative unit.

In preparing the NOPR analysis, DOE derived base case market efficiency distributions that are 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. For battery chargers, DOE also adjusted its efficiency distributions for pending efficiency regulations in California (for more information please see IV.G.4). As a result, the updated analysis more accurately accounts for LCC and PBP impacts.

14. Compliance Date

The compliance date is the date when a new standard becomes operative, i.e., the date by which battery charger and EPS 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 2013. EPCA had prescribed that DOE complete a rulemaking to amend the Class A EPS standards by July 2011 and had given manufacturers a two-year lead time to satisfy those standards—i.e., July 2013. (42 U.S.C. 6295(u)(3)(D)(i)(II)(bb). Given the timing in issuing this rule, DOE may choose to retain this prescribed two-year lead time for EPS manufacturers in spite of the compliance date currently provided in EPCA. There are no similar requirements for the compliance date for battery charger and new (non-Class A) EPS standards, but DOE is also targeting a two-year time period between publication and compliance. 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 (2013). However, DOE bases the cost of the equipment on the most recent available data; all dollar values are expressed in 2010$. DOE invites comment on the compliance date it should provide manufacturers in light of the current set of circumstances.

15. Payback Period Inputs

The PBP is the amount of time a consumer needs to recover the assumed additional costs of a more-efficient product through lower operating costs. As in the preliminary analysis, DOE used a ''simple'' PBP for the NOPR, because the PBP does not take into account other changes in operating expenses over time or the time value of money. As inputs to the PBP analysis, DOE used the total installed cost of the product to the consumer for each efficiency level, as well as the first-year annual operating costs for each efficiency level. The calculation requires the same inputs as the LCC, except for energy price trends and discount rates; only energy prices for the year the standard becomes required for compliance (2013 in this case) are needed.

DOE received a single comment addressing its initial PBP analysis. In particular, Philips commented that DOE had underestimated the projected PBP for inductively charged toothbrushes (i.e., battery charger product class 1). (Philips, No. 43 at p. 2) DOE notes that payback periods comprise a metric demonstrating the underlying cost-effectiveness of a standard level. An underestimated PBP could result from an underestimated incremental consumer purchase price or an overestimated amount of operating cost savings. Philips suggested an alternate usage profile for battery charger product class 1 that included time spent in unplugged mode. (Philips, No. 41 at p. 2) In its view, the use of such an adjusted profile would provide a more accurate picture of the projected savings.

DOE agrees with Philips that battery chargers in product class 1 likely spend some time in unplugged mode and adjusted its usage profile accordingly. The usage profile for these products now includes time in unplugged mode, which resulted in a reduction in operating cost savings. In the NOPR, DOE refined many of its estimates for the inputs contributing to purchase price and operating costs. While DOE is confident in the accuracy of these inputs and the accompanying PBP calculations presented in this NOPR, DOE continues to seek comment to help refine its approach as needed.

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[50] The Federal Reserve Board, Federal Reserve Statistical Release, Selected Interest Rates, Historical Data, Instrument: Treasury Constant Maturities, Maturity: 10-year, Frequency: Annual, Description: Market yield on U.S. Treasury securities at 10-year constant maturity, quoted on investment basis. Available at: *http://www.federalfederalreserve.gov/releases/H15/data.htm.*

G. National Impact Analysis

The National Impact Analysis (NIA) assesses the national energy savings (NES) and the net present value (NPV) of total consumer costs and savings that would be expected to result from new or amended standards at specific efficiency levels. (''Consumer'' in this context refers to consumers of the product being regulated.) 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. For the NOPR analysis, DOE forecasted the energy savings, operating cost savings, product costs, and NPV of consumer benefits for products sold from 2013 through 2042.

DOE evaluates the 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 or amended energy conservation standards. DOE compares these projections with projections characterizing the market for each product class if DOE adopted new or amended standards at specific energy efficiency levels (*i.e.,* the TSLs or standards cases) for that class. For the base case forecast, DOE considers historical trends in efficiency and various forces that are likely to affect the mix of efficiencies over time. For the standards cases, DOE also considers how a given standard would likely affect the market shares of efficiencies greater than the standard.

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. MS Excel is the most widely used spreadsheet calculation tool in the United States and there is general familiarity with its basic features. Thus, DOE's use of MS Excel as the basis for the spreadsheet models provides interested parties with access to the models within a familiar context. The TSD and other documentation that DOE provides during the rulemaking help explain the models and how to use them, and interested parties can review DOE's analyses by changing various input quantities within the spreadsheet. The NIA spreadsheet model uses average values as inputs (as opposed to probability distributions).

For the current analysis, the NIA used projections of energy prices from the *AEO2010* Reference case. In addition, DOE analyzed scenarios that used inputs from the *AEO2010* High Economic Growth, Low Economic Growth, and Carbon Cap and Trade 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 TSD.

Table IV–29 summarizes the inputs and key assumptions DOE used in its preliminary NIA and the changes to the analysis for the NOPR. Discussion of these inputs and changes follows the table. See chapter 10 of the TSD for further details.

Table IV-29 Summary of Inputs, Sources and Key Assumptions for the National Impact Analysis

Inputs	Source	Key Assumptions
Base Year Shipments	Market Assessment	[Refer to the Market Assessment]
Shipment Growth Rate	Shipment Analysis	0.75 percent annually, equal to population growth
Lifetimes	Market Assessment	Battery charger and EPS lifetime is equal to the lifetime of the end-use product it powers.
Base Year Efficiencies	Market Assessment	[Refer to the Market Assessment]
Base-Case Forecasted Efficiencies	Shipments Analysis	Efficiency distributions remain unchanged throughout the forecast period
Standards-Case Forecasted Efficiencies	Shipments Analysis	”Roll-up” scenario
Annual Energy Consumption per Unit	Energy Use Analysis	Annual shipment weighted-average marginal energy consumption values for each product class
Improvement Cost per Unit	Engineering Analysis	Annual shipment weighted-average marginal cost values for each product class
Markups	Markups Analysis	[Refer to the Markups Analysis]
Repair and Maintenance Cost per Unit	None	Assumed to be zero
Energy Prices	AEO 2010	Trend extrapolation from 2035 to 2062
Electricity Site-to-Source Conversion Factor	AEO 2010	Conversion factor does not change after 2035
Discount Rate	Office of Management and Budget	Three and seven percent real
Compliance Date of Standard	EISA 2007 for EPSs	Compliance date for battery charger standards matches that specified in the statute for EPS standards (2013)

1. Shipments

Forecasts of product shipments are needed to forecast the impacts standards will have on the Nation. DOE develops shipment forecasts 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 or EPSs. 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.

Stakeholders submitted several comments questioning DOE's assumption in the preliminary analysis that shipment volumes would not be affected by new or amended standards. AHAM and PTI stated that certain products, such as hair clippers, cordless vacuum cleaners, electric shavers, and DIY power tools, are discretionary purchases for consumers. Because of the discretionary nature of these purchases, AHAM and PTI claimed, standards that cause significant increases in the end-use product's price may lead some families to forgo purchasing these products and find other means to meet their needs. These parties asked DOE to consider lower shipments in its standards case forecasts. (AHAM, No. 42 at pp. 14–15; PTI, No. 45 at p. 12) In addition, AHAM, CEA, and Cobra Electronics all stated that increases in product price could lead some manufacturers to substitute primary batteries for rechargeable batteries in certain products, *e.g.*, portable navigation devices and portable radios, reducing the number of battery chargers and EPSs for these products. (AHAM, No. 42 at p. 14; CEA, No. 46 at p. 3; Cobra, No. 51 at p. 2) Lastly, Stanley Black & Decker and Lester stated that increases in product price for battery-operated gardening products and golf cars could drive consumers toward their gasoline-powered equivalents. (SBD, No. 44 at p. 2; Lester, No. 50 at p. 3)

In response to these comments, 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, EPSs, or the end-use consumer products that DOE is analyzing in this rulemaking. Because some applications using battery chargers and EPSs, such as smartphones and videogame consoles, could be considered more discretionary than home appliances, which have an estimated relative price elasticity of −0.34 (See—*http://ees.ead.lbl.gov/bibliography/an_analysis_of_the_price_elasticity_of_demand_for_household_appliances*), 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, the standards being proposed today 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 0.03 percent for electric shavers to a decrease of 1.46 percent for DIY power tools with detachable batteries. Results for all battery charger applications are contained in appendix 9A to the TSD. The corresponding impacts on NES and NPV are included in appendix 10A. DOE did not conduct a similar analysis for EPS applications due to the small size of the price increases (relative to the price of EPS applications) expected to result from the EPS standards being proposed today.

2. Shipment Growth Rate

In the preliminary analysis, DOE noted that the market for battery chargers and EPSs has grown tremendously in the past 10 years. Additionally, DOE found that many market reports have predicted enormous future growth for the applications that employ battery chargers and EPSs. However, in forecasting the size of these markets over the next 32 years, DOE considered the possibility that much of the market growth associated with these products has already occurred. In many reports predicting growth of applications that employ battery chargers or EPSs, DOE noted that growth was predicted for new applications, but older applications were generally not included. That is, the demand for battery chargers and EPSs had not grown, but rather the products that use such devices had transitioned to a new product mix. (See chapter 9 of the Preliminary TSD.)

With this in mind, DOE took a conservative approach in its forecast and estimated that while the specific applications that use battery chargers or EPSs will change, the overall number of individual units that use battery chargers or EPSs will grow slowly, with new applications replacing some current applications, but with little change in per-capita consumption of battery chargers or EPSs over time.

To estimate future market size while assuming no change in the per-capita battery charger and EPS purchase rate, DOE used population growth rate as the compound annual market growth rate. DOE presented this approach to stakeholders for comment and received no comments objecting to its use. Population growth rate values were obtained from the U.S. Census Bureau 2009 National Projections, which forecast population through 2050. DOE took the average annual population growth rate, 0.75 percent, and applied this rate to all battery charger and EPS product classes. For the NOPR analysis, DOE continues to apply this scenario.

3. Product Class Lifetime

For the preliminary analysis, 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 remaining in use for each year following the initial year in which those units were shipped. For the NOPR analysis, DOE continued to apply this scenario.

For more information on the calculation of product class lifetime profiles, see chapter 10 of the TSD.

4. 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 or amended standards) and each of the standards cases. Section IV.A.2 above explains how DOE developed efficiency distributions (which yield shipment-weighted average efficiency) for battery charger and EPS product classes for the first year of the forecast period. To project the trend in efficiency over the entire forecast period, DOE considered recent standards, voluntary programs such as ENERGY STAR, and other trends.

DOE received two comments regarding the effect of European Union (EU) energy efficiency standards on the efficiency of battery chargers and EPSs in the U.S. market. AHAM commented that the EU is planning to begin a series of battery charger efficiency standards in 2011 that could have an effect on some non-wall-adapter battery chargers. (AHAM, No. 42 at p. 15) Similarly, Cobra Electronics commented that the EU's most recent energy efficiency standard for EPSs was established at international efficiency marking protocol level V. (Cobra, No. 51 at p. 3)

In the preliminary analysis, DOE found two programs that would influence EPS efficiency in the short term. The first is the ENERGY STAR program for EPSs (called ''external power adapters''), which specified that EPSs be at or above CSL 1 in order to qualify. This voluntary program was very active, with more than 3,300 qualified products as of May 2010.[51] The second program influencing EPS efficiency is the European Union Ecodesign requirements on Energy Using Products, which includes legislation on EPSs that requires that EPSs sold in the EU be at or above CSL 1, effective April 2011. Europe currently represents approximately one-third of the global EPS market. DOE did not identify any programs that required efficiency above CSL 1. These factors apply to Class A EPSs.

DOE agrees that standards established by the EU will affect the U.S. market, due to the global nature of EPS design, production, and distribution. With these programs in mind, DOE estimated that approximately half of the Class A EPS market at CSL 0 in 2009 would transition to CSL 1 by 2013. In updating its analysis for the NOPR, DOE reviewed these two programs for any changes. DOE found that no new European standards had been announced during the time between the preliminary analysis and the NOPR. However, in regard to the ENERGY STAR program, the U.S. Environmental Protection Agency announced that its program for EPSs would be cancelled effective December 31, 2010.[52] In preparing today's notice, DOE also noted that the European mobile phone industry agreed to adhere to the GSMA Universal Charging Solution, which incorporates a no-load (''standby'') power consumption

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[51] EPA, ''ENERGY STAR External Power Supplies AC–DC Product List,'' May 24, 2010 and EPA, ''ENERGY STAR External Power Supplies AC–AC Product List,'' May 24, 2010. Both documents last retrieved on May 28, 2010 from *http://www.energystar.gov/index.cfm?c=ext_power_supplies.power_supplies_consumers.*

[52] EPA, ''ENERGY STAR EPS EUP Sunset Decision Memo,'' July 19, 2010. Last retrieved on July 8, 2011 from *http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/eps_eup_sunset_decision_july2010.pdf.*

requirement that is stricter than both the current Federal standard and ENERGY STAR version 2.0 criteria.

In summary, DOE found no new evidence to support the long-term improvement of EPSs beyond the initial improvement of units as estimated during the preliminary analysis. Thus, DOE has maintained its earlier assumption that EPSs will not improve in efficiency after 2013 in the base case.

For battery charger efficiency trends, DOE considered three key factors: European standards, the EPA's ENERGY STAR program, and the recently approved battery charger standards in California.

The EU included battery chargers in a preparatory study on eco-design requirements that it published in January 2007. 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 2013 to account for European standards.

DOE examined the ENERGY STAR voluntary program for battery charging systems and found that as of January 22, 2010, less than 150 battery charging systems had been qualified. As of July 1, 2011, only 241 battery charging systems had been qualified.[53] (Contrast this with the more than 3,300 EPSs that were ENERGY STAR-qualified as of May 2010.) Given the small number of qualified products, DOE also did not adjust its battery charger efficiency distributions to account for any potential market effects of the ENERGY STAR program.

In the preliminary analysis, DOE found no battery charger standards slated to take effect by 2013. Subsequently, the California Energy Commission (CEC) approved battery charger standards on January 12, 2012 that will take effect on February 1, 2013 for most, if not all, of the battery chargers within the scope of DOE's rulemaking. Hence, 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 that California's share of the U.S. battery charger market is equivalent to its share of U.S. GDP (13 percent). Table IV–30 contrasts the resultant base case efficiency distributions, used in preparing today's notice, with those used in the preliminary analysis.

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[53] EPA, ''Qualified Product (QP) List for ENERGY STAR Qualified Battery Charging Systems.'' Retrieved on July 8, 2011 from *http://www.energystar.gov/ia/products/prod_lists/BCS_prod_list.xls.*

Table IV-30 Changes to Base Case Efficiency Distributions to Account for CEC Standards

DOE Product Class	CSL that Best Approximates the CEC Standard	Scenario	Percent of Battery Charger Market at Given CSL Prior to Federal Standards Taking Effect			
			CSL 0	CSL 1	CSL 2	CSL 3
1	0	Ref – Prelim.	77.8%	11.1%	11.1%	0.0%
		Ref. – NOPR	77.8%	11.1%	11.1%	0.0%
		Sensitivity Case	77.8%	11.1%	11.1%	0.0%
2	2	Ref – Prelim.	20.6%	25.7%	50.6%	3.1%
		Ref. – NOPR	17.9%	22.3%	56.6%	3.1%
		Sensitivity Case	0.0%	0.0%	96.9%	3.1%
3	2	Ref – Prelim.	19.5%	71.1%	9.4%	0.0%
		Ref. – NOPR	17.0%	61.8%	21.2%	0.0%
		Sensitivity Case	0.0%	0.0%	100.0%	0.0%
4	2	Ref – Prelim.	10.6%	45.1%	44.3%	0.0%
		Ref. – NOPR	9.2%	39.3%	51.5%	0.0%
		Sensitivity Case	0.0%	0.0%	100.0%	0.0%
5	3	Ref – Prelim.	32.4%	59.5%	8.1%	0.0%
		Ref. – NOPR	28.2%	51.8%	7.0%	13.0%
		Sensitivity Case	0.0%	0.0%	0.0%	100.0%
6	3	Ref – Prelim.	40.9%	33.4%	25.7%	0.0%
		Ref. – NOPR	35.5%	29.1%	22.4%	13.0%
		Sensitivity Case	0.0%	0.0%	0.0%	100.0%
7	1	Ref – Prelim.	50.0%	50.0%	0.0%	0.0%
		Ref. – NOPR	43.5%	56.5%	0.0%	0.0%
		Sensitivity Case	0.0%	100.0%	0.0%	0.0%
8	0	Ref – Prelim.	50.0%	40.0%	10.0%	0.0%
		Ref. – NOPR	50.0%	40.0%	10.0%	0.0%
		Sensitivity Case	50.0%	40.0%	10.0%	0.0%
10a/b	3	Ref – Prelim.	100.0%	0.0%	0.0%	0.0%
		Ref. – NOPR	87.0%	0.0%	0.0%	13.0%
		Sensitivity Case	0.0%	0.0%	0.0%	100.0%

DOE recognizes that the CEC standards may also raise the efficiency of battery chargers sold outside of California. However, the magnitude of this effect cannot 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 in 2013 meet the CEC standards. The base case efficiency distributions assumed in this sensitivity case are shown in Table IV–30. This scenario represents 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. In fact, under this scenario, DOE might be limited to setting standards only for product classes 1 and 8, as further improvements to the efficiency of products in the other product classes are not currently projected to be cost-effective. Results of this sensitivity analysis can be found in Appendix 8–B and Appendix 10–A.

DOE believes it is unlikely that all battery chargers sold in the United States will meet the CEC standards by February 1, 2013. First, manufacturers have been given an extremely short transition period of only one year; second, DOE's proposed standards are not as stringent as the CEC standards for product classes 2 through 6, which would potentially reduce the cost of production for these products and make it unlikely that they would be manufactured on a nationwide basis to the higher CEC levels; and third, the CEC standards will be preempted by

Federal standards in the future if DOE finalizes standards for these products, giving manufacturers the option of specifically producing products solely for the California market for an interim period.

DOE seeks comment on its assumptions concerning the impacts of the CEC standards on its base case efficiency distributions. In addition, DOE seeks comment on its assumptions about EPS efficiency, specifically, that EPSs within product classes B (DC output, basic-voltage), C (DC output, low-voltage), D (AC output, basic-voltage) and E (AC output, low-voltage) will improve in efficiency slightly prior to 2013, but then no longer improve in the absence of standards, and that EPSs within product classes X (multiple-voltage) and H (high-power) will not improve in efficiency in the absence of standards. (See issues 10 and 11 under ''Issues on Which DOE Seeks Comment'' in section VII.E of this notice.)

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.

In the preliminary analysis, DOE used a roll-up scenario to develop its forecasts of efficiency trends in the standards cases. The NOPR analysis also applies this scenario. For further details about the forecasted efficiency distributions, see chapter 9 of the TSD.

5. Product Price Forecast

As noted in section IV.F., DOE assumed no change in battery charger and EPS pricing over the 2013–2042 period. In addition, DOE conducted sensitivity analysis using three alternative price trends based on AEO indexes. These price trends, and the NPV results from the associated sensitivity cases, are described in appendix 10–B of the NOPR TSD.

6. 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 compared against one another to yield unit energy savings values for each CSL.

To better evaluate actual energy savings when calculating unit energy consumption for a product class at a given CSL, DOE considered only those units that would actually be at that CSL and did not consider any units already at higher CSLs. That is, the shipment-weighted average unit energy consumption for a CSL ignored any shipments from higher CSLs.

In addition, when calculating unit energy consumption for a product class, DOE used marginal energy consumption, which was taken to be the consumption of a unit above the minimum energy consumption possible for that unit. Marginal unit energy consumption values were calculated by subtracting the unit energy consumption values for the highest considered CSL from the unit energy consumption values at each CSL.

For the NOPR, DOE assumes that energy efficiency would not improve after 2013 in the base case. Therefore, the projected UEC values in the NOPR analysis, as well as the unit energy savings values, do not vary over time. In addition, 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.

For further details on the calculation of unit energy savings for the NIA, see chapter 10 of the NOPR TSD.

7. 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 CSL. In addition, when calculating unit costs for a product class, DOE uses that product class's marginal costs—the costs of a given unit above the minimum costs for that unit.

For further details on the calculation of unit costs for the NIA, see chapter 10 of the NOPR TSD.

8. Repair and Maintenance Cost per Unit

In the preliminary analysis, DOE did not consider repair or maintenance costs for battery chargers or EPSs because the vast majority cannot be repaired and do not require any maintenance. DOE maintains this assumption in its NOPR analysis.

For the NOPR analysis, 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 life-cycle cost and payback period 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 in calculating NPV. For further discussion of this issue, see section IV.F.5 above.

9. Energy Prices

In the preliminary analysis, DOE assumed that all energy consumption and savings would take place in the residential sector, and therefore any energy cost savings would be calculated using residential sector rates.

However, DOE is aware that many products that employ battery chargers and EPSs are located within commercial buildings. Given this fact, the energy cost savings from such products should be calculated using commercial sector rates, which are lower in value than residential sector rates, and would lower the overall financial benefits derived from energy savings in the NPV. In order to account for these products in the NOPR analysis, DOE considered the impacts of battery charger and EPS usage in a commercial setting.

In order to determine the energy usage split between the residential and commercial sector, DOE first separated products into residential and commercial categories. Then, for each product class, using shipment values for 2013, 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. This ratio was held constant throughout the period of analysis.

For further details on the calculation of sector-weighted energy prices for the NIA, see chapter 10 of the NOPR TSD.

10. Site-to-Source Energy Conversion

To estimate the national energy savings expected from appliance standards, DOE uses a multiplicative factor to convert site energy savings (at the home or commercial building) into primary or source energy savings (the energy required to convert and deliver the site energy). These conversion factors account for the energy used at power plants to generate electricity and losses in transmission and distribution, as well as for natural gas losses from pipeline leakage and energy used for pumping. For electricity, the conversion factors vary over time due to projected changes in generation sources (*i.e.,* the power plant types projected to provide electricity to the country). The factors that DOE developed are marginal values, which represent the response of the system to an incremental decrease in consumption associated with appliance standards.

In the preliminary analysis, DOE used annual site-to-source conversion factors based on reported values in *AEO2010,* which provides energy forecasts through 2035. For 2036–2062, DOE used conversion factors that remain constant at the 2035 values. For the NOPR, DOE continued to use this approach.

Section 1802 of the Energy Policy Act of 2005 (EPACT 2005) directed DOE to contract a study with the National Academy of Science (the Academy) to examine whether the goals of energy conservation standards are best served by measurement of energy consumed, and efficiency improvements, at the actual point-of-use or through the use of the full-fuel-cycle (FFC), beginning at the source of energy production. (Pub. L. No. 109–58). The FFC measure includes point-of-use energy plus the energy consumed in extracting, processing, and transporting primary fuels and the energy losses associated with generation, transmission, and distribution of electricity. The study, ''Review of Site (Point-of-Use) and Full-Fuel-Cycle Measurement Approaches to DOE/EERE Building Appliance Energy-Efficiency Standards,'' was completed in May 2009 and provided five recommendations. A free copy of the study can be downloaded at: *http://www.nap.edu/catalog.php?record_id=12670.*

The Academy's primary recommendation was that ''DOE consider moving over time to use of a FFC measure of energy consumption for assessment of national and environmental impact, especially levels of greenhouse gas emissions, and to providing more comprehensive information to the public through labels and other means, such as an enhanced Web site.'' The Academy further recommended that DOE work with the Federal Trade Commission (FTC) to consider options for making product-specific GHG emissions estimates available to enable consumers to make cross-class product comparisons.

More specifically, the Academy recommended that DOE use the FFC measure of energy consumption for the environmental assessment and national impact analyses used in energy conservation standards rulemakings. The FFC measure would provide more complete information about the total energy use and GHG emissions associated with operating an appliance than the primary energy measure currently used by DOE. Utilizing the FFC measure for environmental assessments and national impact analyses would not require alteration of the measures used to determine the energy efficiency of covered products and covered equipment as existing law still requires such measures to be based solely on the energy consumed at the point-of-use. (42 U.S.C. 6291(4), 6311(4)). However, using the FFC measure in lieu of primary energy in environmental assessments and national impact analyses could affect DOE's consideration of future alternative standard levels.

In response to the NAS committee recommendations, on August 20, 2010, DOE issued a Notice of Proposed Policy proposing to incorporate a FFC analysis into the methods it uses to estimate the likely impacts of energy conservation standards on energy use and greenhouse gas (GHG) emissions, rather than the primary (extended site) energy measures it currently uses. Additionally, DOE proposed to work collaboratively with the FTC to make FFC energy and GHG emissions data available to the public to enable consumers to make cross-class comparisons. On October 7, 2010, DOE held an informal public meeting to discuss and receive comments on its planned approach. The Notice, a transcript of the public meeting and all public comments received by DOE are available at: *http://www.regulations.gov/search/Regs/home.html#docketDetail?R=EERE-2010-BT-NOA-0028.* DOE is developing a final policy statement on these subjects and intends to begin implementing the policy in future energy conservation standards rulemakings.

For further details about the calculation of national energy savings, see chapter 10 of the TSD.

11. Discount Rates

The inputs for determining the NPV of the total costs and benefits experienced by consumers of battery chargers and EPSs are: (1) total increased product cost, (2) total annual savings in operating costs, and (3) a discount factor. For each standards case, DOE calculates net savings each year as total savings in operating costs less total increases in product costs, relative to the base case. DOE calculates operating cost savings over the life of each product shipped from 2013 through 2042.

DOE multiplies the net savings in future years by a discount factor to determine their present value. For the preliminary analysis and today's NOPR, DOE estimated the NPV of consumer benefits using both a 3-percent and a 7-percent real discount rate. DOE uses these discount rates in accordance with guidance provided by the Office of Management and Budget (OMB) to Federal agencies on the development of regulatory analysis.[54] 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 TSD.

12. Benefits From Effects of Standards on Energy Prices

The reduction in electricity consumption associated with new and amended standards for battery chargers and EPSs could affect overall electricity generation, and thus affect the electricity prices charged to consumers in all sectors of the economy. As a simplifying assumption in the preliminary analysis, DOE assumed no change in electricity prices as a result of energy savings from new or amended standards for battery chargers and EPSs.

Commenting on the preliminary analysis, NEEP stated that the economic benefits of the reduced need for new power plants should be estimated and requested that DOE quantify electricity demand reductions achieved by these updated standards in financial terms. (NEEP, No. 49 at p. 2)

In preparing the NOPR analysis, DOE used NEMS–BT to assess the impacts of the reduced need for new electric power plants and infrastructure projected to result from standards. In NEMS–BT, changes in power generation infrastructure affect utility revenue requirements, which in turn affect electricity prices. From these data, DOE estimated the impact on electricity prices associated with each considered TSL. Although the aggregate benefits for electricity users are potentially large, there may be negative effects on some of the entities involved in electricity supply, particularly power plant providers and fuel suppliers. Because there is uncertainty about the extent to which the benefits for electricity users from reduced electricity prices would be a transfer from entities involved in electricity supply to electricity consumers, DOE tentatively concludes

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[54] 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.*

that, at present, it should not give a heavy weight to this factor in its consideration of the economic justification of new or amended standards. DOE is continuing to investigate the extent to which electricity price changes projected to result from standards represent a net gain to society.

For further details about the effect of standards on energy prices, see chapter 10 of the TSD.

H. Consumer Subgroup Analysis

In analyzing the potential impacts of new or amended standards, DOE evaluates the impacts on identifiable subgroups of consumers (*e.g.,* low-income households or small businesses) that may be disproportionately affected by a national standard. In the preliminary analysis, DOE identified four consumer subgroups of interest—low-income consumers, small businesses, top marginal electricity price tier consumers, and consumers of specific applications within a representative unit or product class.

Interested parties supported DOE's decision to analyze consumers of specific applications in the subgroup analysis. AHAM commented that DOE should consider subgroups of applications to ensure that CSLs are justified for applications with different energy usage characteristics from the product class. (AHAM, No. 42 at p. 12) Stanley Black & Decker also commented that outdoor gardening appliances were only operated a portion of the year, and would have different energy usage characteristics from the product class, necessitating a subgroup analysis. (SBD, No. 44 at pp. 1–2) Wahl Clipper commented that infrequently charged products should not be compared in the same fashion as those that are plugged in most of the time. (Wahl, No. 53 at p. 2)

Additionally, manufacturers commented that averaging LCC results of various applications within the representative unit or product class would not lend enough weight to applications with fewer shipments. PTI noted that power tools have little in common with other applications aside from their battery energy and voltage levels. In its view, the averaging of LCC results would diminish the impact of the power tools on the LCC results for the entire product class. (PTI, No. 45 at pp. 6, 13) Similarly, AHAM and PTI commented that certain applications sell at lower price points than other applications within the product class. They argued that averaging the LCC results across these applications would deemphasize the impacts on the individual applications. (AHAM, No. 42 at pp. 13–14; PTI, No. 45 at pp. 6, 13)

DOE's subgroup analysis for consumers of specific applications considered the LCC impacts of each application within a representative unit or 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 or EPS as a percentage of the application's total purchase price are not relevant to DOE's LCC analysis. The LCC considers the incremental cost between different standard levels. DOE used the cost of the EPS or battery charger component in the LCC, not the final price of the application. Therefore, a $2,000 and $20 product are assumed to have the same cost for a battery charger or EPS (e.g., $5) if they are within the same CSL of the same representative unit or product class. The LCC considers the incremental impacts on consumers who purchase the product, but does not account for price elasticity or the economic impacts of consumers switching to non-covered products. Instead, DOE explored these possibilities in a shipments sensitivity analysis, as explained in section IV.G.1 above. The application-specific subgroup analyses represent an estimate of the marginal impacts of standards on consumers of each application within a representative unit or product class.

At the preliminary analysis public meeting, AHAM commented that some applications span multiple battery charger product classes, making it difficult for the LCC to focus on specific applications. (AHAM, Pub. Mtg. Tr., No. 57 at p. 153)

DOE notes that several applications span more than one product class or representative unit. Because each product class has associated characteristics and costs, it is difficult to aggregate LCC results across product classes. Therefore, DOE calculated application-specific results for each product class and representative unit. For applications that span multiple product classes, DOE calculated the LCC and PBP impacts for that application in each product class.

For each subgroup, DOE considered variations on the standard inputs. DOE defined low-income consumers as residential consumers with incomes at or below the poverty line, as defined by the U.S. Census Bureau. DOE found 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. For small businesses, DOE analyzed the potential impacts of standards by conducting the analysis with different discount rates, as small businesses do not have the same access to capital as larger businesses. DOE estimated that for businesses purchasing battery chargers or EPSs, small companies have an average discount rate that is 4.5 percent higher than the industry average. For top tier marginal electricity price consumers, DOE researched inclined marginal block rates for the residential and commercial sectors. DOE found that top tier marginal rates for general usage in the residential and commercial sectors were $0.306 and $0.221, 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.

Chapter 11 of the TSD contains further information on the LCC analyses for all subgroups.

I. Manufacturer Impact Analysis

1. Overview

DOE conducted separate manufacturer impact analyses (MIA) for EPSs and battery chargers to estimate the financial impact of new or amended energy conservation standards on these industries. 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 EPSs and applications that include battery chargers covered in this rulemaking. The key MIA output is industry net present value, or INPV. DOE used the GRIM to calculate cash flows using standard accounting principles and to compare changes in INPV between a 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 and amended standards on manufacturers. Different sets of assumptions (scenarios) produce different results.

DOE calculated the MIA impacts of new and amended energy conservation standards by creating separate GRIMs for EPS original device manufacturers (ODMs) and battery charger manufacturers. In each GRIM, DOE presents the industry impacts by grouping similarly impacted products. For EPSs DOE presented the industry impacts by grouping the four representative product class B units (with output powers at 2.5, 18, 60, and

120 Watts) to characterize the results for product classes B, C, D, and E. DOE also presented the results for product classes X and H separately. For battery chargers, DOE presented the industry impacts by the major product class groupings for which TSLs are selected (product class 1; product classes 2, 3, and 4; product classes 5 and 6; product class 7; product class 8; product class 10). When appropriate, DOE also presented the results for differentially impacted industries within and across those groupings. This is necessary because a given industry, depending upon how narrowly it is defined, may fall into several product classes. By segmenting the results into these similar industries, DOE is also able to discuss how subgroups of battery charger manufacturers will be impacted by new energy conservation standards.

The complete MIA is presented in chapter 12 of the NOPR TSD.

2. EPS MIA

The MIA for EPSs focused on the original device manufacturers—or ODMs. These companies manufacture the EPS itself, as opposed to the application it is designed for or sold with. DOE analyzed the impact of standards on EPS manufacturers at the ODM level for three basic reasons: (1) The ODM typically certifies compliance with the DOE energy conservation standards and completes most design work for the EPS (even if EPS specifications are given by an OEM); (2) unlike battery chargers, the EPS is not fully integrated into end-use applications; and (3) most of the EPS final assembly and manufacturing is done by ODMs, which then ship the EPS as a component to OEMs. In essence, unlike a battery charger, the EPS typically becomes a final product when under the control of the ODMs, regardless of any additional steps in the distribution chain to the consumer.

a. EPS GRIM Key Inputs

Many of the inputs to the GRIM come from the engineering analysis, the NIA, manufacturer interviews, and other research conducted during the MIA. The major GRIM inputs are described in detail in the sections below.

i. EPS Manufacturer Production Costs

The MIA is concerned with how changes in efficiency impact the manufacturer production costs (MPCs). The MPCs and the corresponding prices for which fully assembled EPSs are sold to OEMs, frequently referred to as ‘‘factory costs’’ in the industry, are major factors in industry value calculations. DOE's MPCs include the cost of components (including integrated circuits), other direct materials of the finalized EPS, the labor to assemble all parts, factory overhead, and all other costs borne by the ODM to fully assemble the EPS.

In the engineering analysis, cost-efficiency curves are developed for the four representative product class B units and product classes X and H, which were all analyzed directly. The MPCs are calculated in one of two ways. For the product class B representative units, DOE based its MPCs on information gathered during manufacturer interviews. In these interviews, manufacturers described the costs they would incur to achieve increases in energy efficiency. For product classes H and X, the engineering analysis created a complete bill of materials (BOM) derived from the disassembly of the units selected for teardown.

To calculate the percentage of the MPC attributable to labor, material, and overhead, DOE used the average percentages from all teardowns completed as part of the engineering analysis.

For further detail, see the Engineering Analysis discussion in section IV.C.1 of this NOPR.

ii. EPS Shipment Forecast

Industry value, the key GRIM output, depends on industry revenue, which, in turn, depends on the quantity and prices of EPSs shipped in each year of the analysis period. Industry revenue calculations require forecasts of: (1) Total annual shipment volume; (2) the distribution of shipments across analyzed representative units (because prices vary by representative unit); and, (3) the distribution of shipments across efficiencies (because prices vary with efficiency).

In the NIA, DOE estimated total EPS shipments by application in 2009 and assumed a constant compound annual growth rate for total EPS shipments throughout the analysis period. DOE did not assume a decrease in shipments due to energy conservation standards.

The GRIM requires that shipments be disaggregated by analyzed representative unit. In the LCC, DOE allocated total EPS shipments among all analyzed EPS applications. In the MIA, DOE assigned each application's associated EPS shipments to one of the six representative units in the following manner. First, DOE assigned any EPS application that uses multiple voltages to product class X. Second, any EPS application with an output power greater than 250 Watts was assigned to product class H. Lastly, DOE assigned each unit shipped in product classes B, C, D, and E to one of four groups, corresponding to one of the four representative units (output powers of 2.5, 18, 60, and 120 Watts), whichever has the closest output power. For example, if an application has an output power of 4 Watts, DOE assigned that application to the 2.5W representative unit grouping.

As discussed above, revenue calculations also require knowledge of the efficiency distribution in each year of the analysis period. DOE first developed efficiency distributions for 2009 based on products that DOE tested. Next, DOE estimated a 2013 efficiency distribution based on an assessment of recent trends in product efficiency. DOE then linearly extrapolated the efficiency distributions for the intermediate years between 2009 and 2013. DOE assumed a constant efficiency distribution in the base case throughout the analysis period. See section IV.G of this NOPR for more information about DOE's base-case EPS shipments forecast.

iii. EPS Product and Capital Conversion Costs

DOE expects new and amended energy conservation standards to cause some manufacturers to incur one-time conversion costs to bring their production facilities and product designs into compliance with the new and amended 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 and amended 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.

DOE received several comments on the preliminary analysis about the impact of product and capital conversion costs on EPS manufacturers and OEMs. Many commenters expressed concerns about potential conversion costs. AHAM suggested that DOE seek input from manufacturers related to the impact of additional engineering, testing, and capital improvements that are associated with any significant design changes. Specifically, AHAM noted that changes to the outside housing of some battery chargers and EPSs will result in changes to plastic injection molds that cost tens of thousands of dollars each year, as well as changes in the size of external packaging of the product. (AHAM, No. 42 at p. 11) Similarly, Cobra suggested that incremental engineering design costs be assessed because they may become a significant part of the initial cost of the product. (Cobra, No. 51 at p. 2)

DOE agrees that testing, certification, and engineering costs could represent a substantial cost for the EPS industry. DOE relied on a number of assumptions from other analyses and data gathered from publicly available sources to estimate product conversion costs. The key values used to estimate product conversion costs were application lifetimes, shipments of each application from 2011 and 2013, and typical industry research and development expenses. Because the product lifecycle tends to be shorter for electronics, DOE assumed that in the base case, a portion of the applications will be redesigned between the announcement of an energy conservation standard and the implementation of that energy conservation standard. Those applications that are scheduled for redesign are excluded from the projected product conversion costs.

DOE assumed that an application's product lifetime—the average number of years a product is used by consumers—is equal to its production cycle, the average number of years between when manufacturers redesign that application. DOE based this simplifying assumption on feedback received from several manufacturers during manufacturer interviews. However, DOE is aware that not all product lifetimes directly correspond to their production cycle, as some products may have shorter or longer production cycles compared to their product lifetimes. DOE believes on average the product lifetime is an appropriate estimate of the production cycle for an application. So for example, for an application with a five-year product lifetime, DOE assumed that application to also have a five-year production cycle. Therefore on average one-fifth of these applications would be redesigned each year by manufacturers. Because there is a two-year time period between the announcement of the standard and its compliance date, two-fifths of the applications with a five-year production cycle will be redesigned in that timeframe, irrespective of whether a standard is implemented. As a result, three-fifths of the five-year applications would need to be redesigned as a result of a new or amended energy conservation standard. In addition, only those products that do not meet the established energy conservation standard would be required to be redesigned, as the efficiency of products meeting or exceeding the standard would remain unchanged.

AHAM stated that products that undergo changes must be sent to third-party testing laboratories for energy efficiency testing and these testing costs must be factored into the overall cost of changing a product's design. AHAM suggested that DOE ask manufacturers for information on these costs. AHAM also argued the cost of safety certification should be included in the overall cost. (AHAM, No. 42 at pp. 11) Cobra commented that third-party testing would be an undue burden on manufacturers, stating that DOE should not require it unless a significant compliance problem with the current system is proven. (Cobra, No. 51 at p. 4)

DOE notes that it does not currently require manufacturers to use third-party testing to demonstrate compliance with EPS or battery charger energy conservation standards as the above comments suggest. However, DOE recognizes other organizations that provide certifications for safety or other product attributes may constitute part of the total product conversion costs (such as UL certification). DOE also understands that many ODMs and/or OEMs will likely pay for third-party testing to ensure compliance with the energy conservation standard because many do not have certified labs. DOE included testing costs as part of the research and development costs used to calculate the product conversion cost for the industry because these costs represent a significant portion of existing expenses that are factored into the methodology.

DOE used a similar approach to calculate capital conversion costs, using application lifetimes and the shipments of each application between 2011 and 2013 as the key assumptions. Whereas DOE estimated product conversion costs using a multiple of typical industry R&D expenditures, DOE estimated capital conversion costs using a multiple of typical industry capital expenditures. In response to AHAM's comment regarding the potential changes to the plastic injection molds used to cast the external casings of EPSs, DOE assumed in its analysis that the changes for the actual EPS designs would require a lower capital investment than for battery chargers because these changes would affect only the external housing of an EPS. By comparison, battery chargers may require changes to the entire housing, which would require a greater capital investment.

Cobra also expressed concerns about conversion costs for manufacturers of linear EPSs because, depending on the efficiency level DOE sets, a manufacturer would have to transition from a mechanical assembly process to an automated printed circuit board (PCB) assembly process. (Cobra, No. 51 at p. 3)

The capital cost of transitioning from a mechanical assembly process to an automated PCB assembly process would be borne by the EPS ODM in most cases. For most CSLs, there are a variety of technologies available for EPSs and many ODMs do not exclusively offer linear EPSs. OEMs that do not own their own manufacturing facilities will also be impacted by this transition, but the impact will manifest itself primarily through higher factory costs after standards apply. DOE fully analyzed these costs in the engineering costs and the GRIM's INPV calculations. In particular, the capital conversion cost assumptions that DOE used increase at CSLs that require a technology change because, as Cobra states, these transitions greatly increase the required capital and product conversion costs, especially for manufacturers that must transition to a new assembly process. This factor is taken into account for the 2.5W representative unit. DOE assumed the product and capital conversion costs associated with upgrading CSL 1 and baseline 2.5W representative units would be greater than the product and capital conversion costs of other representative units because the technology employed in upgrading those 2.5W representative units change from linear to switch mode technology. This technology change would be more costly than an ordinary product redesign because companies focusing on incremental changes for applications using linear technology may not have the experience and expertise to implement switch mode technology in their applications without additional product development efforts.

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

iv. Financial Inputs

DOE was unable to locate sufficient data on publicly-traded EPS manufacturers because few, if any, major EPS ODMs are publicly traded in the United States. Consequently, few, if any, of these companies file annual 10–K reports with the Securities and Exchange Commission. Because these documents were not available, the preliminary MIA DOE developed began with the basic financial parameters used in the ballast rulemaking (such as R&D percentage of revenue, capital expenditure percentage of revenue, SG&A percentage of revenue, tax rate as a percentage of revenue, etc.) because many of the companies included in that analysis were structured similarly to EPS manufacturers, manufacture products in similar locations, and use similar production processes [76 FR 20090, 20134–20135 April 11, 2011 (notice of proposed rulemaking to set amended efficiency standards for fluorescent lamp ballasts, describing various aspects of the manufacturing industry) and section 4.3 of chapter 13 of the NOPR TSD accompanying that notice]. During manufacturer interviews, DOE asked EPS manufacturers to comment on these initial financial parameters. Several EPS manufacturers interviewed confirmed that these initial financial parameters were an appropriate representation of the EPS industry. Consequently, DOE applied these parameters in analyzing the EPS industry in the MIA.

v. EPS Standards-Case Shipments

The base-case efficiency distribution and growth rate drive total industry revenue in the base case. In the standards case, DOE assumed that manufacturers will respond to new and amended standards by improving only those products that do not meet the standards in 2013, but not exceed, the new and amended standard level. Products that already meet or exceed the proposed level remain unaffected. This is referred to as a ''roll-up'' scenario. See chapter 9 of the TSD for a complete explanation of the efficiency distribution of EPSs and battery chargers by product class.

vi. EPS Markup Scenarios

As discussed above, the MPCs of the six representative units are the factory costs of the ODM and include direct labor, material, overhead, and depreciation. The MSP is the price the ODM sells an EPS to an OEM. The MSP is equal to the MPC multiplied by the manufacturer markup. The manufacturer markup covers all the ODM's non-production costs (i.e., SG&A, R&D, and interest, etc.) and profit. Total EPS revenue is equal to the MSPs at each CSL multiplied by the shipments at that CSL.

Modifying these manufacturer markups in the standards case yields different sets of impacts on manufacturers. For the MIA, DOE modeled two standards-case markup scenarios to represent the uncertainty regarding the potential impacts on prices and profitability for manufacturers following the implementation of new and amended energy conservation standards: (1) A flat markup scenario and (2) a preservation of operating profit scenario. These scenarios lead to different markups values, which, when applied to the inputted MPCs, result in varying revenue and cash flow impacts.

The flat markup scenario assumed that the cost of goods sold for each product is marked up by a flat percentage to cover SG&A expenses, R&D expenses, and profit. This scenario represents the upper bound of industry profitability in the standards case because manufacturers are able to fully pass through additional costs due to standards to their customers.

DOE also modeled a lower-bound profitability scenario. During interviews, ODMs and OEMs indicated that the electronics industry is extremely price sensitive throughout the distribution chain. Because of the highly competitive market, this scenario models the case in which ODMs' higher production costs for more efficient EPSs cannot be fully passed through to OEMs. In this scenario, the manufacturer markups are lowered such that manufacturers are only able to maintain the base-case total operating profit in absolute dollars in the standards case, despite higher product costs and required investment. DOE implemented this scenario in the GRIM by lowering the manufacturer markups at each TSL to yield approximately the same earnings before interest and taxes in both the base case and standards cases in the year after the compliance date for the new and amended standards. This scenario represents the lower bound of industry profitability following new and amended energy conservation standards because higher production costs and the investments required to comply with the new and amended energy conservation standard do not yield additional operating profit.

b. Comments From Interested Parties Related to EPSs

DOE also received comments on the potential manufacturer impacts that would result from DOE's treatment of EPSs as both a stand-alone product and a component of another regulated product (the battery charger). AHAM stated that this treatment could lead to duplicative testing if this rulemaking were to establish different compliance dates for EPSs and battery chargers, or if future standards were to be updated at different points for battery charger and EPSs. (AHAM No. 44 at p. 11)

In response, DOE notes that EPS and battery charger standards for this rulemaking will go into effect on the same date. Therefore, DOE does not foresee a situation in which updated regulations would occur at different intervals.

To account for the compliance costs for certifying an EPS alone and as a component of a battery charging system, DOE has included compliance costs for both the EPS and the battery charging system in its conversion cost estimates in the EPS GRIM and the battery charger GRIM, respectively. DOE also notes for product class N EPSs, which only function as a battery charger component (as opposed to EPSs that can directly power the application), the Class A EPS standards prescribed in 42 U.S.C. 6295(u)(3) will continue to apply to the Class A EPSs in product class N. Any additional energy-related savings generated by the use of more efficient product class N EPSs will be captured through the battery charger standards that DOE is proposing to set. Consequently, conversion costs for product class N EPSs are not included in the EPS analysis, but the conversion costs for the battery charging portion of the application are included in the battery charger GRIM for these applications. DOE believes that this approach will help to ensure that additional energy savings can be obtained by applying more stringent levels in a manner that reduces the complexity of the overall standards that are set. Depending on the additional information that DOE receives in response to this proposed approach, the agency may alter the approach to account for that additional information.

In response to the preliminary analysis, Cobra suggested that DOE account for incremental engineering design costs in the rulemaking analysis, as those costs may comprise a significant portion of the product's initial cost. DOE notes that the incremental engineering costs are directly accounted for in the MPCs which are a central input to the GRIM.

Cobra also questioned what it viewed as a DOE assumption that achieving a new or amended standard can be done with present staffing and within the two years between the notice and the compliance date. Cobra stated that while this may be possible if the standard is set close to today's standards, it will not continue to be the case if the standard is set closer to the max tech level. Cobra stated that achieving a new or amended standard will take even longer if DOE regulates products under an EPS and battery charger regulation at the same time due to additional design burdens. (Cobra, No. 51 at p. 2)

Partly in recognition of this situation, DOE is not proposing new or amended standards for product class N EPSs in today's notice. This approach allows manufacturers to focus on improving the efficiency of these products as a system. As shown by DOE's capital and product conversion costs that increase at each higher efficiency level, DOE also agrees that standards that are closer to max-tech would require a more substantial research and development effort by manufacturers and are accounted for in DOE's analysis. However, DOE does not assume that standards set closer to the max tech level could be met by all manufacturers with their present staffing. In addition to standard research and development expenses that account for ongoing product development, DOE's methodology accounts for the additional product conversion costs that would be required for products that fall below the required efficiency level or would not have been redesigned in the period between the final rule's issuance and the compliance date of the standard. The EPS conversion cost estimates also account for any additional engineering or product development resources necessary to meet new or amended energy conservation standards.

c. High-Power EPS Manufacturer Interviews

To better understand the possible impacts on product class H, DOE attempted to gather more information about the possible impacts on high-power EPS ODMs. DOE identified a total of 13 manufacturers of high-power EPSs. DOE attempted to contact all manufacturers of high-power EPSs. DOE managed to locate contact information for eleven of these manufacturers and contacted each to schedule interviews. Six of these eleven were domestic manufacturers and five were foreign manufacturers. Of these eleven manufacturers for whom DOE found contact information, five were non-responsive. The remaining six declined to discuss the impacts of new standards on high-power EPSs. Four of the six manufacturers that declined to be interviewed were domestic manufacturers and two were foreign manufacturers.

3. Battery Charger MIA

In the battery charger MIA, DOE analyzed the impacts of standards on manufacturers of the applications that incorporate the covered battery chargers (the application OEMs). DOE believes this MIA focus, which differs from the approach DOE is using for the EPS MIA, is appropriate for several reasons.

First, the application OEM will be the party most directly financially impacted by any energy conservation standards, as evidenced by their participation in the rulemaking process. Battery chargers are almost always integrated into and/or sold with the final application—meaning the severity of necessary conversion costs and the financial impact of higher battery charger costs can only be assessed meaningfully at the application level. Because most battery chargers are sold with, or fully integrated into, the end-use application, OEMs will pay for any costs required to alter the application if the new battery charger design requires it. These costs will vary from application to application, even within a product class.

Second, the battery charger value chain varies greatly and is principally dictated by the application for which it is designed and with which it is sold. While EPSs are almost exclusively sold as finalized components, battery charger manufacturing is split between companies that produce battery chargers for OEMs and OEMs that produce battery chargers ''in house.''

Third, the OEM typically designs the battery charger and would certify compliance with any DOE regulations because it is often impossible to separate the battery charger from the application.

Fourth, even if the OEM does not design the battery charger, it typically will still integrate it into the final product. As a result, even if an OEM did not design the battery charger, it must still integrate it into the final application. Therefore, the OEM will be responsible for any changes to the application (such as the plastic housing) which are necessary due to the changes in the battery charger.

Lastly, within a given product class, individual applications may be much more severely impacted than others within the same product class—even at the same CSL. These differential impacts would be obscured if DOE did not consider the different characteristics of the application industries.

In some industries, particularly those that utilize high-energy battery chargers, the directly impacted party will likely be the battery charger ODM (as opposed to the OEM). Manufacturers of battery chargers for golf cars, for example, produce and sell stand alone battery chargers and would be responsible for compliance with energy conservation standards and all associated conversion costs. DOE conducted a subgroup analysis for product class 7, which it presents in the regulatory flexibility analysis, section VI.B. That analysis addresses the potential impacts of the proposed standards on small businesses. DOE is following this approach because the only manufacturers of these products that DOE identified are small businesses.

To calculate impacts on the application OEM, DOE analyzed the industries of the applications that use covered battery chargers. DOE presents results in two different ways. First, DOE presents the industry impacts by the major product class groupings for which TSLs are derived (product class 1; product classes 2, 3, and 4; product classes 5 and 6; product class 7; product class 8; product class 10).

Second, DOE used an alternative construction for evaluating the MIA results for battery chargers. DOE has developed this approach because if it grouped results in the same manner as the TSL product class groupings noted above, they would not adequately account for the fact that many applications within the same product class groupings are very dissimilar. The aggregate projected impacts would not necessarily be representative of each particular industry within each product class grouping. To address this potential problem, the analysis (particularly for product classes 2, 3, and 4) groups applications into four industry subcategories. These industry subgroups share similar characteristics and the proposed standards are projected to affect these industry subgroups similarly. To group the applications, DOE assigned each application to one of four distinct industry subgroups: small appliances, consumer electronics, power tools, and high-energy products (''high-energy'' products are those applications that fit into product classes 5, 6, and 7). This additional approach enhances the interpretability and transparency of the MIA results by providing a meaningful way to compare impacts across applications.

DOE has set up a flexible methodology that allows the analysis of individual applications or a set of applications. DOE reports these quantitative MIA results for each individual application, product class, and industry subgroup in chapter 12 of the TSD.

a. Battery Charger GRIM Key Inputs

Many of the inputs to the GRIM come from the engineering analysis, the NIA, manufacturer interviews, and other research conducted in preparing the MIA. The major GRIM inputs are described in detail in the sections below.

i. Battery Charger Manufacturer Production Costs and Application Prices

Calculating manufacturer impacts at the OEM level for battery chargers requires two critical inputs: First, the price that the application OEM charges for its finished product (to calculate revenue); and, second, the portion of that price represented by its battery charger (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.F.

DOE calculated the second figure—the price of the battery charger itself at each CSL—in the engineering analysis. The engineering analysis calculated a separate cost efficiency curve for each of the 10 battery charger product classes. Based on product testing data, tear-down data and manufacturer feedback, DOE created a BOM at the 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.

ii. Battery Charger Financial Parameters

Because any two application OEMs may compete in very different markets, a single set of financial parameters cannot adequately characterize each manufacturer's cost structure. To address this limitation, DOE gathered and disaggregated publicly available financial data for representative manufacturers in each of the four industry categories it analyzes: Small appliance manufacturers, consumer electronics manufacturers, power tool manufacturers, and high-energy product manufacturers. DOE then assigned each application to one of the four industry subgroups. In the GRIM, each individual application uses the cost structure of the industry subgroup to which it belongs.

iii. Battery Charger Shipment Forecast

As with EPS shipments, DOE estimated total domestic shipments of each analyzed application for 2013 that is sold with a battery charger. DOE then distributed the associated shipments among the 10 product classes and among the four industry subgroups. See chapter 12 of the TSD for a complete list of the applications DOE included in each of the four industry subgroups. DOE also adjusted its efficiency distributions and shipments in the base case, to account for pending efficiency regulations in California (for more information please see IV.A.2.d). In the GRIM, DOE used the battery charger shipment projections from 2009 to 2042 that were generated in the NIA.

iv. Battery Charger Product and Capital Conversion Costs

Capital and product conversion costs triggered by a new energy conservation standard are critical inputs to the GRIM. DOE received various comments about the impact of product and capital conversion costs on manufacturers of applications that incorporate covered battery chargers.

AHAM suggested that DOE seek manufacturer input regarding the impact of additional engineering, testing, and capital improvements that are associated with any significant design changes that would be needed to satisfy new standards for battery chargers. Specifically, AHAM noted that changes to the outside housing of some battery chargers will result in changes to plastic injection molds that cost tens of thousands of dollars each year, as well as changes in the size of the external packaging of the product. (AHAM, No. 42 at p. 11) PTI stated that manufacturers will encounter redesigning, retooling and re-qualifying costs for battery chargers used in power tools. The magnitude of these costs will depend on the final CSL selected. For example, the difference between CSL 1 and CSL 2 for product class 4 could be hundreds of thousands of dollars. (PTI, No. 45 at p. 13) Similarly, Cobra argued that incremental engineering design costs should be included in the analysis because they may become a significant part of the initial cost of the product. (Cobra, No. 51 at p. 2)

DOE agrees that testing and engineering costs could represent a substantial cost burden to manufacturers, depending on the efficiency levels eventually selected. DOE has included the testing costs for battery charger applications to comply with the energy conservation standards in its calculation of conversion costs. At the higher CSLs, manufacturers could be compelled to redesign products that would have been redesigned years later in the base case. DOE accounts for the additional testing and engineering time by assuming that energy conservation standards would require manufacturers to alter products before the end of their natural lifecycle, resulting in substantial product conversion costs. The extent of the product conversion costs depends largely on whether a given standard level requires a technology change—moving from NiMH to lithium ion chemistry, for example—or only minor design tweaks. Within a given product class, some applications will face technology changes and the associated major redesigns at much lower CSLs than other applications. Therefore, DOE estimated product conversion costs for each individual application, rather than in aggregate by product class.

Because of the large number of applications analyzed, DOE approximates the impacts of standards-driven conversion costs by assuming manufacturers will incur a given multiple of normal R&D and normal capital expenditures. The exact multiple used depends on each CSL and each product class and is calibrated to manufacturer feedback received during interviews. Intuitively, this approach to product and capital expenditures accelerates the product cycle and compresses resources that would normally have been spread over a number of years into a shorter timeframe. In the standards case, these expenditures are in addition to, and not in lieu of, normal engineering, testing and equipment costs. DOE only assumes conversion costs for the proportion of shipments that fall below the analyzed TSL within any given application. Also, DOE separately calculated the conversion costs associated with the products sold in California that would have to comply with the CEC battery charger standard. These conversion costs are included in the base case and separate from the conversion costs associated with the DOE standard. For example, in product class 4, computer notebooks would not be impacted at CSL 1 because all computer notebooks meet CSL 1 in the base case. In contrast, DIY power tools would face more substantial conversion costs at CSL 1 because 40 percent of all models would not meet this level and would need to be upgraded. Therefore, DOE assumes these applications, despite incorporating battery chargers that are in the same product class, would incur different levels of R&D and capital expenditures.

Based on manufacturer interviews and the engineering analysis, DOE anticipates that new standards may result in the alteration of the external housing in the application, which would trigger additional design costs and expenses for new injection molds used to construct these housings. DOE tentatively believes these changes would most likely occur in those applications incorporating battery chargers that require a substantial technology shift to meet the new standards. DOE includes the associated housing costs in its estimates of the capital conversion costs and believes its methodology accounts for these changes.

As discussed in section IV.I.2.a.iii of the EPS MIA methodology, AHAM and Cobra communicated concerns regarding testing and certification costs that are associated with changes in products due to new standards. (AHAM, No. 42 at p. 11; Cobra, No. 51 at p. 4) DOE summarizes and responds to these comments, which relate to battery chargers as well as EPSs, in section IV.I.2.a.iii.

PTI also noted that manufacturers will encounter ‘‘stranded costs’’ when forced to retire tooling before the end of its service life, resulting in unused inventory. Stranded costs are capital assets that are not yet fully depreciated, but are made obsolete by a new or amended energy conservation standard. (PTI, No. 47 at p. 13)

DOE agrees with PTI that energy conservation standards could strand tooling before the end of its useful life. DOE has estimated these costs as part of stranded assets, which are treated as a non-cash expense in the compliance year of the standard.

PTI asserted that the resources that manufacturers would ordinarily devote to new product development, which drives much of the power tool industry, would be reduced in order to meet any new regulations. (PTI, No. 47 at p. 13)

DOE understands there are opportunity costs related to any investment and that manufacturers may face difficult decisions in selecting non-energy related product development projects when faced with the prospect of standards-induced resource allocation. DOE notes that the GRIM analysis accounts for both ordinary, ongoing research and development efforts, as well as those prompted by new energy standards. DOE weighs these impacts when deciding the most appropriate TSL for the proposed standard.

PTI stated that the power tool industry is somewhat unique because a significant proportion of its members' product offerings revolve around detachable pack battery systems. Achieving higher CSLs depends on fulfilling certain technical changes that would require redesigning the entire battery charger, including the battery pack. According to PTI, this situation would disrupt the market because manufacturers would be required to abandon these legacy systems and strand a large installed base of consumers with unsupported systems. For example, in product class 4, PTI argued that CSL 2 would require nickel-based systems to switch to Li-ion, which would most likely require a complete redesign of the system that is unlikely to be backward compatible with existing tools. (PTI, No. 47 at p. 12)

DOE agrees it would take a substantial research and development effort to redesign nickel-based systems to Li-ion. For power tools, the backward compatibility issues described by PTI arise from designing the entire battery chargers (including the battery pack) for power tool applications. Based on its engineering analysis, DOE tentatively believes that the technical challenges to achieving backward compatibility could be met at CSL 2 in the context of a complete redesign. DOE has accounted for the additional engineering costs in the MIA.

v. Battery Charger Standards-Case Shipments

The base-case efficiency distribution and growth rate drive total industry revenue in the base case. As with EPS shipments, the standards case assumes that manufacturers will respond to standards by improving those products that do not meet the new standards to meet, but not exceed, the standard level. Products that are already as efficient as, or more efficient than, the standard level would remain unaffected under this approach. This is referred to as a ‘‘roll-up’’ scenario. DOE did not consider elasticity or substitution away from battery chargers in the standards case in the main NIA scenario. However, this was considered as a sensitivity analysis which is included as an appendix in chapter 12 of the NOPR TSD.

vi. Battery Charger Markup Scenarios

The revenue DOE calculates for the battery charger GRIM is the revenue generated from the sale of the application that incorporates the covered battery charger. It is the revenue earned on the sale of the product to the OEM's first customer (e.g., the retailer). After calculating the average retail price from the product price survey as discussed above, DOE discounted the price by the appropriate retailer markup (calculated in the market and technology assessment) to calculate the per-unit revenue the OEM generates for each application. To calculate the potential impacts on manufacturer profitability in the standards case, DOE analyzed how the incremental costs of more efficient battery chargers would impact this revenue stream on an application-by-application basis.

In comments, manufacturers raised concerns about higher battery charger input costs resulting in reduced profit margins. PTI stated that many manufacturers only sell through retailers and have ‘‘price points’’ that they must hit, particularly in the ‘‘do-it-yourself’’ (DIY) market. Although the cost to produce the product may change with more efficient battery chargers, in its view, there would be no change in price for the consumer. Faced with higher product costs, PTI asserted that manufacturers will have to reduce gross margin or ultimately reduce the utility of the product. (PTI, No. 47 at p. 12) Lester also expressed concerns about increased costs to produce golf cars, which will either be passed along to purchasers or result in reduced profit margins for the manufacturers. (Lester, No. 52 at p. 1)

DOE acknowledges that new or amended standards have the potential to increase product prices and disrupt manufacturer profitability, particularly as the market transitions to meet a new energy conservation standard. Based on the comments from interested parties and DOE's manufacturer interviews, there is a great deal of uncertainty regarding how the markets for such a wide variety of applications will adjust, both in the near term and long term. To account for this uncertainty, DOE analyzes three profitability, or markup, scenarios in the GRIM: the ‘‘constant price,’’ ‘‘pass through,’’ and ‘‘flat markup’’ scenarios.

The constant price scenario analyzes the situation in which manufacturers of applications are unable to pass on any incremental costs of more efficient battery chargers to their customers. This scenario is reflective of some manufacturers' description of the negotiating power of large retailers, who account for the vast majority of shipments of some applications. Manufacturers believe these large retailers would be unwilling to accept any price increases. This scenario results in the most significant negative impacts because no incremental costs added to the application—either because of higher battery charger component costs or because of investments in tooling and design—can be recouped. As a result, manufacturer gross margins decline as cost-of-goods-sold increase, on a dollar-for-dollar basis. The higher the incremental cost of the battery charger with respect to the total application price, the greater the impacts on the manufacturer. For example, the impact of an incremental $2.00 increase in the cost of the battery charger is much greater on a product that sells for $50 than on a product that retails for $500.

For some applications in certain product classes, the max-tech battery charger price is nearly as expensive as the total base case application price itself. Under the constant price scenario, such circumstances can yield highly negative results, which are not meaningful because, in reality, producers would not continue to produce at prices that did not cover variable costs. If prices fell below the level necessary to cover variable costs, a firm would be better off not producing anything at all. Therefore, DOE applies a boundary condition in the constant price scenario, which assumes that as battery charger costs increase, application prices remain constant (and gross margin would continue to decline) only until manufacturers cease to cover their variable costs (where gross margin is zero). At that point, DOE assumes manufacturers can pass on any further incremental costs of the battery charger on a dollar-for-dollar basis to their customers.

In the pass through scenario, DOE assumes that manufacturers are able to pass through the incremental costs of more efficient battery chargers to their customers, but without earning any additional operating profit on those higher costs. Therefore, though less severe than the constant price scenario in which manufacturers absorb all incremental costs, this scenario also results in margin compression and adverse financial impacts as battery charger costs increase.

Lastly, DOE considers a flat markup scenario to analyze the upper bound (most positive) of profitability impacts following the compliance date of new standards. In this scenario, manufacturers are able to maintain their base case gross margin as a percentage of revenue at higher CSLs despite higher product costs of more efficient battery chargers. In other words, manufacturers are able to pass on, and fully mark up, the higher incremental product costs due to more efficient battery chargers. This scenario is a more likely outcome for high-value, differentiated products, for which energy efficiency indirectly drives customer-valued benefits such as lighter weight and greater transportability. For other applications, particularly low-cost products for which energy efficiency is not an important selling attribute, the scenario is less likely.

In summary, DOE believes these three scenarios present the potential range of profitability impacts on OEM application manufacturers.

b. Battery Charger Comments From Interested Parties

The following section discusses interested parties' comments on the preliminary analyses that impact the battery charger MIA methodology. In general, DOE provides background on an issue that was raised by interested parties, summarizes the interested parties' comments, and responds to those comments.

i. Compliance Date and Implementation Period

Many manufacturers commented on the implementation timeline of a new standard. For example, with respect to medical devices, Philips noted that the development life cycle is at least two to four years. Philips also mentioned that the regulatory approval cycle for medical products is longer than for consumer grade products, suggesting that medical devices should either be exempt or be given a longer transition time. (Philips, No. 43 at p. 3)

Lester expressed similar concerns, noting that the proposed timelines are not reasonable for large, integrated vehicle manufacturers. It added that properly designing, testing, and ramping up production of a battery charging system commonly exceeds three years. Furthermore, Lester stated that an insufficient timeline could lead manufacturers to utilize components that have not been designed or tested properly. Additionally, a premature compliance date could cause product shortages, defects, increased costs, and unplanned capital expenditures that will either be passed on to purchasers or result in reduced profits. Lester suggested a timeline extension to five years. (Lester, No. 52 at p. 1, 2) Similarly, Cobra stated that two years will not be enough time to comply if DOE sets the standard level near max tech. (Cobra, No. 51 at p. 2)

AHAM commented that the effective date should be two years after the final rule for small appliance battery charger products, but noted a longer time period might be necessary for some other product groups. AHAM argued that an earlier effective date would facilitate consistency across all 50 states. However, AHAM also mentioned that DOE must factor in additional time due to new requirements for third-party testing. (AHAM, No. 44 at p. 3, 11) Lastly, AHAM pointed out that the time needed depends significantly upon which standard level DOE chooses, as well as whether products are treated as both EPSs and battery chargers. (AHAM, Pub. Mtg. Tr., No. 37 at p. 373, 374)

EISA 2007 prescribed a two-year period between the issuance of the final rule for Class A EPSs and the compliance date of the amended energy conservation standard. See 42 U.S.C. 6295(u)(3)(D). Congress did not grant DOE with the specific authority to change this date for individual product classes falling within Class A as requested by Philips, Lester, and AHAM. However, DOE notes that Congress did not impose a specific compliance date timeline for battery chargers and newly covered non-Class A EPSs. For these products, DOE has tentatively concluded that the two-year window between the announcement of the final rule and compliance with rule is sufficient for manufacturers to meet the TSLs analyzed in today's rule. As the comments suggest, depending on the resources available to a given manufacturer, their technological starting point, and the proposed CSL, the typical product design cycle will vary significantly. As such, some manufacturers will likely have to dedicate more resources than others to upgrade some or all of their product lines. DOE notes, however, that designs achieving the levels proposed in today's NOPR are currently on the market for all product classes except battery charger product class 10. For all of these product classes, the TSLs proposed are below the max-tech level and either represent the best-in-market efficiency or a lower level. For battery charger product class 10, however, DOE is proposing the max-tech level based on information derived from manufacturer input. Therefore, DOE has tentatively concluded that the technologies required to reach the efficiencies proposed in today's rule are achievable within two years.

DOE requests comment on what an appropriate compliance date for battery chargers and non-Class A EPSs would be, including whether a two-year lead time would be reasonable. DOE may decide to adjust the compliance date for these products depending on the nature of the information it receives on this issue.

With respect to unplanned capital expenditures, DOE agrees that standards may require changes to tooling and equipment, as well as incremental engineering efforts. Ultimately, whether any manufacturer chooses to allocate the resources necessary to upgrade some or all of their product lines, or to source some or all of them, is a business decision. Regardless of these decisions, DOE accounts for the conversion costs for manufacturers to upgrade all their non-compliant products to comply with each TSL. DOE considers the results of this analysis in weighing the projected benefits and burdens associated with the rule. See section 0 for that determination.

ii. Cumulative Regulatory Burden

Several manufacturers expressed concerns about other regulations that affect battery chargers. Three potential regulations are the U.S. Department of Transportation's regulation of the packaging and transportation of Li-ion cells in both end-products and in cell configurations, see 75 FR 1302 (Jan. 11, 2010), the future series of regulations on battery chargers from the European Union, (Commission Regulation (EC) No 278/2009 of 6 April 2009), and the California battery charger standard set by CEC (Docket # 11–AAER–2). (AHAM, No. 44 at p. 11, 15)

For the cumulative regulatory burden, DOE attempts to quantify and/or describe the impacts of other Federal regulations that have a compliance date within three years of the compliance date of this rulemaking. This analysis does not include the Department of Transportation's proposal to regulate the packaging and transportation of lithium ion cells given that no requirements are yet in place and any analysis attempting to account for what these requirements might be would be speculative. DOE does acknowledge that EU regulations on battery chargers would be an overlapping regulatory burden on manufacturers, if the EU decides to regulate battery chargers in the future, because identical products are sold throughout the world. At this time the EU has specifically excluded battery chargers from their regulations but will consider in the future to expand the scope of the regulation to include battery chargers (see the adopted draft regulation of EC No 278/2009, 17 October 2008, p. 10). DOE does not include the costs to comply with future regulations in the EU because they are outside the scope of the cumulative regulatory burden, which focuses on Federal regulations. However, DOE did quantitatively assess the impacts of the CEC battery charger standard on battery charger manufacturers in section V.B.2.e of this NOPR.

iii. Employment

Lester expressed concerns about losing domestic manufacturing jobs to low-cost countries as a result of implementing the new standard. The company stated that because switch-mode battery charger assembly is more labor intensive than other designs, it expects standards requiring switch-mode designs to accelerate the trend towards offshore manufacturing. Lester added that DOE should prioritize the impact to manufacturing in the U.S. among other criteria in determining which standards to adopt. According to Lester, battery chargers for applications that use transformer-based battery chargers, which are typically used in high-energy applications, tend to correlate with requirements for longer life, greater durability, and higher reliability. (Lester, No. 52 at p. 3)

While the vast majority of applications using EPSs and battery chargers are manufactured overseas, DOE agrees that new or amended standards could adversely impact domestic employment for companies currently producing covered products in the United States. This is especially a concern for the golf car industry because battery chargers for this application still have a significant U.S. manufacturing presence. Any manufacturers that would be forced to develop a new technology to meet new standards, especially one that is more labor intensive, would face significant economic pressures to move operations overseas or source products directly from overseas third-party suppliers. DOE's direct employment analysis (see section V.B.2.b) discusses the preliminary estimates for the impacts on changes in employment at the analyzed TSLs.

In selecting the TSLs proposed in today's notice, the Secretary considers a variety of factors to weigh the overall benefits and burdens of the rule, including, as Lester notes, the impact on United States manufacturing. DOE also notes that the impacts on small businesses are treated directly in the Regulatory Flexibility Analysis in section VI.B.

iv. Supply Chain

Lester expressed concerns over the potential for supply chain disruptions, noting that as production of chargers is moved to lower-cost countries, manufacturers of electric vehicles will face logistical risks that are less likely to occur domestically. (Lester, No. 52 at p. 2)

DOE agrees that overseas manufacturing can complicate the supply chain of firms that elect to move production offshore. However, such a strategy is a business decision and not one that is required to meet the TSLs analyzed in today's rulemaking. DOE also notes that the vast majority of all battery chargers on the market already make use of global supply chains.

4. Comments From Interested Parties Related to EPSs and Battery Chargers

The following section discusses interested parties' comments on the preliminary analyses that impact both the EPS and battery charger MIA methodology. This section provides background on specific issues raised by interested parties, summarizes the relevant comments, and discusses DOE's response.

a. Cumulative Burden

AHAM expressed concern about the possibility of DOE applying CEC's Tier 2 EPS standards which, it asserts, are wrongly applied to the wall adapters of battery chargers. (AHAM, No. 44 at p. 15) PTI added that DOE should consider the cumulative regulatory burden that would be imposed if the CEC were to regulate the power factor of battery chargers. This would increase the costs of achieving higher efficiencies. (PTI, No. 47 at p. 11)

With respect to the CEC standards, DOE notes that the proposed EPS standards in today's NOPR would preempt state regulations on EPS efficiencies. As for potential power factor regulation, DOE has included a quantitative analysis of the CEC standard on battery charger manufacturers in section V.B.2.e.

Similarly, Philips expressed concerns about FDA regulations on medical products, which can delay the time-to-market from a few weeks to many months. Philips also noted that the EU Directive on the Restriction of Hazardous Substances (RoHS) proposed a minimum of six years for medical device manufacturers to reach compliance, which reflects a longer product design cycle and regulatory approval process. (Philips, No. 43 at p. 3)

DOE acknowledges that the EU RoHS proposed a minimum of six years for medical device manufacturers to comply with the directive. However, EU's RoHS regulations have the potential to affect the entire medical application, while the DOE energy conservation standards at issue here cover only the battery charger or EPS portion of the device. DOE does not include the costs to comply with future regulations in the EU as part of the cumulative regulatory burden because they are outside its scope, which focuses on U.S. regulations. DOE notes that it has the authority to set a compliance period for non-Class A EPSs and battery chargers that varies from the two-year lag between the issuance of the final rule and the compliance date of the standard prescribed in EISA for Class A

EPSs. However, DOE has consulted with the FDA and does not believe that this extension for non-Class A EPSs is necessary. This situation is described in detail in chapter 3 of the TSD. DOE also does not believe there are technical differences between medical EPSs and non-medical EPSs that would affect the ability of manufacturers to improve the efficiency of medical EPSs. However, DOE requests further comment on the appropriateness of the proposed compliance date for non-Class A EPS and battery charger product classes and if there are any specific medical applications that would be adversely affected by a 2013 date that mirrors the statutorily-prescribed compliance date for Class A EPSs.

Cobra commented on the significant burden facing small manufacturers from recent regulatory actions including EISA 2007, the Consumer Product Safety Improvement Act of 2008 (CPSIA 2008), California's Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), Mercury-Containing and Rechargeable Battery Management Act, recycling regulations, and EU's RoHS. Cobra contended that these regulations challenge its ability to compete against larger companies while spending resources to prove compliance with all established regulations. Cobra also mentioned that while it does not manufacture products that are covered under CPSIA 2008, it asserted that it needs to demonstrate to customers that its products can still satisfy those requirements for marketing purposes. (Cobra, No. 53 at pp. 1, 2)

DOE agrees that maintaining compliance with the various standards may be a challenge for manufacturers, especially smaller manufacturers. Furthermore, DOE understands that because products with EPSs and battery chargers are sold globally, the design of these products are more harmonized than for other appliances. DOE has analyzed the cost to comply with the EISA requirements in this rulemaking. DOE also further describes the recycling requirements and RoHS in chapter 12 of the TSD. DOE has also attempted to quantify these costs where applicable.

b. Competition

AHAM asked DOE to evaluate the potential for a reduction in competition, in the event standards cause manufacturers of low-cost products to leave the market. (AHAM, Pub. Mtg. Tr., No., No. 37 at p. 144)

EPCA directs DOE to consider any lessening of competition likely to result from standards. It directs the Attorney General to determine the impact, if any, of any lessening of competition likely to result from a proposed standard and to transmit such determination to the Secretary, not later than 60 days after the publication of a proposed rule, 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)) DOE will transmit a copy of today's proposed rule to the Attorney General and request that the U.S. Department of Justice (DOJ) provide its determination on this issue. DOE will publish and address the Attorney General's determination in the final rule, if any, and will pay particular attention to any potential competitive impacts in that determination.

At this time, DOE does not believe there is significant potential for a reduction in competition due to the standards proposed in this rule. Particularly for some of the low-cost products, there are relatively few barriers to entry and the TSLs proposed in today's rule do not require use of patented technology. Technology that can be used exclusively by one manufacturer does not pass the screening analysis.

However, given the wide array of applications that incorporate covered EPSs and battery chargers, DOE seeks comment on which specific markets, if any, exhibit the potential for a reduction in competition.

5. Manufacturer Interviews

DOE conducted additional interviews with manufacturers following the preliminary analysis in preparation for the NOPR analysis. In these interviews, DOE asked manufacturers to describe their major concerns with this rulemaking. The following section describes the key issues identified by manufacturers during these interviews.

a. Product Groupings

Several manufacturers expressed concern over the approach DOE outlined in which a variety of different applications would be grouped together within the same product class and would have to meet equivalent standards. EPS and battery charger product classes are defined by characteristics such as type of current conversion, voltage, and output power. However, the proposed EPS and battery charger product classes do not necessarily group applications performing similar end-use functions. Manufacturers stated that grouping applications that consume a larger amount of electricity over their lifetime with applications that consume only a fraction of electricity over their lifetime can put the applications that are used less frequently at an unfair disadvantage.

Manufacturers were particularly concerned about the potential for groupings to impact specific battery charger applications after finalizing the standard. For battery chargers, DOE is proposing standards using one UEC equation for each product class. Specific applications can be grouped into a product class whose individual usage profile differs from the usual profile of the product class. This is especially true if the shipments of one application are significantly greater than the shipments of another application with a very different usage profile (i.e., the millions of laptop shipments versus DIY power tools). Both laptops and DIY power tools would be regulated using the same usage profile parameters to satisfy a given energy conservation standard. Therefore, there is less potential for consumers to save energy cost effectively with respect to those applications that are not used frequently compared to applications that are used continuously even though both applications would be required to meet the same standard.

DOE recognizes manufacturer concerns over how specific applications are grouped together as a result of the proposed division of product classes. DOE's LCC analysis and manufacturing impact analysis evaluate the impacts on users and manufacturers, respectively, on a applications-specific basis. Although the UEC is established at the product class level, the granularity of these analyses enables DOE to consider the benefits and burdens on users and manufacturers of specific applications, and take those results into consideration in determining which TSLs to select.

b. Competition From Substitutes

Manufacturers have stated that several of their applications compete directly with applications using other forms of energy, such as products powered by gasoline, disposable alkaline batteries, or corded products. Products that use battery chargers must remain cost competitive with these alternatively powered products because these products are close substitutes. Manufacturers of lawn care products, such as mowers and trimmers, and mobility units, such as motorized bikes and golf cars, are competing in the same markets as gas-powered versions of these applications. Similarly, manufacturers of smaller electronic devices, such as digital cameras, are competing in the same market as disposable alkaline battery-powered digital cameras. Several applications also have direct competition with similar non-electric applications, such as electric toothbrushes and DIY power tools. Having products powered by a rechargeable battery is a feature that adds value for consumers. A significant increase in the cost of manufacturing the battery charger could lead manufacturers to remove the rechargeable feature of an application or choose an alternative method to power the device, ultimately reducing the consumer utility for these applications. If energy conservation standards lead to a significant price increase, consumers could switch to these alternatives.

Based on these concerns, DOE considered the impact of price elasticity on application shipment volumes. These price elasticity sensitivity results are presented in Appendix 12–B of the TSD.

c. Test Procedure Concerns

While most manufacturers agree that using the UEC is an appropriate test procedure metric for battery chargers, some battery charger manufacturers stated there is a problem of separating the battery charging function of an application from the other functions being performed by the application. In their view, it is not easy to isolate the battery charging portion of the application for testing and/or creating cost-efficiency curves. Manufacturers stated that the test procedure must clearly separate out the charging portion of the energy consumption in order to regulate its efficiency accurately. DOE specifically took this factor into consideration for UPS manufacturers and explains its approach in detail in section IV.C.2.i of this NOPR.

d. Multiple Regulation of EPSs and Battery Chargers

Manufacturers raised concerns that specific applications that are shipped with both an EPS and a battery charger would be subject to regulations for both components—one energy conservation standard for the EPS and a separate energy conservation standard for the battery charger of the same application. Having to meet two separate standards may not allow the manufacturers to maximize the efficiency of both the EPS and the battery charger together and could add to the overall cost of the application. DOE took these comments into consideration but has tentatively determined that establishing standards for each product was the most appropriate action given the statutory requirements to set standards for these products. For further detail and DOE's rationale for this decision, see section IV.A.1 of this NOPR.

e. Profitability Impacts

Several manufacturers stated that they expect energy conservation standards to negatively impact the profitability of battery chargers. At higher CSLs, standards could increase MPCs and manufacturers believed these higher costs would not necessarily be passed on to consumers. Several applications use specific price points that consumers expect those applications to have. Consequently, manufacturers believe that cost increases would be at least partly absorbed by manufacturers to keep retail prices from rising sharply.

The battery charger often represents a significant portion of the overall cost of the application. Any increase in the cost of the battery charger would have a significant impact on the cost of these applications as a whole. If energy conservation standards led to a significant reduction in profitability, some manufacturers could potentially exit the market and reduce the number of competitors. Additionally, many electronic applications are considered luxury items so consumers could also choose to forgo their purchases altogether if the application prices increased substantially.

As discussed in section IV.I.2.a and IV.I.3.a of this NOPR, DOE evaluates a range of profitability scenarios in the MIA that take these specific concerns into account. These sections and Chapter 12 of the TSD discuss the results and details of those analyses.

f. Potential Changes to Product Utility

Manufacturers believe adverse impacts from new and amended standards could also indirectly affect product utility. Several manufacturers indicated that other features that do not affect efficiency could be removed or component quality could be sacrificed to meet new and amended standard levels and maintain current application prices. Manufacturers also stated that the financial burden of developing products to meet new and amended energy conservation standards has an opportunity cost due to limited capital and R&D dollars. Investments incurred to meet new and amended energy conservation standards reflect foregone investments in innovation and the development of new features that consumers value and on which manufacturers earn higher absolute profit.

DOE's engineering analysis only analyzes utility-neutral design changes to meet higher efficiency standards and accounts for the costs incurred to achieve those levels. While there may be cheaper ways to meet a given efficiency level by reducing other features that provide utility, those design paths are not assumed in DOE's analyses. DOE recognizes the opportunity cost of standards-induced investment and accounts for the conversion expenditures manufacturers may incur at each TSL, as discussed in section IV.I.3.a.iv. Whether a given manufacturer chooses to mitigate these costs (and the associated product costs illustrated in the engineering analysis' cost-efficiency curves) by reducing product utility is a business decision and not one mandated by the proposed energy conservation standards.

J. Employment Impact Analysis

DOE considers employment impacts in the domestic economy as one factor in selecting a proposed standard. Employment impacts include direct and indirect impacts. Direct employment impacts are changes in the number of employees of manufacturers of the products subject to standards, their suppliers, and related service firms. The MIA addresses the direct employment impacts that concern manufacturers of battery chargers and EPSs. Indirect employment impacts from standards consist of the jobs created or eliminated in the national economy, other than in the manufacturing sector being regulated, due to: (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 sectoral employment statistics developed by the Labor Department's Bureau of Labor Statistics (BLS). The BLS regularly publishes its estimates of the number of jobs per million dollars of economic activity in different sectors of the economy, as well as the jobs created elsewhere in the economy by this same economic activity. Data from BLS indicate that expenditures in the utility sector generally create fewer jobs (both directly and indirectly) than do expenditures in other sectors of the economy.[55] 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

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

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 energy conservation 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, the Department believes net national indirect employment may increase due to shifts in economic activity resulting from amended standards for Class A EPSs and new standards for non-Class A EPSs and battery chargers.

In developing today's NOPR, DOE estimated indirect national employment impacts using an input/output (I–O) model of the U.S. economy called Impact of Sector Energy Technologies version 3.1.1 (ImSET).[56] ImSET is a special purpose version of the ''U.S. Benchmark National Input-Output'' model, designed to estimate the national employment and income effects of energy-saving technologies. The ImSET software includes a computer-based I–O model with structural coefficients to 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. Given the relatively small change to expenditures due to efficiency standards and the resulting small changes to employment, however, DOE believes that the size of any forecast error caused by using ImSET will be small.

No comments were received on the preliminary TSD for battery chargers and EPSs concerning the employment impacts analysis. For more details on the employment impact analysis, see chapter 13 of the NOPR TSD.

K. Utility Impact Analysis

The utility impact analysis estimates several important effects on the utility industry that would result from the adoption of new or amended energy conservation standards. For the NOPR analysis, DOE used the NEMS–BT model to generate forecasts of electricity and natural gas consumption, electricity generation by plant type, and electric generating capacity by plant type, that would result from each considered TSL. DOE obtained the energy savings inputs associated with efficiency improvements to the subject products from the NIA. DOE conducts the utility impact analysis as a scenario that departs from the latest *AEO* Reference case. For this NOPR, the estimated impacts of amended energy conservation standards are the differences between values forecasted by NEMS–BT and the values in the *AEO2010* Reference case (which does not contemplate amended standards).

As part of the utility impact analysis, DOE used NEMS–BT to assess the impacts on natural gas prices of the reduced demand for natural gas projected to result from the considered standards. DOE also used NEMS–BT to assess the impacts on electricity prices of the reduced need for new electric power plants and infrastructure projected to result from the considered standards. In NEMS–BT, changes in power generation infrastructure affect utility revenue, which in turn affects electricity prices. DOE estimated the change in electricity prices projected to result over time from each considered TSL. The benefits associated with the impacts of proposed standards on energy prices are discussed in section IV.G.5.

For more details on the utility impact analysis, see chapter 14 of the NOPR TSD

L. Emissions Analysis

In the emissions analysis, DOE estimated the reduction in power sector emissions of carbon dioxide (CO_2), nitrogen oxides (NO_X), and mercury (Hg) from amended energy conservation standards for Class A EPSs and new energy conservation standards for non-Class A EPSs and battery chargers. DOE used the NEMS–BT computer model, which is run similarly to the AEO NEMS, except that battery charger and EPS energy use is reduced by the amount of energy saved (by fuel type) due to each TSL. The inputs of national energy savings come from the NIA spreadsheet model, while the output is the forecasted physical emissions. The net benefit of each TSL in today's proposed rule is the difference between the forecasted emissions estimated by NEMS–BT at each TSL and the *AEO 2010* Reference Case. NEMS–BT tracks CO_2 emissions using a detailed module that provides results with broad coverage of all sectors and inclusion of interactive effects. For today's NOPR, DOE used the version of NEMS–BT based on *AEO2010,* which incorporated projected effects of all emissions regulations promulgated as of January 31, 2010. For the final rule, DOE intends to revise the emissions analysis using the most current version of NEMS–BT.

SO_2 emissions from affected electric generating units (EGUs) are subject to nationwide and regional emissions cap-and-trade programs, and DOE has preliminarily determined that these programs create uncertainty about the impact of energy conservation standards on SO_2 emissions. 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 are also limited under the Clean Air Interstate Rule (CAIR; 70 FR 25162 (May 12, 2005)), which created an allowance-based trading program. Although CAIR was remanded to EPA by the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit), see *North Carolina* v. *EPA,* 550 F.3d 1176 (D.C. Cir. 2008), it remains in effect temporarily, consistent with the D.C. Circuit's earlier opinion in *North Carolina* v. *EPA,* 531 F.3d 896 (D.C. Cir. 2008). On July 6, 2011 EPA issued a replacement for CAIR, the Cross-State Air Pollution Rule. 76 FR 48208 (August 8, 2011). (See *http://www.epa.gov/crossstaterule/*). On December 30, 2011, however, the D.C. Circuit stayed the new rules while a panel of judges reviews them, and told EPA to continue enforcing CAIR (see *EME Homer City Generation* v. *EPA,* No. 11–1302, Order at *2 (D.C. Cir. Dec. 30, 2011)). The *AEO 2010* NEMS used for today's NOPR assumes the implementation of CAIR.

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 imposition of an efficiency standard could be used to permit offsetting increases in SO_2 emissions by any regulated EGU. However, if the amended and new standards resulted in a permanent increase in the quantity of unused emissions allowances, there would be an overall reduction in SO_2 emissions from the standards. While there remains some uncertainty about the ultimate effects of efficiency standards on SO_2 emissions covered by the existing cap-and-trade system, the NEMS–BT modeling system that DOE uses to forecast emissions reductions currently indicates that no physical reductions in power sector emissions would occur for SO_2.

As discussed above, the *AEO 2010* NEMS used for today's NOPR assumes the implementation of CAIR, which established a cap on NO_X emissions in 28 eastern States and the District of Columbia. With CAIR in effect, the

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[56] M.J. Scott, O.V. Livingston, J.M. Roop, R.W. Schultz, and P.J. Balducci, *ImSET 3.1: Impact of Sector Energy Technologies; Model Description and User's Guide* (2009) (Available at: *http://www.pnl.gov/main/publications/external/technical_reports/PNNL-18412.pdf*).

energy conservation standards for battery chargers and EPSs are expected to have little or no physical effect on NO_X emissions in those States covered by CAIR, for the same reasons that they may have little effect on SO_2 emissions. However, the proposed standards would be expected to reduce NO_X emissions in the 22 States not affected by CAIR. For these 22 States, DOE is using the NEMS–BT to estimate NO_X emissions reductions from the standards considered in today's NOPR.

On December 21, 2011, EPA announced national emissions standards for hazardous air pollutants (NESHAPs) for mercury and certain other pollutants emitted from coal and oil-fired EGUs. (See *http://epa.gov/mats/pdfs/20111216MATSfinal.pdf*). The NESHAPs do not include a trading program and, as such, DOE's energy conservation standards would likely reduce Hg emissions. For the emissions analysis for this rulemaking, DOE estimated mercury emissions reductions using NEMS–BT based on *AEO2010,* which does not incorporate the NESHAPs. DOE expects that future versions of the NEMS–BT model will reflect the implementation of the NESHAPs.

For more details on the emissions analysis, see chapter 15 of the NOPR TSD.

M. Monetizing Carbon Dioxide and Other Emissions Impacts

As part of the development of this proposed rule, DOE considered the estimated monetary benefits likely to result 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 similar to the calculation of the NPV of consumer benefit, DOE considered the reduced emissions expected to result over the lifetime of products shipped in the forecast period for each TSL. This section summarizes the basis for the monetary values used for each of these emissions and presents values considered in this rulemaking.

For today's NOPR, DOE is relying on a set of values for the social cost of carbon (SCC) that was developed by an interagency process. A summary of the basis for these values is provided below, and a more detailed description of the methodologies used is provided as an appendix to chapter 16 of the TSD.

1. Social Cost of Carbon

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 that have small, or ''marginal,'' impacts on cumulative global emissions. The estimates are presented with an acknowledgement of the many uncertainties involved and with a clear understanding that they should be updated over time to reflect increasing knowledge of the science and economics of climate impacts.

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

a. Monetizing Carbon Dioxide Emissions

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 carbon dioxide.

When attempting to assess the incremental economic impacts of carbon dioxide emissions, the analyst faces a number of serious challenges. A recent report from the National Research Council[57] points out that any assessment will suffer from uncertainty, speculation, and lack of information about (1) future emissions of greenhouse gases, (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 serious questions of science, economics, and ethics and should be viewed as provisional.

Despite the serious limits of both quantification and monetization, SCC estimates can be useful in estimating the social benefits of reducing carbon dioxide emissions. Consistent with the directive in Executive Order 12866 quoted above, the purpose of the SCC estimates presented here is to make it possible for Federal agencies to incorporate the social benefits from reducing carbon dioxide emissions into cost-benefit analyses of regulatory actions that have small, or ''marginal,'' impacts on cumulative global emissions. Most Federal regulatory actions can be expected to have marginal impacts on global emissions.

For such policies, 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 value appropriate for that year. The net present value 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. This approach assumes that the marginal damages from increased emissions are constant for small departures from the baseline emissions path, an approximation that is reasonable for policies that have effects on emissions that are small relative to cumulative global carbon dioxide emissions. For policies that have a large (non-marginal) impact on global cumulative emissions, there is a separate question of whether the SCC is an appropriate tool for calculating the benefits of reduced emissions. This concern is not applicable to this notice, and DOE does not attempt to answer that question here.

At the time of the preparation of this notice, the most recent interagency estimates of the potential global benefits resulting from reduced CO_2 emissions in 2010, expressed in 2010$, were $4.9, $22.3, $36.5, and $67.6 per metric ton avoided. For emissions reductions that occur in later years, these 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,[58] although preference is given to

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

[58] 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.

consideration of the global benefits of reducing CO_2 emissions.

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. Specifically, the interagency group has set a preliminary goal of revisiting the SCC values within 2 years or at such time as substantially updated models become available, and to continue to support research in this area. In the meantime, the interagency group will continue to explore the issues raised by this analysis and consider public comments as part of the ongoing interagency process.

b. Social Cost of Carbon Values Used in Past Regulatory Analyses

To date, economic analyses for Federal regulations have used a wide range of values to estimate the benefits associated with reducing carbon dioxide emissions. In the final model year 2011 CAFE rule, the U.S. Department of Transportation (DOT) used both a ''domestic'' SCC value of $2 per ton of CO_2 and a ''global'' SCC value of $33 per ton of CO_2 for 2007 emission reductions (in 2007$), increasing both values at 2.4 percent per year.[59] DOT also included a sensitivity analysis at $80 per ton of CO_2. See *Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Year 2011,* 74 FR 14196 (March 30, 2009) (Final Rule); Final Environmental Impact Statement Corporate Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2011–2015 at 3–90 (Oct. 2008) (Available at: *http://www.nhtsa.gov/fuel-economy*). A domestic SCC value is meant to reflect the value of damages in the United States resulting from a unit change in carbon dioxide emissions, while a global SCC value is meant to reflect the value of damages worldwide.

A 2008 regulation proposed by DOT assumed a domestic SCC value of $7 per ton of CO_2 (in 2006$) for 2011 emission reductions (with a range of $0–$14 for sensitivity analysis), also increasing at 2.4 percent per year. See *Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2011–2015,* 73 FR 24352 (May 2, 2008) (Proposed Rule); Draft Environmental Impact Statement Corporate Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2011–2015 at 3–58 (June 2008) (Available at: *http://www.nhtsa.gov/fuel-economy*). A regulation for packaged terminal air conditioners and packaged terminal heat pumps finalized by DOE in October of 2008 used a domestic SCC range of $0 to $20 per ton CO_2 for 2007 emission reductions (in 2007$). 73 FR 58772, 58814 (Oct. 7, 2008) In addition, EPA's 2008 Advance Notice of Proposed Rulemaking on Regulating Greenhouse Gas Emissions Under the Clean Air Act identified what it described as ''very preliminary'' SCC estimates subject to revision. 73 FR 44354 (July 30, 2008). EPA's global mean values were $68 and $40 per ton CO_2 for discount rates of approximately 2 percent and 3 percent, respectively (in 2006$ for 2007 emissions).

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 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 ton of CO_2.

These interim values represent 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 and were offered for public comment in connection with proposed rules, including the joint EPA–DOT fuel economy and CO_2 tailpipe emission proposed rules.

c. Current Approach and Key Assumptions

Since the release of the interim values, the interagency group reconvened on a regular basis to generate improved SCC estimates, which were considered for this proposed rule. Specifically, the group considered public comments and further explored the technical literature in relevant fields. The interagency group relied on three integrated assessment models (IAMs) commonly used to estimate the SCC: the FUND, DICE, and PAGE models.[60] These models are frequently cited in the peer-reviewed literature and were used in the last assessment of the Intergovernmental Panel on Climate Change. 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 SCC values for use in regulatory analyses. Three values are based on the average SCC from three integrated assessment models, at discount rates of 2.5, 3, and 5 percent. The fourth value, 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 temperature change further out in the tails of the SCC distribution. For emissions (or emission reductions) that occur in later years, these values grow in real terms over time, as depicted in Table IV–31.

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[59] Throughout this section, references to tons of CO_2 refer to metric tons.

[60] The models are described in appendix 16–A of the TSD.

Table IV-31 Social Cost of CO_2, 2010–2050 (in 2007 dollars per metric ton)

	Discount Rate			
	5% Avg	3% Avg	2.5% Avg	3% 95th
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

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 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 concerns and problems that should be addressed by the research community, including research programs housed in many of the Federal agencies participating in the interagency process to estimate the SCC.

DOE recognizes the uncertainties embedded in the estimates of the SCC used for cost-benefit analyses. As such, DOE and others in the U.S. Government intend 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 this context, statements recognizing the limitations of the analysis and calling for further research take on exceptional significance.

In summary, in considering the potential global benefits resulting from reduced CO_2 emissions, DOE used the most recent values identified by the interagency process, adjusted to 2010$ using the GDP price deflator. For each of the four cases specified, the values used for emissions in 2010 were $4.9, $22.3, $36.5, and $67.6 per metric ton avoided (values expressed in 2010$).[61] To monetize the CO_2 emissions reductions expected to result from amended standards for Class A EPSs and new standards for non-Class A EPSs and battery chargers in 2013–2042, DOE used the values identified in Table A1 of the ''Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866,'' which is reprinted in appendix 16–A of the NOPR TSD, appropriately adjusted to 2010$. 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.

d. Valuation of Other Emissions Reductions

DOE investigated the potential monetary benefit of reduced NO_X emissions from the TSLs it considered. As noted above, new or amended energy conservation standards would reduce NO_X emissions in those 22 states that are not affected by the CAIR. DOE estimated the monetized value of NO_X emissions reductions resulting from each of the TSLs considered for today's NOPR based on environmental damage estimates found in the relevant scientific literature. Available estimates suggest a very wide range of monetary values, ranging from $370 per ton to $3,800 per ton of NO_X from stationary sources, measured in 2001$ (equivalent to a range of $450 to $4,623 per ton in 2010$).[62] In accordance with OMB guidance, DOE conducted two calculations of the monetary benefits derived using each of the economic values used for NO_X, one using a real discount rate of 3 percent and another using a real discount rate of 7 percent.[63]

DOE is aware of multiple agency efforts to determine the appropriate range of values used in evaluating the potential economic benefits of reduced Hg emissions. DOE has decided to await further guidance regarding consistent valuation and reporting of Hg emissions before it once again monetizes Hg emissions in its rulemakings.

N. Discussion of Other Comments

NEEP viewed the adoption of strong Federal energy conservation standards for battery chargers and EPSs as smart, minimal-cost mechanisms to help Northeast states achieve their aggressive energy savings goals. (NEEP, No. 49 at p. 3)

Lester suggested that DOE consider establishing incentive programs for U.S. manufacturers as an alternative to setting efficiency standards. The company claimed that these incentives would encourage the development of efficient, domestically produced products. (Lester, No. 50 at p. 3) DOE notes that this rulemaking constitutes an ''economically significant regulatory action'' under Executive Order (E.O.) 12866, Regulatory Planning and Review. 58 FR 51735 (October 4, 1993) Under 10

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[61] Table A1 presents SCC values through 2050. For DOE's calculation, it derived values after 2050 using the 3-percent per year escalation rate used by the interagency group.

[62] For additional information, refer to 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,* Washington, DC.

[63] OMB, Circular A–4: Regulatory Analysis (Sept. 17, 2003).

CFR part 430, subpart C, appendix A, section III.12, DOE must evaluate non-regulatory alternatives to proposed standards by performing a regulatory impact analysis (RIA). 61 FR 36981 at p. 36978 (July 15, 1996) In this RIA, DOE compared the effectiveness of multiple possible alternatives to standards, including manufacturer tax credits for efficient battery chargers and EPSs. The results of this analysis are available in chapter 17 of the TSD.

During manufacturer interviews, DOE also received questions regarding multi-voltage and multi-capacity battery chargers. Particularly with multi-voltage battery chargers, it is possible for the device to fall into more than one product class and manufacturers sought clarification on how to certify these devices. DOE notes that its recently promulgated test procedure describes the manner in which a multi-voltage or multi-capacity device must be tested. 76 FR 31750. For these devices, manufacturers may be required to test their product more than once and the batteries with which the devices are used for each test may put the battery charger into two product classes. If that is the case, the device would need to be certified for each product class for which it has been tested. This approach is consistent with DOE's approach for switch-selectable EPSs and DOE tentatively believes that this approach will result in the maximum energy savings for its proposed standards. DOE will consider alternative approaches and requests feedback from manufacturers and other interested parties on this proposal and any others, such as certifying at just the highest or lowest capacity or voltage.

O. Marking Requirements

Under 42 U.S.C. 6294(a)(5), Congress granted DOE with the specific authority to establish labeling or marking requirements for a number of consumer products. Among these products are battery chargers and EPSs. DOE notes that the creation of such marking requirements, particularly for a portion of the products covered by today's proposal, was specifically contemplated by Congress. In particular, EISA 2007 set standards for Class A EPSs and created marking requirements for these products. Section 301 of that public law specified that all Class A EPSs shall be clearly and permanently marked in accordance with the ''International Efficiency Marking Protocol for External Power Supplies'' (the ''Marking Protocol'').[64] (42 U.S.C. 6295(u)(3)(C))

The Marking Protocol, developed by the EPA in consultation with stakeholders both within and outside the United States, was originally designed in 2005 and updated in 2008 to meet the needs of those voluntary and regulatory programs in place at those times. In particular, the Marking Protocol defines efficiency mark ''IV'', which corresponds to the current Federal standard for Class A EPSs, and efficiency mark ''V'', which corresponds to ENERGY STAR version 2.0. (The ENERGY STAR program for EPSs ended on December 31, 2010.) In addition, these marks currently apply only to single-voltage EPSs with nameplate output power less than 250 watts, but not to multiple-voltage or high-power EPSs.

In today's notice, DOE proposes to amend the product marking (or ''labeling'') requirements for EPSs and is considering adopting a similar requirement for battery chargers. Specifically, DOE proposes to (1) extend to all EPSs the marking requirement created by EISA 2007, which currently applies only to Class A EPSs; (2) reserve an efficiency mark (or marks) in the Marking Protocol for standard levels in the final rule that do not already have a corresponding mark; and (3) require that EPSs in proposed product class N bear a specific marking to distinguish them from other EPSs and facilitate compliance verification. In addition, DOE is considering establishing a distinguishing mark for EPSs for certain security or life safety alarm or surveillance systems and is considering requiring that battery chargers be marked in accordance with a battery charger marking protocol similar to that for EPSs. DOE welcomes comment on all of these issues.

DOE notes that it is proposing standards for EPSs in product classes B, C, D, and E that exceed efficiency level ''V'', the highest level currently defined in the Marking Protocol. In addition, it is proposing standards for multiple-voltage and high-power EPSs. DOE is working with EPA to revise the Marking Protocol to accommodate all of the new and amended standards for EPSs being proposed today.

DOE is also proposing to create a separate product class (product class N) for EPSs that cannot power an end-use consumer product directly. They would be subject to less stringent standards than those being proposed today for their ''direct operation'' counterparts. To aid in determining whether EPSs are in compliance with standards, DOE proposes that (1) a Class A EPS in product class N be permanently marked with an ''N'' as a superscript to the circle that contains the appropriate Roman numeral; (2) a non-Class A EPS in product class N be permanently marked with the abbreviation ''EPS–N''; (3) an EPS in product class N that is sold separately from the battery charger or end-use consumer product with which it is intended to be used shall also be permanently marked with the manufacturer and model number of that battery charger or end-use consumer product; and (4) an EPS that is in product class N but, nonetheless, meets the relevant standard set for direct operation EPSs (and bears the appropriate Roman numeral) need not be marked with an ''N'', with ''EPS–N'', nor with the manufacturer and model number of the associated device.

DOE seeks input on what distinguishing mark should appear on EPSs for certain security and life safety equipment. A recently enacted law amended EPCA to exclude these devices from the no-load mode efficiency standards. Public Law 111–360 (Jan. 4, 2011) (to be codified at 42 U.S.C. 6295(u)(3)). The exclusion applies to AC–AC EPSs manufactured before July 1, 2017, that have nameplate output of 20 watts or more, are certified as being designed to be connected to a security or life safety alarm or surveillance system component (as defined in the law), and are permanently marked with a distinguishing mark for such products as established within the Marking Protocol. No such distinguishing mark exists within the Marking Protocol, but DOE intends to work with EPA and other stakeholders to establish such a mark. The mark, which could be the word ''ACTIVE'' or an ''A'' in a circle, for example, would likely be required to appear adjacent to the appropriate Roman numeral. DOE welcomes input on what mark would be appropriate, where it should be located, and any other details related to how that mark should be presented on a given device.

Lastly, EPS efficiency markings can be useful in certain circumstances to help verify whether a given product complies with the relevant standards. To assist in ensuring that compliant products can be readily identified, DOE is also considering marking requirements for battery chargers. NRDC submitted a comment in November 2010, after the close of the preliminary analysis comment period, requesting that DOE consider such a marking protocol for battery chargers. (NRDC, No. 56) NRDC

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[64] U.S. EPA, ''International Efficiency Marking Protocol for External Power Supplies,'' October 2008, available at Docket No. 62.

claimed that establishing an efficiency marking protocol for battery chargers would have several benefits, including creating a simple vocabulary for all stakeholders, facilitating enforcement, lowering the cost of compliance for industry by facilitating international adoption, and encouraging voluntary adoption of higher levels. NRDC proposed using Roman numerals, as is done for EPSs. To avoid confusion, the Roman numerals on battery chargers would appear next to the word ''BC'', as shown in Table IV–32, in contrast to the Roman numerals on EPSs, which stand alone. NRDC's comment also includes recommendations on where the mark should be located.

Consistent with this suggestion, DOE is considering adopting a marking protocol for battery chargers that would have ''BC III'' denote the battery charger standard levels adopted in the final rule. This marking would give other standards-setting bodies the option of defining a lower efficiency level (''BC II'') for use on BCs sold to consumers outside the United States and would reserve ''BC I'' for products that do not meet the criteria for the other (higher) marks. A similar approach was used when the efficiency marking protocol for EPSs was established. The formulas given for each of the battery charger product classes for BC Level III match the standards being proposed today and could change.

Table IV-32 Proposed Efficiency Marking Protocol for Battery Chargers

Level	Description	Maximum Annual Energy Consumption†	
BC I	Used if no other criteria are met		
BC II	Less than Level III	TBD	
BC III	DOE standards (compliance date in 2013)	PC 1	3.04
		PC 2	$= 0.2095(E_{batt}*) + 5.87$
		PC 3	For $E_{batt} < 9.74$ Wh, $= 4.68$ For $E_{batt} \geq 9.74$ Wh, $= 0.0933(E_{batt}) + 3.77$
		PC 4	For $E_{batt} < 9.71$ Wh, $= 9.03$ For $E_{batt} \geq 9.71$ Wh, $= 0.2411(E_{batt}) + 6.69$
		PC 5	For $E_{batt} < 355.18$ Wh, $= 20.06$ For $E_{batt} \geq 355.18$ Wh, $= 0.0219(E_{batt}) + 12.28$
		PC 6	For $E_{batt} < 239.48$ Wh $= 30.37$ For $E_{batt} \geq 239.48$ Wh $= 0.0495(E_{batt}) + 18.51$
		PC 7	$= 0.502(E_{batt}) + 4.53$
		PC 8	0.66
		PC 9	See Product Class 2, 3, or 4 depending upon battery voltage.
		PC 10	1.50
BC IV and higher	Reserved for future use	TBD	

† Annual energy consumption is determined using the DOE test procedure and compliance formulas. E_{batt} stands for battery energy.

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DOE is considering multiple approaches for determining where on the external housing of the battery charger the mark shall be placed. NRDC's proposal specifies where the mark shall be placed in cases where the battery charger has more than one housing, as described in Table IV–33. (NRDC, No. 56) DOE's concern with NRDC's proposal is the difficulty in accurately identifying and locating charge control in a battery charger. Alternatively, DOE could give manufacturers the flexibility to choose where to place the mark. DOE expects that manufacturers will most often choose to place the mark on a cradle or charging base, if one is present, or on the end-use consumer product.

TABLE IV–33—PROPOSED LOCATION FOR BATTERY CHARGER MARKING

Form factor	Location of battery charger marking
Three separate housings	Charge control component.
Power supply and charge control together, battery separate	Power supply & charge control component.
Charge control and battery together, power supply separate	Charge control & battery component.

DOE is also considering other requirements for the battery charger mark. For example, DOE could require that the mark be placed on a nameplate or in an equally visible location or that the font size used for the mark be similar to that used for other markings on the product such as the UL and CE symbols. DOE is aware that the CEC also is considering establishing marking requirements for battery chargers and is following that process as it develops. If the CEC adopts marking requirements for battery chargers within the scope of today's notice, those requirements would be preempted by any future battery charger marking requirements adopted by DOE. Manufacturers would then have to transition from meeting the CEC's requirements to meeting DOE's requirements. Therefore, DOE would consider adopting the CEC's requirements to minimize the burden associated with that transition.

DOE recognizes that there are several challenges inherent in creating a marking protocol for battery chargers. First, it may prove difficult to specify unambiguously where the mark should be placed given the variety of form factors found in the marketplace. Second, in contrast to EPSs, some battery chargers may not have a nameplate to add a mark to. Third, in those cases where the mark is placed on an end-use consumer product containing a battery charger, it may be misinterpreted by consumers as an endorsement of that product. DOE welcomes comment on these issues, NRDC's proposal, and any other issues related to efficiency markings for battery chargers.

P. Reporting Requirements

For battery chargers and non-Class A external power supplies, DOE will establish certification, compliance, and enforcement provisions in a future rulemaking. This future rulemaking will outline the necessary information that manufacturers must provide in order to certify compliance with any energy conservation standards established by this rulemaking.

V. Analytical Results

The following section addresses the results from DOE's analyses with respect to potential energy efficiency standards for the various product classes examined as part of this rulemaking. Issues discussed include the TSLs examined by DOE, the projected impacts of each of these levels if adopted as energy efficiency standards for battery chargers and EPSs, and the standards levels that DOE is tentatively proposing in today's NOPR. Additional details regarding the analyses conducted by the agency are contained in the publicly available TSD supporting this proposal.

A. Trial Standard Levels

DOE analyzed the benefits and burdens of multiple TSLs for the products that are the subject of today's proposed rule. A description of each TSL DOE analyzed is provided below. DOE attempted to limit the number of TSLs considered for the NOPR by excluding efficiency levels that do not exhibit significantly different economic and/or engineering characteristics from the efficiency levels already selected as a TSL. While the NOPR presents only the results for those efficiency levels in TSL combinations, the TSD contains a more fulsome discussion and includes results for all efficiency levels that DOE examined.

1. External Power Supply TSLs

Table V–1 presents the TSLs for EPSs and the corresponding efficiency levels. DOE chose to analyze product class B directly and scale the results from the engineering analysis to product classes C, D, and E. As a result, the TSLs for these three product classes correspond to the TSLs for product class B. DOE created separate TSLs for the multiple-voltage (product class X) and high-power (product class H) EPSs to determine their standards. DOE did not analyze TSLs above the baseline CSL for product class N and instead proposes applying the baseline EISA 2007 standard to all EPSs in this product class, as discussed in section B below.

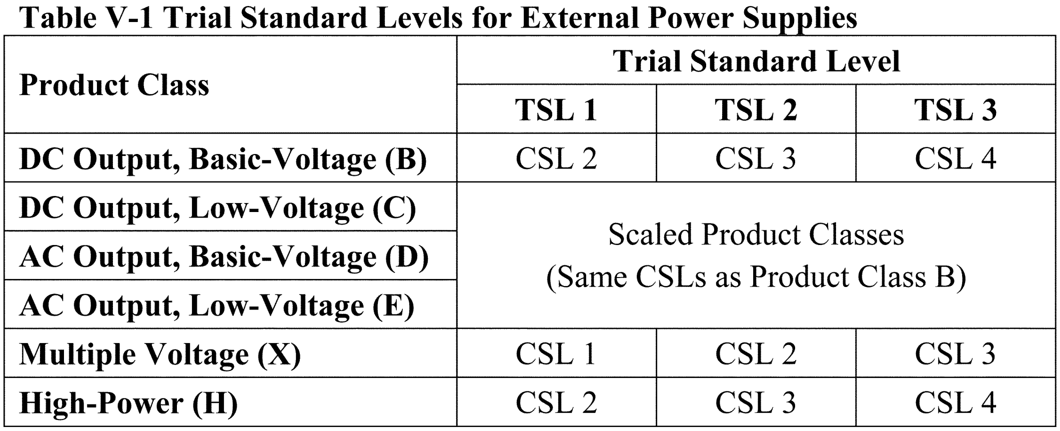

Table V-1 Trial Standard Levels for External Power Supplies

Product Class	**Trial Standard Level**		
	TSL 1	**TSL 2**	**TSL 3**
DC Output, Basic-Voltage (B)	CSL 2	CSL 3	CSL 4
DC Output, Low-Voltage (C)	Scaled Product Classes (Same CSLs as Product Class B)		
AC Output, Basic-Voltage (D)			
AC Output, Low-Voltage (E)			
Multiple Voltage (X)	CSL 1	CSL 2	CSL 3
High-Power (H)	CSL 2	CSL 3	CSL 4

For EPS product class B, DOE examined three TSLs corresponding to each candidate standard level of efficiency developed in the engineering analysis. TSL 1 is an intermediate level of performance above ENERGY STAR, which offers the greatest consumer NPV. TSL 2 is equivalent to the best-in-market CSL and represents an incremental rise in energy savings over TSL 1. TSL 3 is the max-tech level and corresponds to the greatest NES.

For product class X, DOE examined three TSLs above the baseline. TSL 1 is an intermediate level of performance above the baseline. TSL 2 is equivalent to the best-in-market CSL and corresponds to the maximum consumer NPV. TSL 3 is the max-tech level and corresponds to the greatest NES.

For product class H, DOE examined three TSLs above the baseline. TSL 1 corresponds to an intermediate level of efficiency. TSL 2 is the scaled best-in-market CSL and corresponds to the maximum consumer NPV. TSL 3 is the scaled max-tech level, which provides the highest NES.

2. Battery Charger TSLs

Table V–2 presents the TSLs and corresponding candidate standard levels for battery chargers. 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-2 Trial Standard Levels for Battery Chargers

Product Class	Trial Standard Level			
	TSL 1	TSL 2	TSL 3	TSL 4
Low-Energy, Inductive (1)	CSL 1	CSL 2	CSL 3	-
Low-Energy, Low-Voltage (2)	CSL 1	CSL 2	CSL 3	CSL 4
Low-Energy, Med.-Voltage (3)	CSL 1	CSL 1	CSL 2	CSL 3
Low-Energy, High-Voltage (4)	CSL 1	CSL 1	CSL 2	CSL 3
Med.-Energy, Low-Voltage (5)	CSL 1	CSL 2	CSL 3	-
Med.-Energy, High-Voltage (6)	CSL 1	CSL 2	CSL 3	-
High-Energy (7)	CSL 1	CSL 2	-	-
Low-Voltage DC Input (8)	CSL 1	CSL 2	CSL 3	-
High-Voltage DC Input (9)	-	-	-	-
AC Input, AC Output (10)	CSL 1	CSL 2	CSL 3	-

For battery charger product class 1 (low-energy, inductive), DOE examined three trial standard levels corresponding to each candidate standard level developed in the engineering analysis. TSL 1 is an intermediate level of performance above the baseline. TSL 2 is equivalent to the best-in-market and corresponds to the maximum consumer NPV. TSL 3 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, TSL 1 is an intermediate efficiency level above the baseline for each product class and corresponds to the maximum consumer NPV. For 2 of the 3 product classes, TSL 2 corresponds to the same efficiency level, but for the third class, product class 2, TSL 2 represents an incremental efficiency level below best-in-market. TSL 3 corresponds to the best-in-market efficiency level for all product classes. Finally, TSL 4 corresponds to the max-tech efficiency level for all product classes and therefore, the maximum NES.

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 this grouping, three TSLs corresponding to different combinations of efficiency levels were examined. 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, TSL 3 corresponds to the max-tech efficiency level for both product classes and the maximum NES.

For product class 7 (high-energy), DOE examined only two TSLs because of the paucity of products available on the market. TSL 1 corresponds to an efficiency level equivalent to the best-in-market and maximizes consumer NPV is maximized. TSL 2 is the max-tech level and corresponds to the level with the maximum NES.

For product class 8 (low-voltage DC input), DOE examined three TSLs at incremental levels above the baseline. TSL 1 is the first incremental level between the baseline and best-in-market. Consumer NPV is maximized at this level. TSL 2 is the best-in-market efficiency level and is projected to yield higher NES levels over TSL 1. Finally, at TSL 3, or the max-tech efficiency level, NES is maximized.

For product class 9 (high-voltage DC input), DOE did not examine any TSLs in depth. Rather, when DOE completed its engineering analysis, it conducted its LCC analysis on the efficiency levels that had been developed and found that all efficiency levels above the baseline showed negative LCC savings. This fact, combined with the minimal energy consumed per year for these devices, led DOE to propose an alternative standard level for these products. DOE's proposal for this product class is discussed in section V.B.2.f below.

For product class 10 (AC input, AC output), DOE examined three TSLs, each corresponding to an efficiency level developed in the engineering analysis. TSL 1 corresponds to an incremental level of performance above the baseline. TSL 2 is equivalent to what manufacturers stated would be equivalent to the best-in-market level. TSL 3, which DOE projects to yield maximized NPV and NES values, is equivalent to the max-tech efficiency level for product class 10.

B. Economic Justification and Energy Savings

As discussed in section II.A, 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 generally discuss how DOE is addressing each of those seven factors in this rulemaking. For further details and the results of DOE's analyses pertaining to economic justification, see sections IV and V of today's notice.

1. Economic Impacts on Individual Consumers

For individual consumers, measures of economic impact include the changes in LCC and the PBP associated with new or amended standards. The LCC, which is also separately specified as one of the seven factors to be considered in determining the economic justification for a new or amended standard (42 U.S.C. 6295(o)(2)(B)(i)(II)), is discussed in the following section. For consumers in the aggregate, DOE also calculates the net present value from a national perspective of the economic impacts on consumers over the forecast period used in a particular rulemaking.

a. Life-Cycle Cost and Payback Period

As in the preliminary analysis phase, DOE calculated the average LCC savings relative to the base case market efficiency distribution for each representative unit and product class. DOE's projections indicate that a new standard would affect different battery charger and EPS consumers differently, depending on the market segment to which they belong and their usage characteristics. Section IV.F discusses the inputs used for calculating the LCC and PBP. Inputs used for calculating the LCC include total installed costs, annual energy savings, electricity rates, electricity price trends, product lifetime, and discount rates.

The key outputs of the LCC analysis are average LCC savings for each product class for each considered efficiency level, relative to the base case, as well as a probability distribution of LCC reduction or increase. The LCC analysis also estimates, for each product class or representative unit, the fraction of customers for which the LCC will either decrease (net benefit), or increase (net cost), or exhibit no change (no impact) relative to the base case forecast. No impacts occur when the product efficiencies of the base case forecast already equal or exceed the considered efficiency level. Battery chargers and EPSs are used in applications that can have a wide range of operating hours. Battery chargers and EPSs 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.

Another key output of the LCC analysis is the median payback period at each CSL. DOE presents the median payback period rather than the mean payback period because it is more robust in the presence of outliers in the data.[65] These outliers skew the mean payback period calculation but have little effect on the median payback period calculation. A small change in operating costs, which derive the denominator of the payback period calculation, can sometimes result in a very large payback period, which skews the mean payback period 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 payback period, which is not skewed by occasional outliers. Table V–3 through Table V–5 show the results for the representative units and product classes analyzed for EPSs and battery chargers. Additional detail for these results, including frequency plots of the distributions of life-cycle costs and payback periods, are available in chapter 8 of the TSD.

Table V-3 LCC Savings and Payback Period for DC Output, Basic-Voltage External Power Supplies

	Weighted Average LCC Savings*2010$*]			**Median Payback Period [*yrs*]**		
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 1**	**TSL 2**	**TSL 3**
2.5W AC-DC, Basic V	0.10	0.04	0.02	3.5	4.3	4.3
18W AC-DC, Basic V	0.68	0.69	(1.19)	1.2	3.1	8.1
60W AC-DC, Basic V	(0.33)	(0.45)	(1.38)	6.3	5.4	6.4
120W AC-DC, Basic V	0.60	0.61	(5.49)	1.4	1.9	9.1

For EPS product class B (basic-voltage, AC–DC, class A EPSs), each representative unit has a unique value for LCC savings and median PBP. The 2.5W representative unit has positive LCC savings at all TSLs considered, while the 60W representative unit has negative LCC savings at all TSLs. Both the 18W and 120W representative units have positive LCC savings through TSL 2, but turn negative at TSL 3.

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[65] 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-4 LCC Savings and Payback Period for Non-Class A External Power Supplies

	Weighted Average LCC Savings [*2010$*]			Median Payback Period [*yrs*]		
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 1**	**TSL 2**	**TSL 3**
203W Multiple Voltage	2.05	2.07	(3.09)	0.4	4.7	13.2
345W High-Power	124.82	129.08	92.96	0.0	0.2	2.5

The Non-Class A EPSs have varying LCC results at each TSL. See Table V–4. The 203W Multiple Voltage unit (product class X) has positive LCC savings through TSL 2. DOE notes that for this product class, the LCC savings remain largely the same for TSL 1 and 2 because the difference in LCC is approximately $0.01 and 95 percent of this market consists of purchased products that are already at TSL 1. Therefore, the effects are largely from the movement of the 5 percent of the market up from the baseline. The 345W High-Power unit (product class H) has positive LCC savings for each TSL. This projection is largely attributable to the installed price of the baseline unit, a linear switching device, which is more costly than higher efficiency switch-mode power devices, so as consumers move to higher efficiencies, the purchase price actually decreases, resulting in savings.

Table V-5 LCC Savings and Payback Period for Battery Chargers

	Weighted Average LCC Savings [*2010$*]				Median Payback Period [*yrs*]			
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**
PC1 - Low E, Inductive	0.76	1.52	(2.87)	N/A	1.2	1.7	8.5	N/A
PC2 - Low E, Low-Voltage	0.16	(0.12)	(1.81)	(4.54)	0.5	5.2	8.5	16.9
PC3 - Low E, Medium-Voltage	0.35	0.35	(2.12)	(2.15)	3.9	3.9	21.9	21.5
PC4 - Low E, High-Voltage	0.43	0.43	(2.73)	(10.14)	3.0	3.0	13.8	37.6
PC5 - Medium E, Low-Voltage	9.69	33.79	(104.58)	N/A	1.7	0.0	53.4	N/A
PC6 - Medium E, High-Voltage	9.96	40.78	(86.76)	N/A	1.2	0.0	20.8	N/A
PC7 - High E	38.26	(127.30)	N/A	N/A	0.0	27.2	N/A	N/A
PC8 - DC-DC, <9V Input	3.04	(1.96)	(2.31)	N/A	0.0	0.0	24.9	N/A
PC9 - DC-DC, ≥9 V Input	(0.09)	(0.25)	0.00	N/A	7.2	8.8	0.0	N/A
PC10 - Low E, AC Out	6.41	7.26	8.30	N/A	1.3	1.4	1.5	N/A

The LCC results for battery chargers depend on the product class being considered. See Table V–5. For product class 1, LCC results are positive through TSL 2. For the low-energy product classes (PC2, 3, and 4), LCC results are generally positive through TSL 2, with the exception of product class 2, and become negative at TSL 3. The medium-energy product classes (PC5 and 6) are positive through TSL 2 and negative at TSL 3. The high-energy product class (PC7) has positive LCC savings of $38.26 at TSL 1, and then becomes negative at TSL 2. Product class 8 has positive LCC savings only at TSL 1, while product class 10 has positive LCC savings at each TSL (see entries for PC8 and PC10 in Table V–5).

b. Consumer Subgroup Analysis

Certain consumer subgroups may be disproportionately affected by standards. DOE performed LCC subgroup analyses in this NOPR for low-income consumers, small businesses, top tier marginal electricity price consumers, and consumers of specific applications. See section IV.F of this NOPR for a review of the inputs to the LCC analysis. The following discussion presents the most significant results from the LCC subgroup analysis.

Low-Income Consumers

For low-income consumers, the LCC impacts and payback periods are different than for the general population. This subgroup considers only the residential sector, and uses an adjusted electricity price from the reference case scenario. DOE found that low-income consumers below the poverty line typically paid electricity prices that were 0.2 cents per kWh lower than the general population. To account for this difference, DOE adjusted electricity prices by a factor of 0.9814 to derive electricity prices for this subgroup. Table V–6 through Table V–8 show the LCC impacts and payback periods for low-income consumers purchasing EPSs and battery chargers.

The LCC savings and PBPs of low-income consumers is similar to that of the total population of consumers. In general, low-income consumers experience slightly reduced LCC savings, particularly in product classes dominated by residential applications. However, product classes with a large proportion of commercial applications experience less of an effect under the low-income consumer scenario, which is specific to the residential sector, and sometimes have greater LCC savings than the reference case results. None of the changes in LCC savings move a TSL from positive to negative LCC savings, or vice versa.

Table V-6 DC Output, Basic-Voltage External Power Supplies: Low-Income Consumer Subgroup

	Weighted Average LCC Savings [*2010$*]			**Median Payback Period [*yrs*]**		
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 1**	**TSL 2**	**TSL 3**
2.5W AC-DC, Basic V	0.10	0.04	0.01	3.5	4.4	4.4
18W AC-DC, Basic V	0.69	0.70	(1.19)	1.2	3.4	9.8
60W AC-DC, Basic V	(0.29)	(0.35)	(1.19)	6.4	5.3	6.3
120W AC-DC, Basic V	0.65	0.68	(5.32)	1.3	1.8	8.8

Table V-7 Non-Class A External Power Supplies: Low-Income Consumer Subgroup

	Weighted Average LCC Savings [*2010$*]			**Median Payback Period [*yrs*]**		
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 1**	**TSL 2**	**TSL 3**
203W Multiple-Voltage	2.00	2.01	(3.20)	0.4	4.8	13.5
345W High-Power	122.51	126.61	90.23	0.0	0.4	4.3

Table V-8 Battery Chargers: Low-Income Consumer Subgroup

	Weighted Average LCC Savings [*2010$*]				**Median Payback Period [*yrs*]**			
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**
PC1 - Low E, Inductive	0.74	1.47	(2.94)	N/A	1.3	1.7	8.6	N/A
PC2 - Low E, Low-Voltage	0.15	(0.16)	(1.87)	(4.60)	0.5	5.5	8.7	17.2
PC3 - Low E, Medium-Voltage	0.31	0.31	(2.21)	(2.25)	4.4	4.4	22.4	22.4
PC4 - Low E, High-Voltage	0.61	0.61	(2.79)	(10.28)	3.2	3.2	12.3	43.1
PC5 - Medium E, Low-Voltage	9.47	33.26	(105.27)	N/A	1.8	0.0	54.5	N/A
PC6 - Medium E, High-Voltage	9.72	40.06	(87.83)	N/A	1.3	0.0	21.2	N/A
PC7 - High E	39.20	(135.53)	N/A	N/A	0.0	126.6	N/A	N/A
PC8 - DC-DC, <9V Input	3.05	(1.93)	(2.29)	N/A	0.0	0.0	26.6	N/A
PC9 - DC-DC, ≥9 V Input	(0.09)	(0.25)	0.00	N/A	7.2	8.8	0.0	N/A
PC10 - Low E, AC Out	6.24	7.08	8.08	N/A	1.3	1.4	1.5	N/A

Small Businesses

For small business customers, the LCC impacts and payback periods are different than for the general population. This subgroup 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 4.48 percent higher than the industry average, which was applied to the discount rate for the small business consumer subgroup.

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. For EPS product class B, the LCC savings for the 2.5W representative unit become negative at TSL 2 and 3 under the small business scenario, but none of the savings for other representative units change from positive to negative, or vice versa. Similarly, none of the battery charger product classes that were positive in the reference case become negative in the small business subgroup analysis, and vice versa. This observation indicates that small business consumers would experience similar LCC impacts as the general population.

Table V–9 and Table V–10 show the LCC impacts and payback periods for small businesses purchasing EPSs and battery chargers. DOE did not identify any commercial applications for Non-Class A EPSs, and, consequently, did not evaluate these products as part of the small business consumer subgroup analysis.

Table V-9 DC Output, Basic-Voltage External Power Supplies: Small Business Consumer Subgroup

	Weighted Average LCC Savings [*2010$*]			**Median Payback Period [*yrs*]**		
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 1**	**TSL 2**	**TSL 3**
2.5W AC-DC, Basic V	0.03	(0.04)	(0.08)	4.4	5.0	5.0
18W AC-DC, Basic V	0.44	0.32	(1.81)	1.1	2.8	6.9
60W AC-DC, Basic V	(0.46)	(0.73)	(1.93)	7.1	6.0	7.2
120W AC-DC, Basic V	0.46	0.45	(5.98)	1.4	2.0	9.2

Table V-10 Battery Chargers: Small Business Consumer Subgroup

	Weighted Average LCC Savings [*2010$*]				**Median Payback Period [*yrs*]**			
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**
PC1 - Low E, Inductive*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PC2 - Low E, Low-Voltage	0.18	(0.18)	(1.88)	(4.66)	0.5	4.4	8.4	15.4
PC3 - Low E, Medium-Voltage	1.08	1.08	(0.85)	(0.75)	1.2	1.2	4.7	4.6
PC4 - Low E, High-Voltage	0.06	0.06	(2.82)	(10.18)	2.3	2.3	17.0	34.8
PC5 - Medium E, Low-Voltage*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PC6 - Medium E, High-Voltage*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PC7 - High E	37.40	(128.58)	N/A	N/A	0.0	27.2	N/A	N/A
PC8 - DC-DC, <9V Input	3.00	(2.00)	(2.36)	N/A	0.0	0.0	10.9	N/A
PC9 - DC-DC, ≥9 V Input*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PC10 - Low E, AC Out	3.71	4.14	4.65	N/A	1.5	1.7	1.8	N/A

* These product classes do not contain any commercial applications, so the small business consumer subgroup is not applicable.

Top Tier Marginal Electricity Price Consumers

For top tier marginal electricity price consumers, the LCC impacts and payback periods are different than for the general population. The analyses for this subgroup consider a weighted-average of the residential and commercial sectors, and uses an adjusted electricity price from the reference case scenario. DOE used an upper tier inclined marginal block rate for the electricity price in the residential and commercial sectors, resulting in a price of $0.310 and $0.225 per kWh, respectively. Table V–11 through Table V–13 show the LCC impacts and payback periods for top tier marginal electricity price consumers purchasing EPSs and battery chargers.

Consumers in the top tier marginal electricity price bracket 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 many of the negative LCC savings results to positive LCC savings. Some product classes and representative units 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 top tier marginal electricity prices.

Table V-11 DC Output, Basic-Voltage External Power Supplies: Top Tier Marginal Electricity Price Consumer Subgroup

	Weighted Average LCC Savings [*2010$*]			**Median Payback Period [*yrs*]**		
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 1**	**TSL 2**	**TSL 3**
2.5W AC-DC, Basic V	0.86	0.97	1.08	1.4	1.7	1.7
18W AC-DC, Basic V	2.14	3.19	3.54	0.4	1.2	3.2
60W AC-DC, Basic V	0.73	1.51	2.45	2.1	1.9	2.2
120W AC-DC, Basic V	2.05	2.38	(0.28)	0.5	0.6	3.8

Table V-12 Non-Class A External Power Supplies: Top Tier Marginal Electricity Price Consumer Subgroup

	Weighted Average LCC Savings [*2010$*]			**Median Payback Period [*yrs*]**		
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 1**	**TSL 2**	**TSL 3**
203W Multiple Voltage	6.02	6.62	6.25	0.1	1.5	4.2
345W High-Power	313.34	331.76	318.23	0.0	0.0	0.2

Table V-13 Battery Chargers: Top Tier Marginal Electricity Price Consumer Subgroup

	Weighted Average LCC Savings [*2010$*]				**Median Payback Period [*yrs*]**			
Rep. Unit	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**
PC1 - Low E, Inductive	2.55	5.71	2.86	N/A	0.4	0.5	2.7	N/A
PC2 - Low E, Low-Voltage	0.46	1.13	0.83	(1.75)	0.2	1.8	3.0	6.0
PC3 - Low E, Medium-Voltage	1.47	1.47	1.60	1.60	1.4	1.4	7.1	7.2
PC4 - Low E, High-Voltage	1.83	1.83	0.22	(6.34)	1.0	1.0	6.4	14.7
PC5 - Medium E, Low-Voltage	29.35	79.29	(44.77)	N/A	0.9	0.0	21.3	N/A
PC6 - Medium E, High-Voltage	30.62	102.95	6.30	N/A	0.4	0.0	6.7	N/A
PC7 - High E	49.74	(94.46)	N/A	N/A	0.0	13.6	N/A	N/A
PC8 - DC-DC, <9V Input	3.13	(1.57)	(1.89)	N/A	0.0	0.0	8.1	N/A
PC9 - DC-DC, ≥9 V Input	(0.09)	(0.25)	0.00	N/A	7.2	8.8	0.0	N/A
PC10 - Low E, AC Out	20.43	23.53	27.27	N/A	0.4	0.4	0.5	N/A

Consumers of Specific Applications

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

For EPS product class B, the application-specific LCC results indicate that most applications will experience similar levels of LCC savings as the representative unit's average LCC savings. The 2.5W representative unit has positive LCC savings for each TSL, but infrequently charged applications, such as beard and moustache trimmers (among others), experience negative LCC savings. Similarly, the 18W representative unit has projected positive LCC savings through TSL 2, but other applications using EPSs, such as portable DVD players and camcorders, have negative savings. For the 60W representative unit, all applications follow the shipment-weighted average trends, except EPSs used in sleep apnea machines, which have positive LCC savings at each TSL. The same is true for the 120W representative unit, except for EPSs used in portable O_2 concentrator applications, which are projected to yield negative LCC results for all TSLs.

For battery charger product classes, DOE noted similar trends where less frequently used applications experienced lower LCC savings. For product class 2, LCC savings 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. The top three product class 3 applications (which account for over 50 percent of total shipments) have negative LCC savings and contribute to the negative LCC savings of the product class average. However, some applications have significantly positive LCC savings, such as handheld vacuums, LAN equipment, stick vacuums, and universal battery chargers, which together comprise 15 percent of the total shipments in PC3. Product class 4 (e.g., notebooks and netbooks) have no impacts at TSL 1 or TSL 2 because these products already use battery charger technology above the baseline efficiency level. In the other battery charger product classes, the disparate applications tend to experience similar LCC savings. See chapter 11 of the TSD for further detail.

c. Rebuttable Presumption Payback

As discussed in section III.D.2, EPCA provides a rebuttable presumption where, in essence, 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. However, DOE routinely conducts a full economic analysis that considers the full range of impacts, including those to the customer, 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 evaluate definitively the economic justification for a potential standard level (thereby supporting or rebutting the results of any preliminary determination of economic justification).

For EPSs and battery chargers, energy savings calculations in the LCC and PBP analyses used both the relevant test procedures as well as the relevant usage profiles. DOE's recent changes to the test procedures did not affect any characteristics that impact the payback period calculation. Because DOE calculated payback periods using a methodology consistent with the rebuttable presumption test for EPSs and battery chargers in the LCC and payback period analyses, DOE did not perform a stand-alone rebuttable presumption analysis, as it was already embodied in the LCC and PBP analyses.

2. Economic Impacts on Manufacturers

DOE performed an MIA to estimate the impact of new and amended energy conservation standards on manufacturers of EPSs and battery chargers. The section below describes the expected impacts on manufacturers at each potential TSL.

a. 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 (2011) through the end of the analysis period. The discussion also notes the difference in cash flow between the base case and the standards case in the year before the compliance date of potential new and amended 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.

i. EPS Cash Flow Impacts

For EPSs, the MIA describes the impacts on EPS ODMs. Each set of results below shows two tables of INPV impacts on the ODM. The first table reflects the lower (less severe) bound of impacts and the second represents the upper (more severe) bound. To evaluate this range of cash-flow impacts on EPS manufacturers, DOE modeled two different scenarios using different markup assumptions. These assumptions correspond to the bounds of a range of market responses that DOE anticipates could occur in the standards case. Each scenario results in a unique set of cash flows and corresponding industry value at each TSL.

To assess the lower (less severe) end of the range of potential impacts, DOE modeled the flat markup scenario. The flat markup scenario assumes that in the standards case manufacturers would be able to pass the higher production costs required to manufacture more efficient products on to their customers. To assess the higher (more severe) end of the range of potential impacts, DOE modeled the preservation of operating profit markup scenario in which higher energy conservation standards result in lower manufacturer markups. DOE used the main NIA shipment scenario for both the lower- and higher-bound MIA scenarios that were used to characterize the potential INPV impacts.

Product Classes B, C, D, and E

Table V–14 and Table V–15 present the projected results for product classes B, C, D, and E under the flat and preservation of operating profit markup scenarios. DOE examined four representative units in product class B and scaled the results to product classes C, D, and E using the most appropriate representative unit for each product class.

Table V-14 Manufacturer Impact Analysis for Product Classes B, C, D, and E – Flat Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	(2010$ millions)	231.9	193.0	196.7	249.8
Change in INPV	(2010$ millions)	-	(38.9)	(35.2)	17.9
	(%)	-	-16.8%	-15.2%	7.7%
Product Conversion Costs	(2010$ millions)	-	29.1	34.5	36.3
Capital Conversion Costs	(2010$ millions)	-	32.2	38.1	40.1
Total Conversion Costs	(2010$ millions)	-	61.4	72.6	76.4

Table V-15 Manufacturer Impact Analysis for Product Classes B, C, D, and E – Preservation of Operating Profit Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	(2010$ millions)	231.9	169.4	150.5	108.4
Change in INPV	(2010$ millions)	-	(62.5)	(81.4)	(123.5)
	(%)	-	-26.9%	-35.1%	-53.2%
Product Conversion Costs	(2010$ millions)	-	29.1	34.5	36.3
Capital Conversion Costs	(2010$ millions)	-	32.2	38.1	40.1
Total Conversion Costs	(2010$ millions)	-	61.4	72.6	76.4

At TSL 1, DOE estimates impacts on INPV to range from −$38.9 million to −$62.5 million, or a change in INPV of −16.8 percent to −26.9 percent. At this level, industry free cash flow is estimated to decrease by approximately 179.2 percent to −$10.8 million, compared to the base-case value of $13.6 million in the year leading up to when the new and amended energy conservation standards would need to be met.

At TSL 1, manufacturers of product class B, C, D, and E EPSs face a moderate loss in INPV. For these product classes, the required efficiencies at TSL 1 correspond to an intermediate level above the ENERGY STAR 2.0 levels but below the best in market efficiencies. The conversion costs are a major contribution of the decrease in INPV because the vast majority of the product class B, C, D, and E EPS shipments fall below CSL 2. Manufacturers will incur product and capital conversion costs of approximately $61.4 million at TSL 1. In 2013, approximately 84 percent of product class B, C, D, and E shipments are projected to fall below the proposed amended energy conservation standards. In addition, 92 percent of the products for the 2.5W representative unit are projected to fall below the proposed efficiency standard, and would likely require more substantial conversion costs because meeting the efficiency standard would require 2.5W representative units to switch from linear to switch mode technology. This change would increase the conversion costs for these 2.5W representative units, which account for approximately a quarter of all the product class B, C, D, and E shipments.

At TSL 1, the MPC increases 45 percent for the 2.5W representative units (a representative unit for product class B and all shipments of product classes C and E), 5 percent for the 18 Watt representative units (a representative unit for product class B and all shipments of product class D), 14 percent for the 60W representative units, and 3 percent for the 120W representative units over the baseline. The conversion costs are significant enough to cause a moderately negative industry impact even if the incremental change in MPCs is fully passed on to OEMs. Impacts are more significant under the preservation of operating profit scenario because under this scenario manufacturers would be unable to pass on the full increase product cost.

At TSL 2, DOE estimates impacts on INPV to range from −$35.2 million to −$81.4 million, or a change in INPV of −15.2 percent to −35.1 percent. At this level, industry free cash flow is estimated to decrease by approximately 212.1 percent to −$15.2 million, compared to the base-case value of $13.6 million in the year before the compliance date.

TSL 2 represents the best-in-market efficiencies for product class B, C, D, and E EPSs. The difference in conversion costs and incremental production costs at TSL 2 make the INPV impacts slightly better than TSL 1 in the flat markup scenario and worse under the preservation of operating profit scenario. The product conversion costs increase by $5.4 million and the capital conversion costs increase by $5.9 million from TSL 1 because the vast majority of current products fall below the efficiency requirements at TSL 2. Also, at TSL 2, the MPC increases 60 percent for the 2.5W representative units (a representative unit for product class B and all shipments of product classes C and E), 18 percent for the 18 Watt representative units (this is a representative unit for product class B and all shipments of product class D), 22 percent for the 60W representative units, and 4 percent for the 120W representative units over the baseline. However, the similar conversion costs and relatively minor additional incremental costs make the industry impacts at TSL 2 similar to those at TSL 1.

At TSL 3, DOE estimates impacts on INPV to range from $17.9 million to −$123.5 million, or a change in INPV of 7.7 percent to −53.2 percent. At this level, industry free cash flow is estimated to decrease by approximately 223.0 percent to −$16.7 million, compared to the base-case value of

$13.6 million in the year before the compliance date.

TSL 3 represents the max-tech CSL for product class B, C, D, and E EPSs. At TSL 3, DOE modeled a wide range of industry impacts because the very large increases in per-unit costs lead to a wide range of potential impacts depending on who captures the additional value in the distribution chain. None of the existing products on the market meet the efficiency requirements at TSL 3. However, since most of the products at TSL 2 also fall below the standard level, there is only a slight difference between the conversion costs at TSL 2 and TSL 3. The different INPV impacts occur due to the large changes in incremental MPCs at the max-tech level. At TSL 3, the MPC increases 69 percent for the 2.5W representative unit (this is a representative unit for product class B and all shipments for product classes C and E), 80 percent for the 18 Watt representative units (this is a representative unit for product class B and all shipments for product class D), 46 percent for the 60W representative units, and 53 percent for the 120W representative units over the baseline. If manufacturers are able to fully pass on these costs to OEMs (the flat markup scenario), the increase in cash flow from operations is enough to overcome the conversion costs to meet the max-tech level and INPV increases slightly. However, if the manufacturers are unable to pass on these costs and only maintain the current operating profit (the preservation of operating profit markup scenario), there is a large, negative impact on INPV, because substantial increases in working capital drain operating cash flow. The conversion costs associated with switching the entire market, the large increase in incremental MPCs, and the extreme pressure from OEMs to keep product prices down make it more likely that ODMs will not be able to fully pass on these costs to OEMs and the ODMS would face a substantial loss instead of a slight gain in INPV at TSL 3.

Product Class X

Table V–16 and Table V–17 below present the projected results for product class X under the flat and preservation of operating profit markup scenarios.

Table V-16 Manufacturer Impact Analysis for Product Class X EPS – Flat Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	(2010$ millions)	44.1	43.7	32.2	39.6
Change in INPV	(2010$ millions)	-	(0.4)	(12.0)	(4.6)
	(%)	-	-1.0%	-27.1%	-10.3%
Product Conversion Costs	(2010$ millions)	-	0.3	6.9	6.9
Capital Conversion Costs	(2010$ millions)	-	0.4	7.6	7.6
Total Conversion Costs	(2010$ millions)	-	0.7	14.4	14.4

Table V-17 Manufacturer Impact Analysis for Product Class X EPS – Preservation of Operating Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	(2010$ millions)	44.1	43.4	31.4	26.3
Change in INPV	(2010$ millions)	-	(0.7)	(12.8)	(17.9)
	(%)	-	-1.7%	-28.9%	-40.5%
Product Conversion Costs	(2010$ millions)	-	0.3	6.9	6.9
Capital Conversion Costs	(2010$ millions)	-	0.4	7.6	7.6
Total Conversion Costs	(2010$ millions)	-	0.7	14.4	14.4

At TSL 1, DOE estimates impacts on INPV to range from −$0.4 million to −$0.7 million, or a change in INPV of −1.0 percent to −1.7 percent. At this level, industry free cash flow is estimated to decrease by approximately 10.9 percent to $2.3 million, compared to the base-case value of $2.6 million in the year before the compliance date.

At TSL 1, manufacturers of product class X face a very slight decline in INPV because most of the market already meets TSL 1. The total conversion costs are approximately $0.7 million. Conversion costs are low because 95 percent of the products already meet the TSL 1 efficiency requirements.

At TSL 2, DOE estimates impacts on INPV to range from −$12.0 million to −$12.8 million, or a change in INPV of −27.1 percent to −28.9 percent. At this level, industry free cash flow is estimated to decrease by approximately 218.6 percent to −$3.1 million, compared to the base-case value of $2.6 million in the year leading up to when the new energy conservation standards would need to be met.

At TSL 2, manufacturers face a more noticeable loss in industry value. DOE estimates that manufacturers will incur total product and capital conversion costs of $14.4 million at TSL 2. The conversion costs increase at TSL 2 because the entire market falls below the efficiency requirements at TSL 2. However, the total impacts are also driven by the incremental MPCs at TSL 2. At TSL 2, the MPC increases 16 percent over the baseline. Therefore, the projected changes in INPV under both the flat and preservation of operating profit markup scenarios are similar.

At TSL 3, DOE estimates impacts on INPV to range from −$4.6 million to

−$17.9 million, or a change in INPV of −10.3 percent to −40.5 percent. At this level, industry free cash flow is estimated to decrease by approximately 218.6 percent to $3.1 million, compared to the base-case value of $2.6 million in the year before the compliance date.

TSL 3 could result in substantial impacts on INPV. As with TSL 2, the entire market falls below the required efficiency at TSL 3 and total industry conversion costs are also $14.4 million. However, the main difference at TSL 3 is the increase in the MPC. At TSL 3, the MPC increases 46 percent over the baseline. If the ODM can pass on the higher price of these products to the OEM at TSL 3, the decline in INPV is not severe. However, if ODMs cannot pass on these higher MPCs to OEMs, the loss in INPV is much more substantial.

Product Class H

Table V–18 and Table V–19 present the projected results for product class H under the flat and preservation of operating profit markup scenarios.

Table V-18 Manufacturer Impact Analysis for Product Class H EPS – Flat Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	(2010$ millions)	0.11	0.06	0.06	0.08
Change in INPV	(2010$ millions)	-	(0.05)	(0.05)	(0.03)
	(%)	-	-45.5%	-44.0%	-24.4%
Product Conversion Costs	(2010$ millions)	-	0.02	0.02	0.02
Capital Conversion Costs	(2010$ millions)	-	0.02	0.02	0.02
Total Conversion Costs	(2010$ millions)	-	0.05	0.05	0.05

Table V-19 Manufacturer Impact Analysis for Product Class H EPS – Preservation of Operating Profit Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	(2010$ millions)	0.11	0.07	0.07	0.06
Change in INPV	(2010$ millions)	-	(0.04)	(0.04)	(0.05)
	(%)	-	-32.7%	-33.8%	-47.3%
Product Conversion Costs	(2010$ millions)	-	0.02	0.02	0.02
Capital Conversion Costs	(2010$ millions)	-	0.02	0.02	0.02
Total Conversion Costs	(2010$ millions)	-	0.05	0.05	0.05

At TSL 1, DOE estimates impacts on INPV to range −$0.04 million to −0.05 million, or a change in INPV of −32.7 percent to −45.5 percent. At this level, industry free cash flow is estimated to decrease by approximately 284.4 percent to −$0.01 million, compared to the base-case value of $0.01 million in the year before the compliance date.

At TSL 1, product class H manufacturers face a significant relative loss in industry value. The base case industry value of $100,000 is low and since DOE estimates that total conversion costs at TSL 1 would be approximately $50,000, the conversion costs represent a substantial portion of total industry value. The conversion costs are high relative to the base case INPV because the entire market in 2013 is projected to fall below an efficiency standard set at TSL 1. This means that all products in product class H would have to be redesigned to meet the efficiency level at TSL 1, leading to total conversion costs that are large relative to the base case industry value. In addition, the MPC at TSL 1 declines by 21 percent compared to the baseline since the switching technology that would be required to meet this efficiency level is less costly to manufacture than baseline products that use linear technology. This situation results in a lower MSP and lower revenues for manufacturers of baseline products, which exacerbates the impacts on INPV from new energy conservation standards for these products.

At TSL 2, DOE estimates impacts on INPV to range from −0.04 million to −0.05 million, or a change in INPV of −33.8 percent to −44.0 percent. At this level, industry free cash flow is estimated to decrease by approximately 284.4 percent to −$0.01 million, compared to the base-case value of $0.01 million in the year before the compliance date.

The impacts on INPV at TSL 2 are similar to TSL 1. The conversion costs are the same since the entire market in 2013 would fall below the required efficiency at both TSL 1 and TSL 2. Also, the MPC is projected to decrease by 19 percent at TSL 2 compared to the baseline, which is similar to the 21 percent decrease at TSL 1. Overall, the similar conversion costs and lower industry revenue for the minimally compliant products make the INPV impacts at TSL 2 similar to TSL 1.

At TSL 3, DOE estimates impacts on INPV to range from −$0.03 million to −0.05 million, or a change in INPV of −24.4 percent to −47.3 percent. At this level, industry free cash flow is estimated to decrease by approximately 284.4 percent to −$0.01 million, compared to the base-case value of $0.01 million in the year leading up to when the new energy conservation standards would need to be met.

Impacts on INPV range from moderately to substantially negative at TSL 3. As with TSL 1 and TSL 2, the entire market falls below the required efficiency and the total industry conversion costs estimated by DOE remain at $50,000. However, the MPC increases at TSL 3 relative to the estimated cost of the baseline unit and changes the possible impacts on INPV at TSL 3. If ODMs can fully pass on the higher production cost of these products to the OEM at TSL 3, the decline in INPV is less severe. However, if the ODM cannot pass on these higher MPC to OEM then the loss in INPV is much more substantial.

ii. Battery Charger Cash Flow Impacts

DOE reports INPV impacts at each TSL for the six product class groupings below. 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 application's MSP and the incremental cost of improving its battery charger; and (2) the dominant base case battery charger technology that a given application utilizes, which is approximated by the application's efficiency distribution.

With respect to the first point, 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 point 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.

As discussed in section IV.I, DOE analyzed three markup scenarios—constant price, pass through, and flat markup. These scenarios were described earlier. 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[66] 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.[67] 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 mark up—the higher incremental product costs associated with more efficient battery chargers.

Product Class 1

The following tables (Table V–20 through Table V–23) summarize information related to the analysis performed to project the potential impacts on product class 1 battery charger manufacturers.

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[66] Notably, this is not the case with negative sloping cost-efficiency curves. When a higher efficiency level can be achieved at a lower product cost, the constant price scenario yields positive impacts because larger margins are realized by the manufacturer on each unit produced.

[67] While the Flat Markup scenario typically results in the most positive impacts of any scenario, a negatively sloping cost-efficiency curve will yield the opposite effect. When a higher efficiency level can be achieved at a lower product cost, the margin on each unit produced is lower, in absolute terms, in the Flat Markup scenario. This effect leads to lower operating profit, cash flow, and INPV.

Table V-20 Applications in Product Class 1

Product Class 1
Rechargeable Toothbrushes
Rechargeable Water Jets

Table V-21 Cash Flow Results – Product Class 1 – Flat Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	491	492	493	520
Change in INPV	2010$ Millions	-	1	1	29
	(%)	-	0.1%	0.3%	5.9%
Product Conversion Costs	2010$ Millions	-	0.8	1.9	4.3
Capital Conversion Costs	2010$ Millions	-	0.0	1.8	2.0
Total Investment Required	2010$ Millions	-	0.8	3.7	6.3

Table V-22 Cash Flow Results – Product Class 1 – Pass Through Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	491	479	461	318
Change in INPV	2010$ Millions	-	(12)	(31)	(173)
	(%)	-	-2.5%	-6.2%	-35.3%
Product Conversion Costs	2010$ Millions	-	0.8	1.9	4.3
Capital Conversion Costs	2010$ Millions	-	0.0	1.8	2.0
Total Investment Required	2010$ Millions	-	0.8	3.7	6.3

Table V-23 Cash Flow Results – Product Class 1 – Constant Price Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	491	450	390	51
Change in INPV	2010$ Millions	-	(41)	(101)	(441)
	(%)	-	-8.4%	-20.6%	-89.7%
Product Conversion Costs	2010$ Millions	-	0.8	1.9	4.3
Capital Conversion Costs	2010$ Millions	-	0.0	1.8	2.0
Total Investment Required	2010$ Millions	-	0.8	3.7	6.3

Product class 1 has only two applications: Rechargeable toothbrushes and water jets. Rechargeable toothbrushes represent 99.9 percent of the product class 1 shipments. DOE found the majority of these models include nickel-cadmium (Ni-Cd) battery chemistries, although products with NiMH and Li-ion chemistries exist in the market. More than three quarters of market shipments are at the baseline CSL. However, the efficiency distribution is not necessarily indicative of the distribution of retail price points. 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.

The incremental costs of meeting TSL 1 and TSL 2, which represent CSL 1 and CSL 2 for product class 1, respectively, are relatively minor compared to the average application MSP of $58.36. While most applications will have to be altered at these TSLs, the relatively small increase in battery charger costs do not greatly impact industry cash flow even if none of these incremental costs can be passed on to retailers. At max-tech, however, the battery charger is 3.3 times more expensive than the baseline charger. The baseline level is set at the CSL at which the majority of the market currently ships. Therefore, in addition to the R&D efforts necessary to prepare all product lines to incorporate the max-tech levels, the inability to pass those much higher battery charger costs down the distribution chain drive the negative impacts at max-tech in the worst-case constant price scenario.

Product Classes 2, 3, and 4

The following tables (Table V–24 through Table V–30) 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-24 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)	Medical Nebulizers
Can Openers	DIY Power Tools (Integral)	Netbooks
Consumer Two-Way Radios	Handheld Vacuums	Notebooks
Cordless Phones	Mixers	Portable Printers
Digital Cameras	Portable DVD Players	Professional Power Tools
DIY Power Tools (Integral)	Portable Printers	Professional Power Tools
E-Books	RC Toys	Rechargeable Garden Care Products
Hair Clippers	Stick Vacuums	Robotic Vacuums
Handheld GPS	Toy Ride-On Vehicles	Sleep Apnea Machines
Home Security Systems	Universal Battery Chargers	Stick Vacuums
In-Vehicle GPS	VoIP Adapters	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		
Video Game Consoles		
Wireless Headphones		

Table V-25 Cash Flow Results – Product Classes 2, 3, and 4 – Flat Markup Scenario

	Units	Base Case*	Trial Standard Level			
			1	2	3	4
INPV	2010$ Millions	44,492	44,506	44,625	45,020	45,467
Change in INPV	2010$ Millions	-	15	134	528	975
	(%)	-	0.0%	0.3%	1.2%	2.2%
Product Conversion Costs	2010$ Millions	-	7.1	25.5	160.8	294.5
Capital Conversion Costs	2010$ Millions	-	1.3	6.1	45.4	60.5
Total Investment Required	2010$ Millions	-	8.4	31.6	206.2	355.0

* The reason the Base Case INPV value varies for this product class grouping is because of the uncertainty of how manufacturers will markup their products sold in California due to the CEC standard. The markup scenario used in each table for the DOE standard is also applied to those products sold in California. Therefore in the Flat Markup table above a flat markup is applied to all products sold in California after the CEC standard goes into effect.

Table V-26 Cash Flow Results – Product Classes 2, 3, and 4 – Pass Through Markup Scenario

	Units	Base Case	Trial Standard Level			
			1	2	3	4
INPV	2010$ Millions	44,268	42,679	42,360	40,810	38,949
Change in INPV	2010$ Millions	-	(1,589)	(1,908)	(3,458)	(5,318)
	(%)	-	-3.6%	-4.3%	-7.8%	-12.0%
Product Conversion Costs	2010$ Millions	-	7.1	25.5	160.8	294.5
Capital Conversion Costs	2010$ Millions	-	1.3	6.1	45.4	60.5
Total Investment Required	2010$ Millions	-	8.4	31.6	206.2	355.0

Table V-27 Cash Flow Results – Product Classes 2, 3, and 4 – Constant Price Markup Scenario

	Units	Base Case	Trial Standard Level			
			1	2	3	4
INPV	2010$ Millions	43,808	38,911	37,752	32,944	29,246
Change in INPV	2010$ Millions	-	(4,897)	(6,055)	(10,863)	(14,562)
	(%)	-	-11.2%	-13.8%	-24.8%	-33.2%
Product Conversion Costs	2010$ Millions	-	7.1	25.5	160.8	294.5
Capital Conversion Costs	2010$ Millions	-	1.3	6.1	45.4	60.5
Total Investment Required	2010$ Millions	-	8.4	31.6	206.2	355.0

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Taken together, product classes 2, 3, and 4 include the greatest number of applications and account for more than 75 percent of total battery charger shipments in 2013, the anticipated compliance year for new energy conservation standards. 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, small appliances, power tools, and high-energy applications—in the pass through scenario, which approximates the mid-point of the potential range of impacts. These results highlight impacts at various TSLs.

TSL 1 would require battery chargers in product classes 2, 3 and 4 to each meet CSL 1. Impacts on INPV are relatively moderate at TSL 1 because a majority of application shipments in these product classes already meet CSL 1. However, those shipments already meeting CSL 1 are heavily weighted toward the consumer electronics sector. In most cases, CSL 1 could be met with incremental circuit design improvements and higher efficiency components. Satisfying this level would not require a full topology redesign or a move to Li-ion chemistry, although manufacturers of some applications indicated in interviews that they may elect such a design path.

TSL 2 has the same efficiency requirements for product classes 3 and 4 as TSL 1 (CSL 1). Product class 2 manufacturers would have to meet CSL 2 at TSL 2, which would likely require battery charger design changes (e.g., moving to switched-mode and Li-ion chemistries) that would likely cause application manufacturers to incur significant R&D expenditures relative to what is normally budgeted for battery chargers. However, the financial impact of this investment effect would be minor compared to the base case industry value, which is largely driven by consumer electronics applications.

Industry impacts would become more acute at TSL 3 and TSL 4, as best-in-market or max-tech designs would be required for all battery chargers. The cost of a battery charger in product classes 3 and 4 rises sharply at CSL 2 (best in market) and further at CSL 3 (max-tech). For relatively inexpensive applications, the inability to fully pass on these substantially higher costs (as assumed in the pass through and, to a greater extent, the constant price scenario) leads to significant margin compression, working capital drains, and, ultimately, reductions in INPV at the max-tech TSL.

As discussed above, 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 MSP ($175) than the other product categories ($80 for power tools and $60 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–28 through Table V–30 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 class 2, 3 or 4). The results clearly indicate manufacturers of power tools and small appliances would face disproportionately adverse impacts, as compared to consumer electronics manufacturers and the overall product group's results (shown above in Table V–25 through Table V–27), if they are not able to mark up the incremental product costs.

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Table V-28 Cash Flow Results – Product Classes 2, 3, and 4 – Pass Through Markup Scenario – Consumer Electronics

	Units	Base Case	Trial Standard Level			
			1	2	3	4
INPV	2010$ Millions	41,894	40,679	40,373	39,160	37,683
Change in INPV	2010$ Millions	-	(1,215)	(1,521)	(2,734)	(4,211)
	(%)	-	-2.9%	-3.6%	-6.5%	-10.1%
Product Conversion Costs	2010$ Millions	-	4.8	22.7	140.4	249.2
Capital Conversion Costs	2010$ Millions	-	1.2	5.8	36.1	48.1
Total Investment Required	2010$ Millions	-	5.9	28.5	176.5	297.3

Table V-29 Cash Flow Results – Product Classes 2, 3, and 4 – Pass Through Markup Scenario - Power Tools

	Units	Base Case	Trial Standard Level			
			1	2	3	4
INPV	2010$ Millions	1,814	1,566	1,560	1,344	1,098
Change in INPV	2010$ Millions	-	(248)	(254)	(470)	(716)
	(%)	-	-13.7%	-14.0%	-25.9%	-39.5%
Product Conversion Costs	2010$ Millions	-	1.7	1.8	10.5	26.7
Capital Conversion Costs	2010$ Millions	-	0.1	0.1	4.7	6.2
Total Investment Required	2010$ Millions	-	1.7	2.0	15.3	32.9

Table V-30 Cash Flow Results – Product Classes 2, 3, and 4 – Pass Through Markup Scenario – Small Appliances

	Units	Base Case	Trial Standard Level			
			1	2	3	4
INPV	2010$ Millions	560	435	427	305	168
Change in INPV	2010$ Millions	-	(125)	(133)	(255)	(392)
	(%)	-	-22.4%	-23.7%	-45.4%	-70.0%
Product Conversion Costs	2010$ Millions	-	0.7	0.9	9.9	18.6
Capital Conversion Costs	2010$ Millions	-	0.1	0.2	4.5	6.2
Total Investment Required	2010$ Millions	-	0.7	1.1	14.5	24.7

Product Classes 5 and 6

The following tables (Table V–31 through Table V–34) 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-31 Applications in Product Classes 5 and 6

Product Class 5	Product Class 6
Marine/Automotive/RV Chargers	Electric Scooters
Mobility Scooters	Lawn Mowers
Portable O2 Concentrators	Motorized Bicycles
Ride-On Toy Vehicles	Wheelchairs
Wheelchairs	

Ride-on toy vehicles represent nearly three quarters of the combined shipment volume in product classes 5 and 6, with marine chargers and electric scooters accounting for the majority of the remaining share. DOE's market survey and interviews found that nearly all of the higher energy applications incorporate battery chargers with lead acid battery chemistries. With the exception of battery chargers for toy ride-on vehicles and lawn mowers, the majority of products in these groupings use baseline battery chargers.

Table V-32 Cash Flow Results – Product Classes 5 and 6 – Flat Markup Scenario

	Units	Base Case*	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	1,584	1,589	1,543	2,275
Change in INPV	2010$ Millions	-	6	(40)	692
	(%)	-	0.3%	-2.5%	43.7%
Product Conversion Costs	2010$ Millions	-	1.8	9.8	16.3
Capital Conversion Costs	2010$ Millions	-	0.0	2.1	4.6
Total Investment Required	2010$ Millions	-	1.8	11.9	20.9

* The reason the Base Case INPV value varies for this product class grouping is because of the uncertainty of how manufacturers will markup their products sold in California due to the CEC standard. The markup scenario used in each table for the DOE standard is also applied to those products sold in California. Therefore in the Flat Markup table above a flat markup is applied to all products sold in California after the CEC standard goes into effect.

Table V-33 Cash Flow Results – Product Classes 5 and 6 – Pass Through Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	1,549	1,281	1,324	235
Change in INPV	2010$ Millions	-	(268)	(225)	(1,314)
	(%)	-	-17.3%	-14.5%	-84.8%
Product Conversion Costs	2010$ Millions	-	1.8	9.8	16.3
Capital Conversion Costs	2010$ Millions	-	0.0	2.1	4.6
Total Investment Required	2010$ Millions	-	1.8	11.9	20.9

Table V-34 Cash Flow Results – Product Classes 5 and 6 – Constant Price Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	1,552	1,226	1,429	409
Change in INPV	2010$ Millions	-	(327)	(123)	(1,143)
	(%)	-	-21.0%	-7.9%	-73.6%
Product Conversion Costs	2010$ Millions	-	1.8	9.8	16.3
Capital Conversion Costs	2010$ Millions	-	0.0	2.1	4.6
Total Investment Required	2010$ Millions	-	1.8	11.9	20.9

TSL 1, TSL 2, and TSL 3 represent CSL 1, CSL 2, and CSL 3, respectively, for both product class 5 and product class 6. The battery charger cost associated with each CSL is the same for product classes 5 and 6. The industry impacts at TSL 1 are minor to moderate because a large percentage of the market already meets the CSLs represented in that TSL and because the incremental battery charger product costs are minor relative to the average application MSP of $220. At TSL 2, the battery charger cost declines compared to the baseline because of the technology shift from a line-frequency power supply to a switch-mode power supply, and the resulting impacts are projected to remain fairly moderate. At TSL 3, however, the impacts on INPV are severe because the required max-tech battery chargers would cost nearly seven times the cost of a baseline charger.

Under the flat markup scenario, which assumes manufacturers could fully mark up the product to recover this additional cost, such an increase generates substantially greater cash flow and industry value. However, as noted earlier, the greater the increase in product costs, the less likely DOE believes that manufacturers will be able to fully markup the substantially higher production costs (the flat markup scenario). DOE believes manufacturers would be forced to absorb much of this dramatic cost increase at max-tech, yielding the substantially negative industry impacts, as shown by the lower-bound results.

Product Class 7

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 class 7.

Table V-35 Applications in Product Class 7

Product Class 7
Golf Cars

Table V-36 Cash Flow Results – Product Class 7 – Flat Markup Scenario

	Units	Base Case*	Trial Standard Level	
			1	2
INPV	2010$ Millions	1,034	1,030	1,057
Change in INPV	2010$ Millions	-	(4)	23
	(%)	-	-0.4%	2.2%
Product Conversion Costs	2010$ Millions	-	0.6	2.6
Capital Conversion Costs	2010$ Millions	-	0.2	1.5
Total Investment Required	2010$ Millions	-	0.7	4.1

* The reason the Base Case INPV value varies for this product class grouping is because of the uncertainty of how manufacturers will markup their products sold in California due to the CEC standard. The markup scenario used in each table for the DOE standard is also applied to those products sold in California. Therefore in the Flat Markup table above a flat markup is applied to all products sold in California after the CEC standard goes into effect.

Table V-37 Cash Flow Results – Product Class 7 – Pass Through Markup Scenario

	Units	Base Case	Trial Standard Level	
			1	2
INPV	2010$ Millions	1,036	1,050	1,003
Change in INPV	2010$ Millions	-	14	(33)
	(%)	-	1.4%	-3.2%
Product Conversion Costs	2010$ Millions	-	0.6	2.6
Capital Conversion Costs	2010$ Millions	-	0.2	1.5
Total Investment Required	2010$ Millions	-	0.7	4.1

Table V-38 Cash Flow Results – Product Class 7 – Constant Price Markup Scenario

	Units	Base Case	Trial Standard Level	
			1	2
INPV	2010$ Millions	1,039	1,086	903
Change in INPV	2010$ Millions	-	47	(136)
	(%)	-	4.5%	-13.1%
Product Conversion Costs	2010$ Millions	-	0.6	2.6
Capital Conversion Costs	2010$ Millions	-	0.2	1.5
Total Investment Required	2010$ Millions	-	0.7	4.1

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Golf cars are the only application in product class 7. Approximately half the market incorporates baseline battery charger technology—the other half 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 car. As such, large percentage increases in the cost of the battery charger, as in the case of max-tech, do not yield severe impacts on golf car OEMs, even in the constant price scenario. Note, however, this analysis focuses on the application manufacturer, or the OEM. DOE did identify a U.S. small business manufacturer of the golf car battery charger itself (as opposed to the application). DOE evaluates the impacts on standards on such manufacturers in the Regulatory Flexibility Analysis (see section VI.B for the results of that analysis).

Product Class 8

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 8.

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Table V-39 Applications in Product Class 8

Product Class 8
Bluetooth Headsets
Camcorders
Digital Cameras
E-Books
Handheld GPS
Handheld Image Scanners
Mobile Phones
MP3 Players
Personal Digital Assistants

Table V-40 Cash Flow Results – Product Class 8 – Flat Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	5,703	5,628	5,707	5,672
Change in INPV	2010$ Millions	-	(75)	4	(30)
	(%)	-	-1.3%	0.1%	-0.5%
Product Conversion Costs	2010$ Millions	-	13.2	35.8	79.5
Capital Conversion Costs	2010$ Millions	-	0.0	6.1	6.8
Total Investment Required	2010$ Millions	-	13.2	41.9	86.3

Table V-41 Cash Flow Results – Product Class 8 – Pass Through Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	5,703	6,064	5,730	5,663
Change in INPV	2010$ Millions	-	361	27	(40)
	(%)	-	6.3%	0.5%	-0.7%
Product Conversion Costs	2010$ Millions	-	13.2	35.8	79.5
Capital Conversion Costs	2010$ Millions	-	0.0	6.1	6.8
Total Investment Required	2010$ Millions	-	13.2	41.9	86.3

Table V-42 Cash Flow Results – Product Class 8 – Constant Price Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	5,703	7,002	5,781	5,642
Change in INPV	2010$ Millions	-	1,300	78	(61)
	(%)	-	22.8%	1.4%	-1.1%
Product Conversion Costs	2010$ Millions	-	13.2	35.8	79.5
Capital Conversion Costs	2010$ Millions	-	0.0	6.1	6.8
Total Investment Required	2010$ Millions	-	13.2	41.9	86.3

Product class 8 includes 14 applications, mostly consumer electronics. MP3 players and mobile phones make up the vast majority of product class 8 shipments (58 percent and 31 percent, respectively). Approximately 50 percent of MP3 players meet CSL 1 or higher and 73 percent of mobile phones already incorporate best-in-market battery chargers that exceed CSL 2. For most other applications in this product class, roughly two-thirds of the incorporated battery chargers already meet or exceed CSL 1. Furthermore, because the manufacturer selling prices of these dominant applications dwarf the incremental product costs associated with increasing the efficiency—even at max-tech—the overall industry impacts are projected to be minor for all TSLs for product class 8.

Product Class 9

Table V-43 Applications in Product Class 9

Product Class 9
Flashlights/Lanterns
In-Vehicle GPS
Medical Nebulizers
Portable O2 Concentrators

DOE did not examine any TSLs for product class 9 and did not conduct any downstream analyses for this product class. For product class 9, DOE is not proposing any energy conservation standards. Section V.B.2.fof this NOPR provides a more detailed reason for this decision.

Product Class 10

The following tables (Table V–44 through Table V–47) summarize information related to the analysis performed to project the potential impacts on manufacturers of devices falling into product class 10.

Table V-44 Applications in Product Class 10

Product Class 10
Uninterruptible Power Supplies

Table V-45 Cash Flow Results – Product Class 10 – Flat Markup Scenario

	Units	Base Case*	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	614	614	612	609
Change in INPV	2010$ Millions	-	(0)	(2)	(5)
	(%)	-	-0.1%	-0.4%	-0.9%
Product Conversion Costs	2010$ Millions	-	0.7	2.2	4.5
Capital Conversion Costs	2010$ Millions	-	0.0	0.4	1.5
Total Investment Required	2010$ Millions	-	0.7	2.6	6.0

* The reason the Base Case INPV value varies for this product class grouping is because of the uncertainty of how manufacturers will markup their products sold in California due to the CEC standard. The markup scenario used in each table for the DOE standard is also applied to those products sold in California. Therefore in the Flat Markup table above a flat markup is applied to all products sold in California after the CEC standard goes into effect.

Table V-46 Cash Flow Results – Product Class 10 – Pass Through Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	614	593	586	577
Change in INPV	2010$ Millions	-	(21)	(28)	(37)
	(%)	-	-3.5%	-4.5%	-5.9%
Product Conversion Costs	2010$ Millions	-	0.7	2.2	4.5
Capital Conversion Costs	2010$ Millions	-	0.0	0.4	1.5
Total Investment Required	2010$ Millions	-	0.7	2.6	6.0

Table V-47 Cash Flow Results – Product Class 10 – Constant Price Markup Scenario

	Units	Base Case	Trial Standard Level		
			1	2	3
INPV	2010$ Millions	612	532	512	487
Change in INPV	2010$ Millions	-	(81)	(100)	(126)
	(%)	-	-13.2%	-16.4%	-20.5%
Product Conversion Costs	2010$ Millions	-	0.7	2.2	4.5
Capital Conversion Costs	2010$ Millions	-	0.0	0.4	1.5
Total Investment Required	2010$ Millions	-	0.7	2.6	6.0

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Product class 10 has only one application: Uninterruptible power supplies. The vast majority of models on the market have sealed lead-acid battery chemistries. The efficiency distribution for product class 10 assumes all shipments are at the baseline CSL. Compared to the average application MSP of approximately $289, the incremental costs of meeting the higher CSLs remain relatively low, despite increasing substantially on a percentage basis. Therefore, even in the constant price scenario, INPV impacts are projected to be limited.

b. Impacts on Employment

As part of the direct employment impact analysis, DOE attempted to quantify the number of domestic workers involved in EPS manufacturing. Based on manufacturer interviews and DOE's research, DOE believes that all major EPS ODMs are foreign owned and operated. DOE did identify a few smaller niche EPS ODMs based in the U.S. and attempted to contact these companies. All of the companies DOE reached indicated their EPS manufacturing takes place abroad. During manufacturer interviews, large manufacturers also indicated the vast majority, if not all, EPS production takes place overseas. Due to DOE's inability to identify any EPS ODMs with domestic manufacturing, DOE has tentatively concluded that there are no EPSs currently manufactured domestically.

However, in recognition of the fragmented nature of this market, DOE seeks comment and input as to whether there are EPS manufacturers that have domestic production.

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

For battery chargers, DOE similarly attempted to quantify the number of domestic workers involved in battery charger production. Based on manufacturer interviews and DOE's research, DOE believes that 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 face a difficult decision on 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 source 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 section VI.B below because the major domestic manufacturer is also a small business manufacturer. Similar to EPSs, DOE does not anticipate any 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.

c. Impacts on Manufacturing Capacity

DOE does not anticipate that the standards proposed in today's rule would adversely impact manufacturer capacity. For EPSs, EISA has set a statutory compliance date. The EPS industry is characterized by rapid product development lifecycles. Most battery charger applications have similar design cycles. While there is no statutory compliance date for battery chargers, DOE believes the compliance date proposed in today's rule provides sufficient time for manufacturers to ramp up capacity to meet the proposed standards for battery chargers and EPSs. DOE requests comment on the appropriate compliance date for battery charger (see section I).

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. Because certain applications are disproportionately impacted compared to the overall product class, DOE reports those results individually so they can be considered as part of the overall MIA. DOE did not identify any EPS manufacturer subgroups that would require a separate analysis in the MIA.

DOE also identified small businesses as a 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

While any one regulation may not impose a significant burden on manufacturers, the combined effects of several 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 can lead companies to abandon product lines or markets with lower expected future returns than competing products. For these reasons, DOE conducts an analysis of cumulative regulatory burden as part of its rulemakings pertaining to appliance efficiency. DOE received many comments about the potential cumulative regulatory burden (see section IV.I.4.a) that may result from a standard for battery chargers and EPSs. The regulatory burdens described in those comments, however, generally fall outside of the scope of the cumulative regulatory burden analysis, which generally focuses on the impacts related to Federal regulations with a compliance date within three years of the anticipated compliance date of today's proposal. DOE notes that the potential for duplicative testing requirements raised by some commenters were addressed above.

i. Impact Due to CEC Battery Charger Standard

Table V–48 presents the range of impacts on all battery charger product classes due to the CEC battery charger standards.

Table V-48 – Base Case Manufacturer Impact Analysis for All Battery Charger Product Classes Due to the CEC Standard

	Units	No California Standard	With California Standard*		
			Flat Markup	Pass Through Markup	Constant Price Markup
INPV	2010$ Millions	53,780	53,918	53,660	53,205
Change in INPV	2010$ Millions	-	137	-120	-575
	(%)	-	0.3	(0.2)	(1.1)
Product Conversion Costs	2010$ Millions	-	12.6	12.6	12.6
Capital Conversion Costs	2010$ Millions	-	3.8	3.8	3.8
Total Investment Required	2010$ Millions	-	16.4	16.4	16.4

* The reason the Base Case INPV value varies for battery chargers is because of the uncertainty of how manufacturers will markup their products sold in California due to the CEC standard. The markup scenario used in each column is applied to those products sold in California. Therefore in the Constant Price column a constant price markup is applied to all products sold in California after the CEC standard goes into effect.

DOE quantitatively assessed the impact of the CEC battery charger standard on battery charger application manufacturers. This standard affects applications using a battery charger that are sold in California beginning in 2013. DOE estimates the impacts on manufacturers to range from $137 million to −$575 million, or a change in INPV of 0.3 percent to −1.1 percent. This range depends on manufacturers' ability to pass on the incremental price increases to consumers in the California markets caused by the CEC standard. DOE also estimated manufacturers will have to invest $12.6 million in product conversion costs and $3.8 million in capital conversion costs in order to have all battery charger applications sold in California meet the CEC standard by 2013.

3. National Impact Analysis

a. Significance of Energy Savings

To estimate the energy savings during the analysis period attributable to potential standards for battery chargers and EPSs, DOE compared the energy consumption of these products in the base case to their anticipated energy consumption with standards set at each TSL.

Table V–49 and Table V–50 present DOE's forecasts of the national energy savings at each TSL for battery chargers and EPSs. The savings were calculated using the approach described in section IV.G. Chapter 10 of the NOPR TSD presents tables that also show the magnitude of the energy savings if the savings are discounted at rates of 3 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-49 External Power Supplies: Cumulative National Energy Savings in Quads

Product Class	Trial Standard Level		
	1	2	3
B	0.458	0.725	1.316
B,C,D, E	0.585	0.916	1.604
X	0.063	0.072	0.147
H	0.001	0.001	0.002

Table V-50 Battery Chargers: Cumulative National Energy Savings in Quads

Product Class	Trial Standard Level			
	1	2	3	4
1	0.056	0.130	0.178	N/A
2, 3, 4	0.309	0.759	1.797	1.997
5, 6	0.268	0.596	0.781	N/A
7	0.007	0.021	N/A	N/A
8	0.010	0.041	0.045	N/A
10	0.231	0.268	0.312	N/A

b. Net Present Value of Consumer Costs and Benefits

DOE estimated the cumulative NPV to the Nation of the total costs and savings for consumers that would result from potential standard levels for battery chargers and EPSs. In accordance with the OMB's guidelines on regulatory analysis (OMB Circular A–4, section E, September 17, 2003), DOE calculated NPV using both a 3-percent and a 7-percent real discount rate.

Table V–51 and Table V–52 show the consumer NPV results for each TSL DOE considered for EPSs, using both a 3-percent and a 7-percent discount rate. Table V–53 and Table V–54 show the corresponding results for battery chargers. In each case, the impacts cover the lifetime of products purchased in 2013–2042. See chapter 10 of the TSD for more detailed NPV results.

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Table V-51 Cumulative Net Present Value of Consumer Benefits for External Power Supplies, 3-Percent Discount Rate (2010$ millions)

Product Class	Trial Standard Level		
	1	2	3
B	1,227.7	1,138.4	(3,292.3)
B,C,D, E	1,542.2	1,525.4	(2,982.9)
X	329.2	330.3	(533.2)
H	9.4	9.7	7.6

Table V-52 Cumulative Net Present Value of Consumer Benefits for External Power Supplies, 7-Percent Discount Rate (2010$ millions)

Product Class	Trial Standard Level		
	1	2	3
B	596.2	463.3	(2,356.8)
B,C,D, E	729.7	613.5	(2,301.4)
X	177.7	175.5	(363.5)
H	4.8	5.0	3.6

Table V-53 Cumulative Net Present Value of Consumer Benefits for Battery Chargers, 3-Percent Discount Rate (2010$ millions)

Product Class	Trial Standard Level			
	1	2	3	4
1	294.0	605.6	(781.2)	N/A
2, 3, 4	1,255.1	(366.9)	(14,159.0)	(38,442.7)
5, 6	1,627.9	4,647.7	(11,122.7)	N/A
7	119.4	(493.2)	N/A	N/A
8	2,780.5	(1,654.5)	(2,001.1)	N/A
10	1,192.4	1,354.4	1,549.5	N/A

Table V-54 Cumulative Net Present Value of Consumer Benefits for Battery Chargers, 7-Percent Discount Rate (2010$ millions)

Product Class	Trial Standard Level			
	1	2	3	4
1	156.8	317.9	(527.2)	N/A
2, 3, 4	663.8	(434.7)	(8,973.2)	(23,542.1)
5, 6	867.3	2,539.4	(6,961.4)	N/A
7	69.8	(299.5)	N/A	N/A
8	1,659.3	(999.9)	(1,208.3)	N/A
10	611.3	691.9	788.9	N/A

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DOE conducted NPV sensitivity analysis using three alternative price trends. The NPV results from the associated sensitivity cases are described in appendix 10–X of the NOPR TSD.

c. Indirect Impacts on Employment

DOE develops estimates of the indirect employment impacts of potential standards on the economy in general. As discussed above, DOE expects energy conservation standards for battery chargers and EPSs 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.J, to estimate these effects DOE used an input/output model of the U.S. economy. DOE understands that there are uncertainties involved in projecting employment impacts generated by an input/output model, especially changes in the later years of the analysis. Therefore, DOE generated results for near-term timeframes, such as 2015, where these uncertainties are reduced.

The results suggest 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 13 of the NOPR TSD presents more detailed results.

4. Impact on Utility or Performance of Products

As presented in section III.B of this notice, DOE has tentatively concluded that none of the TSLs considered in this notice would reduce the utility or performance of the products under consideration in this rulemaking. Furthermore, manufacturers of these products currently offer EPSs and battery chargers that meet or exceed the proposed standards. (42 U.S.C. 6295(o)(2)(B)(i)(IV))

5. Impact of Any Lessening of Competition

DOE has also considered any lessening of competition that is likely to result from amended 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 the Secretary, 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 assist the Attorney General in making such determination, DOE will provide DOJ with copies of this NOPR and the TSD for review. DOE will consider DOJ's comments on the proposed rule in preparing the final rule, and DOE will publish and respond to DOJ's comments in that document.

6. Need of the Nation To Conserve Energy

An improvement in the energy efficiency of the products subject to today's NOPR is likely to improve the security of the Nation's energy system and reduce the costs of energy production. Reduced electricity demand may also improve the reliability of the electricity system, particularly during peak-load periods. (42 U.S.C. 6295(o)(2)(B)(i)(VI))

Energy savings from amended standards for Class A EPSs and new standards for non-Class A EPSs and battery chargers could also produce environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with electricity production. Table V–55 and Table V–56 provide DOE's estimate of cumulative CO_2, NO_X, and Hg emissions reductions that would be expected to result from each of the TSLs considered in this rulemaking for EPSs and battery chargers, respectively. In the environmental assessment (chapter 15 in the NOPR TSD), DOE reports annual CO_2, NO_X, and Hg emissions reductions for each considered TSL.

As discussed in section IV.L, DOE has not reported SO_2 emissions reductions from power plants, because there is uncertainty about the effect of energy conservation standards on the overall level of SO_2 emissions in the United States due to SO_2 emissions caps. DOE also did not include NO_X emissions reduction from power plants in States subject to CAIR because an amended energy conservation standard would not affect the overall level of NO_X emissions in those States due to the emissions caps mandated by CAIR.

Table V-55 Cumulative Emissions Reduction for 2013- 2042 Under External Power Supply TSLs

	TSL 1	TSL 2	TSL 3
Product Class B			
CO_2 (Mt)	21.7	34.3	62.5
NO_X (kt)	17.9	28.4	51.6
Hg(t)	0.115	0.182	0.331
Product Classes B, C, D, and E			
CO_2 (Mt)	27.5	43.0	75.4
NO_X (kt)	22.7	35.5	62.3
Hg(t)	0.145	0.227	0.398
Product Class X			
CO_2 (Mt)	2.95	3.38	6.92
NO_X (kt)	2.43	2.79	5.71
Hg(t)	0.015	0.018	0.036
Product Class H			
CO_2 (Mt)	0.054	0.058	0.065
NO_X (kt)	0.045	0.048	0.053
Hg(t)	0.000	0.000	0.000

Table V-56 Cumulative Emissions Reduction for 2013- 2042 Under Battery Charger TSLs

	TSL 1	TSL 2	TSL 3	TSL 4
Product Class 1				
CO_2 (Mt)	2.62	6.11	8.36	N/A
NO_X (kt)	2.17	5.05	6.90	N/A
Hg(t)	0.014	0.032	0.044	N/A
Product Classes 2, 3, 4				
CO_2 (Mt)	14.7	35.9	85.1	94.6
NO_X (kt)	12.1	29.7	70.3	78.1
Hg(t)	0.078	0.191	0.452	0.502
Product Classes 5, 6				
CO_2 (Mt)	12.4	27.4	35.9	N/A
NO_X (kt)	10.2	22.6	29.6	N/A
Hg(t)	0.065	0.143	0.187	N/A
Product Class 7				
CO_2 (Mt)	0.312	0.975	N/A	N/A
NO_X (kt)	0.259	0.808	N/A	N/A
Hg(t)	0.002	0.006	N/A	N/A
Product Class 8				
CO_2 (Mt)	0.457	1.95	2.16	N/A
NO_X (kt)	0.378	1.61	1.78	N/A
Hg(t)	0.002	0.010	0.011	N/A
Product Class 10				
CO_2 (Mt)	10.3	11.9	13.9	N/A
NO_X (kt)	8.46	9.81	11.5	N/A
Hg(t)	0.068	0.079	0.092	N/A

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DOE also estimated monetary benefits likely to result from the reduced emissions of CO_2 and NO_X that DOE estimated for each of the TSLs considered for battery chargers and EPSs. In order to make this calculation similar 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.

As discussed in section IV.M, a Federal interagency group selected four SCC values for use in regulatory analyses, which DOE used in the NOPR analysis. The four SCC values (expressed in 2007$) are $4.7/ton (the average value from a distribution that uses a 5-percent discount rate), $21.4/ton (the average value from a distribution that uses a 3-percent discount rate), $35.1/ton (the average value from a distribution that uses a 2.5-percent discount rate), and $64.9/ton (the 95th-percentile value from a distribution that uses a 3-percent discount rate). These values correspond to the value of CO_2 emission reductions in 2010; the values for later years are higher due to increasing damages as the magnitude of climate change increases. 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.

Table V–57 to Table V–60 and Table V–61 to Table V–66 present the global values of CO_2 emissions reductions at each TSL considered for energy efficiency for EPSs and battery chargers, respectively. As explained in section IV.M.1, DOE calculated domestic values as a range from 7 percent to 23 percent of the global values, and these results are presented in Table V–67to Table V–70 and Table V–71 to Table V–76 for EPSs and battery chargers, respectively.

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Table V-57 External Power Supply Product Class B: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

	Million 2010$			
TSL	**5% discount rate, average***	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	91	448	752	1,369
2	145	710	1,190	2,166
3	263	1,289	2,162	3,936

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-58 External Power Supply Product Classes B, C, D, and E: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

	Million 2010$			
TSL	**5% discount rate, average***	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	116	572	960	1,746
2	182	895	1,501	2,731
3	319	1,568	2,631	4,785

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-59 External Power Supply Product Class X: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

	Million 2010$			
TSL	**5% discount rate, average***	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	12	61	103	187
2	14	70	118	215
3	29	144	242	440

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-60 External Power Supply Product Class H: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	3% discount rate, average*	2.5% discount rate, average*	3% discount rate, 95th percentile*
1	0	1	2	4
2	0	1	2	4
3	0	1	2	4

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-61 Battery Charger Product Class 1: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	3% discount rate, average*	2.5% discount rate, average*	3% discount rate, 95th percentile*
1	11	55	92	167
2	26	127	213	388
3	35	174	292	531

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-62 Battery Chargers Product Classes 2, 3, 4: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	3% discount rate, average*	2.5% discount rate, average*	3% discount rate, 95th percentile*
1	62	302	506	921
2	151	740	1,242	2,260
3	358	1,753	2,940	5,352
4	398	1,949	3,268	5,949

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-63 Battery Chargers Product Classes 5, 6: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	53	261	438	795
2	118	580	974	1,770
3	154	760	1,276	2,318

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-64 Battery Chargers Product Class 7: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	1	6	11	19
2	4	20	33	61

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-65 Battery Chargers Product Class 8: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	2	9	16	29
2	8	40	67	122
3	9	44	74	136

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-66 Battery Chargers Product Class 10: Estimates of Global Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	45	220	370	672
2	52	256	430	780
3	60	298	501	910

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-67 External Power Supply Product Class B: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	6 to 21	31 to 103	53 to 173	96 to 315
2	10 to 33	50 to 163	83 to 274	152 to 498
3	18 to 60	90 to 297	151 to 497	275 to 905

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-68 External Power Supply Product Classes B, C, D, E: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	8 to 27	40 to 132	67 to 221	122 to 402
2	13 to 42	63 to 206	105 to 345	191 to 628
3	22 to 73	110 to 361	184 to 605	335 to 1,101

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-69 External Power Supply Product Class X: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	1 to 3	4 to 14	7 to 24	13 to 43
2	1 to 3	5 to 16	8 to 27	15 to 49
3	2 to 7	10 to 33	17 to 56	31 to 101

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-70 External Power Supply Product Class H: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	0.017 to 0.056	0.085 to 0.280	0.144 to 0.472	0.260 to 0.854
2	0.018 to 0.060	0.092 to 0.301	0.154 to 0.507	0.279 to 0.918
3	0.020 to 0.067	0.102 to 0.334	0.172 to 0.564	0.310 to 1.020

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-71 Battery Charger Product Class 1: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	1 to 3	4 to 13	6 to 21	12 to 38
2	2 to 6	9 to 29	15 to 49	27 to 89
3	2 to 8	12 to 40	20 to 67	37 to 122

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-72 Battery Charger Product Classes 2, 3, 4: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	4 to 14	21 to 69	35 to 116	64 to 212
2	11 to 35	52 to 170	87 to 286	158 to 520
3	25 to 82	123 to 403	206 to 676	375 to 1,231
4	28 to 91	136 to 448	229 to 752	416 to 1,368

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-73 Battery Charger Product Classes 5, 6: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	4 to 12	18 to 60	31 to 101	56 to 183
2	8 to 27	41 to 133	68 to 224	124 to 407
3	11 to 35	53 to 175	89 to 293	162 to 533

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-74 Battery Charger Product Class 7: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

TSL	Million 2010$			
	5% discount rate, average*	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	0.091 to 0.300	0.446 to 1	1 to 2	1 to 4
2	0 to 1	1 to 5	2 to 8	4 to 14

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-75 Battery Charger Product Class 8: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

	Million 2010$			
TSL	**5% discount rate, average***	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	0.135 to 0.442	0.658 to 2	1 to 4	2 to 7
2	1 to 2	3 to 9	5 to 15	9 to 28
3	1 to 2	3 to 10	5 to 17	9 to 31

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

Table V-76 Battery Charger Product Class 10: Estimates of Domestic Present Value of CO_2 Emissions Reduction Under TSLs

	Million 2010$			
TSL	**5% discount rate, average***	**3% discount rate, average***	**2.5% discount rate, average***	**3% discount rate, 95th percentile***
1	3 to 10	15 to 51	26 to 85	47 to 155
2	4 to 12	18 to 59	30 to 99	55 to 179
3	4 to 14	21 to 69	35 to 115	64 to 209

* Columns are labeled by the discount rate used to calculate the SCC and whether it is an average value or drawn from a different part of the distribution. Values presented in the table are based on escalating the SCC values in 2007$ to 2010$ for consistency with other values presented in this notice, and incorporate the escalation of the SCC over time.

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 in this rulemaking on reducing CO_2 emissions 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 any 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 NOPR the most recent values and analyses resulting from the ongoing interagency review process.

DOE also estimated a range for the cumulative monetary value of the economic benefits associated with NO_X emissions reductions anticipated to result from amended standards for Class A EPSs and new standards for non-Class A EPSs and battery chargers. The dollar-per-ton values that DOE used are discussed in section IV.M. Table V–77 presents the cumulative present values for each TSL considered for EPSs, calculated using 7-percent and 3-percent discount rates. Table V–78 presents similar results for the TSLs considered for battery chargers.

Table V-77 Estimates of Present Value of NO_X Emissions Reduction Under External Power Supply TSLs

	TSL 1	TSL 2	TSL 3
	Million 2010$		
Product Class B			
3% discount rate	5 to 53	8 to 83	15 to 151
7% discount rate	3 to 29	5 to 47	8 to 85
Product Classes B, C, D, E			
3% discount rate	6 to 67	10 to 104	18 to 183
7% discount rate	4 to 37	6 to 58	10 to 102
Product Class X			
3% discount rate	1 to 7	1 to 8	2 to 17
7% discount rate	0 to 4	0 to 5	1 to 9
Product Class H			
3% discount rate	0.013 to 0.135	0.014 to 0.145	0.016 to 0.161
7% discount rate	0.007 to 0.069	0.007 to 0.074	0.008 to 0.082

Table V-78 Estimates of Present Value of NO_X Emissions Reduction Under Battery Charger TSLs

	TSL 1	TSL 2	TSL 3	TSL 4
	Million 2010$			
Product Class 1				
3% discount rate	1 to 6	1 to 15	2 to 20	N/A.
7% discount rate	0.344 to 4	1 to 8	1 to 11	N/A.
Product Classes 2, 3, 4				
3% discount rate	3 to 35	8 to 87	20 to 206	22 to 229
7% discount rate	2 to 20	5 to 49	11 to 116	13 to 129
Product Classes 5, 6				
3% discount rate	3 to 30	7 to 67	9 to 88	N/A.
7% discount rate	2 to 16	4 to 37	5 to 48	N/A.
Product Class 7				
3% discount rate	0.073 to 1	0.229 to 2	N/A.	N/A.
7% discount rate	0.042 to 0.431	0.131 to 1	N/A.	N/A.
Product Class 8				
3% discount rate	0.108 to 1	0.459 to 5	1 to 5	N/A
7% discount rate	0.061 to 1	0.260 to 3	0.288 to 3	N/A.
Product Class 10				
3% discount rate	2 to 25	3 to 29	3 to 34	N/A
7% discount rate	1 to 14	2 to 16	2 to 18	N/A.

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–79 shows an example of the calculation of the combined NPV, including benefits from emissions reductions for the case of TSL 1 for battery chargers product classes 2, 3, 4. Table V–80 and Table V–81 present 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 EPSs, 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 scenarios for the valuation of CO_2 emission reductions presented in section IV.M. Table V–82 and Table V–83 present similar results for the TSLs considered for battery chargers.

Table V-79 Adding Net Present Value of Consumer Savings to Present Value of Monetized Benefits from CO_2 and NO_X Emissions Reductions Under TSL 1 for Battery Chargers Product Classes 2, 3, 4

Category	Present Value billion 2010$	Discount Rate
Benefits		
Operating Cost Savings	1.132	7%
	2.038	3%
CO_2 Reduction Monetized Value (at $4.9/Metric Ton)*	0.062	5%
CO_2 Reduction Monetized Value (at $22.3/Metric Ton)*	0.302	3%
CO_2 Reduction Monetized Value (at $36.5/Metric Ton)*	0.506	2.5%
CO_2 Reduction Monetized Value (at $67.6/Metric Ton)*	0.921	3%
NO_X Reduction Monetized Value (at 2,537 /Ton)*	0.011	7%
	0.019	3%
Total Monetary Benefits **	1.445	7%
	2.360	3%
Costs		
Incremental Installed Costs‡	0.468	7%
	0.783	3%
Net Benefits/Costs		
Including CO_2 and NO_X**	0.977	7%
	1.576	3%

* 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 $67.6 per ton represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. See section IV.M for details. The value for NO_X (in 2010$) is the average of the low and high values used in DOE's analysis.

** Total Monetary 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 $22.3/ton in 2010 (in 2010$).

‡ Incremental Product Costs represent the total present value (in 2010$) of costs borne by consumers due to increased manufacturing costs from efficiency improvements.

Table V-80 Results of Adding Net Present Value of Consumer Savings (at 7% Discount Rate) to Net Present Value of Monetized Benefits from CO_2 and NO_X Emissions Reductions Under External Power Supply TSLs

Product Class	TSL	Consumer NPV at 7% Discount Rate added to:			
		SCC Value of \$4.9/metric ton CO_2* and Low Value for NO_X** billion 2010\$	SCC Value of \$22.3/metric ton CO_2* and Medium Value for NO_X** billion 2010\$	SCC Value of \$36.5/metric ton CO_2* and Medium Value for NO_X** billion 2010\$	SCC Value of \$67.6/metric ton CO_2* and High Value for NO_X** billion 2010\$
B	1	0.6905	1.0608	1.3645	1.9944
	2	0.6126	1.1986	1.6792	2.6761
	3	(2.0855)	(1.0208)	(0.1477)	1.6637
B, C, D, and E	1	0.8498	1.3222	1.7100	2.5128
	2	0.8013	1.5402	2.1467	3.4026
	3	(1.9722)	(0.6775)	0.3851	2.5857
X	1	0.1905	0.2411	0.2826	0.3686
	2	0.1903	0.2483	0.2960	0.3947
	3	(0.3333)	(0.2144)	(0.1167)	0.0854
H	1	0.0051	0.0061	0.0069	0.0086
	2	0.0052	0.0063	0.0072	0.0090
	3	0.0039	0.0051	0.0061	0.0081

* These label values represent the global SCC of CO_2 in 2010, in 2010\$. Their present values have been calculated with scenario-consistent discount rates. See section IV.M for a discussion of the derivation of these values.

** Low Value corresponds to \$450 per ton of NO_X emissions. Medium Value corresponds to \$2,537 per ton of NO_X emissions. High Value corresponds to \$4,623 per ton of NO_X emissions, in \$2010.

Parentheses indicate negative (-) values.

Table V-81 Results of Adding Net Present Value of Consumer Savings (at 3% Discount Rate) to Net Present Value of Monetized Benefits from CO_2 and NO_X Emissions Reductions External Power Supply TSLs

Product Class	**TSL**	**Consumer NPV at 3% Discount Rate added to:**			
		SCC Value of \$4.9/metric ton CO_2* and Low Value for NO_X** billion 2010\$	SCC Value of \$22.3/metric ton CO_2* and Medium Value for NO_X** billion 2010\$	SCC Value of \$36.5/metric ton CO_2* and Medium Value for NO_X** billion 2010\$	SCC Value of \$67.6/metric ton CO_2* and High Value for NO_X** billion 2010\$
B	1	1.3243	1.7050	2.0087	2.6490
	2	1.2912	1.8937	2.3743	3.3876
	3	(3.0146)	(1.9199)	(1.0469)	0.7944
B, C, D, and E	1	1.6651	2.1509	2.5387	3.3549
	2	1.7177	2.4775	3.0840	4.3607
	3	(2.6459)	(1.3146)	(0.2519)	1.9852
X	1	0.3423	0.3943	0.4359	0.5233
	2	0.3454	0.4051	0.4527	0.5531
	3	(0.5022)	(0.3799)	(0.2823)	(0.0768)
H	1	0.0096	0.0106	0.0115	0.0132
	2	0.0100	0.0111	0.0120	0.0139
	3	0.0079	0.0091	0.0101	0.0122

* These label values represent the global SCC of CO_2 in 2010, in 2010\$. Their present values have been calculated with scenario-consistent discount rates. See section IV.M for a discussion of the derivation of these values.

** Low Value corresponds to \$450 per ton of NO_X emissions. Medium Value corresponds to \$2,537 per ton of NO_X emissions. High Value corresponds to \$4,623 per ton of NO_X emissions, in \$2010.

Parentheses indicate negative (-) values.

Table V-82 Results of Adding Net Present Value of Consumer Savings (at 7% Discount Rate) to Net Present Value of Monetized Benefits from CO_2 and NO_X Emissions Reductions Under Battery Charger TSLs

Product Class	TSL	Consumer NPV at 7% Discount Rate added to:			
		SCC Value of $4.9/metric ton CO_2* and Low Value for NO_X** billion 2010$	SCC Value of $22.3/metric ton CO_2* and Medium Value for NO_X** billion 2010$	SCC Value of $36.5/metric ton CO_2* and Medium Value for NO_X** billion 2010$	SCC Value of $67.6/metric ton CO_2* and High Value for NO_X** billion 2010$
1	1	0.1682	0.2133	0.2503	0.3269
	2	0.3445	0.4496	0.5358	0.7143
	3	(0.4907)	(0.3471)	(0.2292)	0.0148
2, 3, 4	1	0.7274	0.9767	1.1810	1.6052
	2	(0.2789)	0.3325	0.8337	1.8741
	3	(8.6041)	(7.1561)	(5.9692)	(3.5054)
	4	(23.1317)	(21.5222)	(20.2029)	(17.4641)
5, 6	1	0.9217	1.1370	1.3141	1.6792
	2	2.6605	3.1394	3.5334	4.3456
	3	(6.8028)	(6.1757)	(5.6596)	(4.5960)
7	1	0.0712	0.0764	0.0807	0.0897
	2	(0.2953)	(0.2788)	(0.2654)	(0.2375)
8	1	1.6613	1.6690	1.6754	1.6886
	2	(0.9914)	(0.9584)	(0.9313)	(0.8750)
	3	(1.1989)	(1.1622)	(1.1322)	(1.0697)
10	1	0.6571	0.8390	0.9890	1.2971
	2	0.7451	0.9561	1.1301	1.4874
	3	0.8509	1.0971	1.3001	1.7170

* These label values represent the global SCC of CO_2 in 2010, in 2010$. Their present values have been calculated with scenario-consistent discount rates. See section IV.M for a discussion of the derivation of these values.

** Low Value corresponds to $450 per ton of NO_X emissions. Medium Value corresponds to $2,537 per ton of NO_X emissions. High Value corresponds to $4,623 per ton of NO_X emissions, in $2010.

Parentheses indicate negative (-) values.

Table V-83 Results of Adding Net Present Value of Consumer Savings (at 3% Discount Rate) to Net Present Value of Monetized Benefits from CO_2 and NO_X Emissions Reductions Under Battery Charger TSLs

Product Class	**TSL**	**Consumer NPV at 3% Discount Rate added to:**			
		SCC Value of $4.9/metric ton CO_2* and Low Value for NO_X** <u>billion 2010$</u>	SCC Value of $22.3/metric ton CO_2* and Medium Value for NO_X** <u>billion 2010$</u>	SCC Value of $36.5/metric ton CO_2* and Medium Value for NO_X** <u>billion 2010$</u>	SCC Value of $67.6/metric ton CO_2* and High Value for NO_X** <u>billion 2010$</u>
1	1	0.3057	0.3521	0.3891	0.4669
	2	0.6329	0.7409	0.8271	1.0086
	3	(0.7438)	(0.5962)	(0.4783)	(0.2301)
2, 3, 4	1	1.3202	1.5765	1.7808	2.2120
	2	(0.2073)	0.4212	0.9224	1.9799
	3	(13.7811)	(12.2925)	(11.1057)	(8.6012)
	4	(38.0226)	(36.3680)	(35.0488)	(32.2648)
5, 6	1	1.6837	1.9051	2.0822	2.4535
	2	4.7717	5.2643	5.6584	6.4842
	3	(10.9602)	(10.3152)	(9.7991)	(8.7176)
7	1	0.1207	0.1261	0.1304	0.1395
	2	(0.4889)	(0.4720)	(0.4586)	(0.4302)
8	1	2.7825	2.7905	2.7969	2.8103
	2	(1.6458)	(1.6118)	(1.5847)	(1.5275)
	3	(1.9915)	(1.9538)	(1.9238)	(1.8603)
10	1	1.2394	1.4266	1.5765	1.8898
	2	1.4089	1.6260	1.8000	2.1635
	3	1.6131	1.8664	2.0693	2.4933

* These label values represent the global SCC of CO_2 in 2010, in 2010$. Their present values have been calculated with scenario-consistent discount rates. <u>See</u> section IV.M for a discussion of the derivation of these values.

** Low Value corresponds to $450 per ton of NO_X emissions. Medium Value corresponds to $2,537 per ton of NO_X emissions. High Value corresponds to $4,623 per ton of NO_X emissions, in $2010.

Parentheses indicate negative (-) values.

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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 savings are domestic U.S. consumer 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 CO_2 savings are performed with different methods that use quite different time frames for analysis. The national operating cost savings is measured for the lifetime of products shipped in the 30-year period after the compliance date. The SCC values, on the other hand, reflect the present value of all future climate-related impacts resulting from the emission of one ton of carbon dioxide in each year. These impacts go well beyond 2100.

7. Other Factors

In determining whether a standard is economically justified, DOE may consider any other factors that it deems relevant. (42 U.S.C. 6295(o)(2)(B)(i)(VI)) The California IOUs asked that DOE consider adopting the standard levels proposed by the State of California. (California IOUs, No. 43 at p. 2) In January 2012, the CEC finalized its battery charger energy conservation standards and published energy conservation standards for battery chargers. Prior to finalizing these standards, CEC published a draft staff report outlining the requirements that were ultimately adopted.[68] The standards consist of two metrics; one is a maximum allowance for 24-hour charge and maintenance energy, while the other is a maximum allowance for the combination of maintenance and no battery mode power. DOE analyzed the

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[68] Singh, Harinder; Rider, Ken. 2011. *Staff Report Staff Analysis of Battery Chargers and Self-Contained Lighting Controls.* 2011 California Energy Commission, Efficiency and Renewable Energy Division, Appliances and Process Energy Office. CEC–400–2011–001–SF.

CEC's proposal and determined, for each of DOE's product classes, which CSL aligns most closely with the CEC's proposed standards, as explained in section IV.C.2.d above. Table shows this mapping and the national energy savings and net benefits that could be expected to result from federal standards at these levels. Additional results for these CSLs are presented elsewhere in section V.B and in the TSD.

Table V-84 Selected National Impacts of Aligning Federal Standards with California Standards

Product Class	CSL that Best Approximates the CEC Standard	NES (Quad)	NPV 3% (Million 2010$)	NPV 7% (Million 2010$)	NPV 3% added to SCC Value of $22.3/metric ton CO_2* and Medium Value for NO_X at 3%** (Million 2010$)	NPV 7% added to SCC Value of $22.3/metric ton CO_2* and Medium Value for NO_X at 7%** (Million 2010$)
1	CSL 0	0	0	0	0	0
2	CSL 2	0.585	(855)	(679)	(247)	(88)
3	CSL 2	0.169	(966)	(628)	(791)	(457)
4	CSL 2	0.301	(3,909)	(2,415)	(3,595)	(2,110)
5	CSL 3	0.668	(10,000)	(6,230)	(-9,308)	(5,557)
6	CSL 3	0.113	(1,123)	(731)	(1,007)	(618)
7	CSL 1	0.007	119	70	126	76
8	CSL 0	0	0	0	0	0
10	CSL 3	0.312	1,550	789	1,866	1,097

* Social Cost of CO_2 (SCC) in 2010, in 2010$.

** Medium value corresponds to $2,537 per ton of NO_X emissions, in 2010$.

DOE incorporated the CEC's battery charger standards into its analysis by adjusting its base case efficiency distributions, as explained in section IV.G.4 above. It did not choose proposed standard levels with the explicit intention of aligning its standards with the CEC's. Rather, as in all such rulemakings, the proposed levels were selected to meet a number of criteria specified in EPCA. These decisions for each product class grouping are explained in detail in the following section.

C. Proposed Standards

When considering proposed standards, the new or amended energy conservation standard that DOE adopts for any type (or class) of covered product shall be designed to achieve the maximum improvement in energy efficiency that the Secretary determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) In determining whether a standard is economically justified, the Secretary must determine whether the benefits of the standard exceed its burdens by 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 the significant conservation of energy. (42 U.S.C. 6295(o)(3)(B))

For today's NOPR, DOE considered the impacts of standards at each TSL, beginning with the maximum technologically feasible level, to determine whether that level was economically justified. Where the max-tech level was not justified, DOE then considered the next most efficient level and undertook the same evaluation until it reached the most efficient level that is both technologically feasible and economically justified and saves a significant amount of energy.

DOE separately discusses the benefits and burdens of each TSL for each group of products. To aid the reader in its discussion of the benefits and burdens of each TSL, DOE presents summary tables containing 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 impact whether a given efficiency level is economically justified. These factors include the impacts on identifiable subgroups of consumers, such as low-income households and seniors, who may be disproportionately affected by a national standard. Section V.B.1 presents the estimated impacts of each TSL on these subgroups. DOE also considers impacts on employment stemming from the manufacture of the products subject to standards (see section V.B.2.b), as well as potential indirect impacts in the national economy (see section V.B.3.c).

DOE 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; (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 (that is, renter versus owner; builder vs. purchaser). Other literature indicates that with 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 decreases sales for product manufacturers and the cost to manufacturers 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 detailed estimates of shipments and changes in the volume of product purchases in chapter 9 of the NOPR TSD. However, DOE's current analysis does not explicitly control for heterogeneity in consumer preferences, preferences across subcategories of products or specific features, or consumer price sensitivity variation according to household income.

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.[69] DOE welcomes comments on approaches for improved assessment of the consumer welfare impacts of appliance standards.

1. External Power Supplies

a. Product Class B—Direct Operation External Power Supplies

Table V–85 presents a summary of the quantitative impacts estimated for each TSL for EPSs in product class B. As outlined in section V.A.1, DOE is extending the TSLs for product class B to product classes C, D, and E since product class B was the only one directly analyzed and interested parties supported this approach because of the technical similarities among these products. The efficiency levels contained in each TSL are described in section V.A.1.

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

Table V-85 Summary of Results for Product Class B External Power Supplies

Category	TSL 1	TSL 2	TSL 3
National Energy Savings (quads)	0.4579	0.7246	1.3164
NPV of Consumer Benefits (2010$ million)			
3% discount rate	1,228	1,138	(3,292)
7% discount rate	596	463	(2,357)
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumptions[i] (2010$ million)			
3% discount rate	1,705	1,894	(1,920)
7% discount rate	1,061	1,199	(1,021)
Industry Impacts			
2.5 W, 18 W, 60 W, and 120 W Rep Units*			
Industry NPV Change (2010$ million)	(62.5) - (38.9)	(81.4) - (35.2)	(123.5) – 17.9
Industry NPV (% change)	(26.9) - (16.8)	(35.1) - (15.2)	(53.2) – 7.7
Cumulative Emissions Reduction			
CO_2 (Mt)	21.7	34.3	62.5
NO_X (kt)	17.9	28.4	51.6
Hg (t)	0.115	0.182	0.331
Value of Cumulative Emissions Reduction			
CO_2 (2010$ billion)**	0.091 to 1.369	0.145 to 2.166	0.263 to 3.936
NO_X – 3% discount rate (2010$ million)	5 to 53	8 to 83	15 to 151
NO_X – 7% discount rate (2010$ million)	3 to 29	5 to 47	8 to 85
Mean LCC Savings*** (2010$)			
2.5 W rep unit	0.10	0.04	0.02
18 W rep unit	0.68	0.69	(1.19)
60 W rep unit	(0.33)	(0.45)	(1.38)
120 W rep unit	0.60	0.61	(5.49)
Median PBP (years)			
2.5 W rep unit	3.5	4.3	4.3
18 W rep unit	1.2	3.1	8.1
60 W rep unit	6.3	5.4	6.4
120 W rep unit	1.4	1.9	9.1
Distribution of Consumer LCC Impacts			
2.5 W rep unit			
Net Cost (%)	45.9	59.1	61.3
No Impact (%)	8.3	2.4	0.0
Net Benefit (%)	45.8	38.6	38.7
18 W rep unit			
Net Cost (%)	16.7	37.5	74.4
No Impact (%)	28.5	10.2	0.0
Net Benefit (%)	54.9	52.3	25.6
60 W rep unit			
Net Cost (%)	73.7	85.2	92.8
No Impact (%)	18.0	1.3	0.0
Net Benefit (%)	8.3	13.6	7.2
120 W rep unit			
Net Cost (%)	0.1	8.6	100.0

Category	**TSL 1**	**TSL 2**	**TSL 3**
No Impact (%)	21.2	3.0	0.0
Net Benefit (%)	78.7	88.4	0.0
Generation Capacity Reduction (GW)[†]	0.255	0.404	0.734

Parentheses indicate negative (-) values.
* For the MIA impacts, DOE conservatively presents the impacts for product classes B, C, D, and E as a group versus only the results for product class B for the other analyses. Because there are no technical differences between product class B and the scaled product classes C, D, and E from a manufacturing perspective, there is no product class B "industry" that would be impacted differently than product classes C, D, and E.
** Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.
*** For LCCs, a negative value means an increase in LCC by the amount indicated.
[i] Calculations based on the SCC series corresponding to a value of $22.3/ton in 2010, and a medium value for NO_x corresponding to $2,537/t in 2010$[†] Changes in 2042.

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DOE first considered TSL 3, which represents the max-tech efficiency level. TSL 3 would save 1.316 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefits would be −$2.357 billion, using a discount rate of 7 percent, and −$3.292 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 62.5 Mt of CO_2, 51.6 kt of NO_X, and 0.331 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 3 ranges from $0.263 billion to $3.936 billion.

At TSL 3, the average LCC impact is a gain (consumer savings) of $0.02 for the 2.5W unit and a cost (LCC savings decrease) of $1.19 for the 18W unit, $1.38 for the 60W unit, and $5.49 for the 120W unit. The median payback period is 4.3 years for the 2.5W unit, 8.1 years for the 18W unit, 6.4 years for the 60W unit, and 9.1 years for the 120W unit. The fraction of consumers experiencing an LCC benefit is 38.7 percent for the 2.5W unit, 25.6 percent for the 18W unit, 7.2 percent for the 60W unit, and 0 percent for the 120W unit. The fraction of consumers experiencing an LCC cost is 61.3 percent for the 2.5W unit, 74.4 percent for the 18W unit, 92.8 percent for the 60W unit, and 100 percent for the 120W unit.

At TSL 3, the projected change in INPV for direct operation product classes B, C, D, and E as a group ranges from a decrease of $123.5 million to an increase of $17.9 million. At TSL 3, DOE recognizes the risk of very large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 3 could result in a net loss of 53.2 percent in INPV to manufacturers of EPSs in these product classes. However, as DOE has not identified any domestic manufacturers of direct operation EPSs, it does not project any immediate negative impacts on direct domestic jobs.

The Secretary tentatively concludes that at TSL 3 for EPSs in product class B, the negative NPV of consumer benefits, the economic burden on a significant fraction of consumers due to the large increases in product cost, and the capital conversion costs and profit margin impacts that could result in a very large reduction in INPV, outweigh the benefits of energy savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2. TSL 2 would save 0.7246 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefits would be $463 million, using a discount rate of 7 percent, and $1.138 billion, using a discount rate of 3 percent. Additionally, TSL 2 yields the maximum NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions[70] with a value of $1.199 billion at a 7-percent discount rate and $1.894 billion at a 3-percent discount rate.

The cumulative emissions reductions at TSL 2 are 34.3 Mt of CO_2, 28.4 kt of NO_X, and 0.182 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 2 ranges from $0.145 billion to $2.166 billion.

At TSL 2, the average LCC impact is a gain (consumer savings) of $0.04 for the 2.5W unit, $0.69 for the 18W unit, $0.61 for the 120W unit, and a cost (LCC savings decrease) of $0.45 for the 60W unit. The median payback period is 4.3 years for the 2.5W unit, 3.1 years for the 18W unit, 5.4 years for the 60W unit, and 1.9 years for the 120W unit. The fraction of consumers experiencing an LCC benefit is 38.6 percent for the 2.5W unit, 52.3 percent years for the 18W unit, 13.6 percent for the 60W unit, and 88.4 percent for the 120W unit. The fraction of consumers experiencing an LCC cost is 59.1 percent for the 2.5W unit, 37.5 percent for the 18W unit, 85.2 percent for the 60W unit, and 8.6 percent for the 120W unit.

At TSL 2, the projected change in INPV for product classes B, C, D, and E as a group ranges from a decrease of $81.4 million to a decrease of $35.2 million. DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 2 could result in a net loss of 35.1 percent in INPV to manufacturers of EPSs in these product classes.

The Secretary tentatively concludes that at TSL 2 for EPSs in product class B, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden on a significant fraction of consumers due to the increases in product cost and the capital conversion costs and profit margin impacts that could result in a reduction in INPV to manufacturers.

After considering the analysis, comments to the preliminary analysis and TSD, 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.

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[70] Assuming the social cost of carbon equal to $21.4 per metric ton and NO_X calculated with a medium value of $2,514 per short ton. These values are applied throughout the TSL discussion that follows.

Therefore, DOE today proposes to adopt TSL 2 for EPSs in product class B and, by extension, for EPSs in product classes C, D, and E because of the technical similarities among all of these devices. The proposed new and amended energy conservation standards for these EPSs, expressed as equations for minimum average active-mode efficiency and maximum no-load input power, are shown in Table V–86.

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Table V-86 Proposed Standards for EPSs in Product Classes B, C, D, and E

External Power Supplies – Product Class B: AC-DC, Basic-Voltage		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
0 to ≤ 1 watt	$\geq 0.5 * P_{out} + 0.16$	≤ 0.100
> 1 to ≤ 49 watts	$\geq 0.071 * \ln(P_{out}) - 0.0014 * P_{out} + 0.67$	≤ 0.100
> 49 watts	≥ 0.880	≤ 0.210
External Power Supplies – Product Class C: AC-DC, Low-Voltage		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
0 to ≤ 1 watt	$\geq 0.517 * P_{out} + 0.087$	≤ 0.100
> 1 to ≤ 49 watts	$\geq 0.0834 * \ln(P_{out}) - 0.0014 * P_{out} + 0.609$	≤ 0.100
> 49 watts	≥ 0.870	≤ 0.210
External Power Supplies – Product Class D: AC-AC, Basic-Voltage		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode**
0 to ≤ 1 watt	$\geq 0.5 * P_{out} + 0.16$	≤ 0.210
> 1 to ≤ 49 watts	$\geq 0.071 * \ln(P_{out}) - 0.0014 * P_{out} + 0.67$	≤ 0.210
> 49 watts	≥ 0.880	≤ 0.210
External Power Supplies – Product Class E: AC-AC, Low-Voltage		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode**
0 to ≤ 1 watt	$\geq 0.517 * P_{out} + 0.087$	≤ 0.210
> 1 to ≤ 49 watts	$\geq 0.0834 * \ln(P_{out}) - 0.0014 * P_{out} + 0.609$	≤ 0.210
> 49 watts	≥ 0.870	≤ 0.210

b. Product Class X—Multiple-Voltage External Power Supplies

Table V–87 presents a summary of the quantitative impacts estimated for each TSL for multiple-voltage EPSs. The efficiency levels contained in each TSL are described in section V.A.

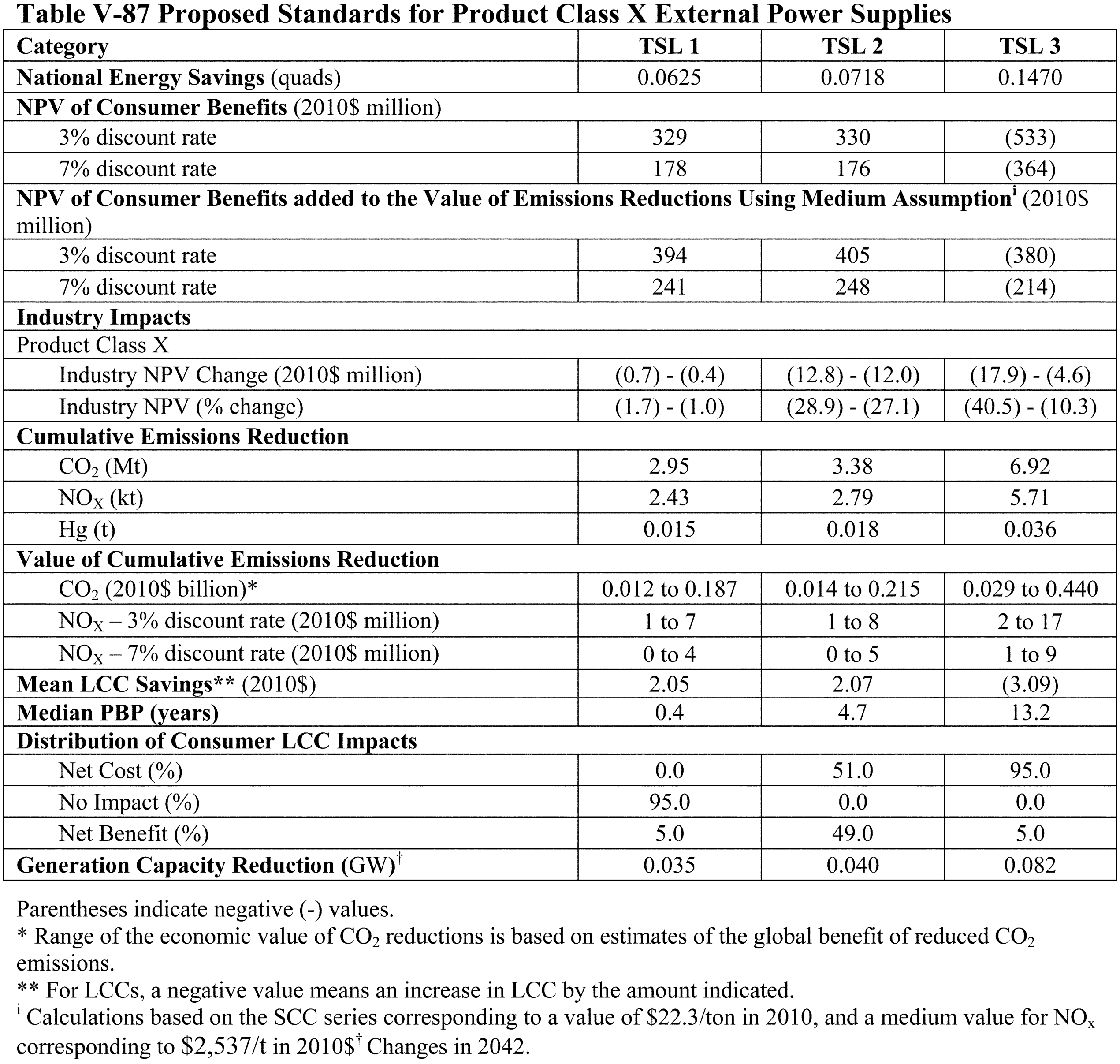

Table V-87 Proposed Standards for Product Class X External Power Supplies

Category	**TSL 1**	**TSL 2**	**TSL 3**
National Energy Savings (quads)	0.0625	0.0718	0.1470
NPV of Consumer Benefits (2010$ million)			
3% discount rate	329	330	(533)
7% discount rate	178	176	(364)
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumption[i] (2010$ million)			
3% discount rate	394	405	(380)
7% discount rate	241	248	(214)
Industry Impacts			
Product Class X			
Industry NPV Change (2010$ million)	(0.7) - (0.4)	(12.8) - (12.0)	(17.9) - (4.6)
Industry NPV (% change)	(1.7) - (1.0)	(28.9) - (27.1)	(40.5) - (10.3)
Cumulative Emissions Reduction			
CO_2 (Mt)	2.95	3.38	6.92
NO_X (kt)	2.43	2.79	5.71
Hg (t)	0.015	0.018	0.036
Value of Cumulative Emissions Reduction			
CO_2 (2010$ billion)*	0.012 to 0.187	0.014 to 0.215	0.029 to 0.440
NO_X – 3% discount rate (2010$ million)	1 to 7	1 to 8	2 to 17
NO_X – 7% discount rate (2010$ million)	0 to 4	0 to 5	1 to 9
Mean LCC Savings** (2010$)	2.05	2.07	(3.09)
Median PBP (years)	0.4	4.7	13.2
Distribution of Consumer LCC Impacts			
Net Cost (%)	0.0	51.0	95.0
No Impact (%)	95.0	0.0	0.0
Net Benefit (%)	5.0	49.0	5.0
Generation Capacity Reduction (GW)[†]	0.035	0.040	0.082

Parentheses indicate negative (-) values.

* Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

** For LCCs, a negative value means an increase in LCC by the amount indicated.

[i] Calculations based on the SCC series corresponding to a value of $22.3/ton in 2010, and a medium value for NO_x corresponding to $2,537/t in 2010$[†] Changes in 2042.

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DOE first considered TSL 3, which represents the max-tech efficiency level. TSL 3 would save 0.147 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefits would be −$364 million, using a discount rate of 7 percent, and −$533 million, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 6.92 Mt of CO_2, 5.71 kt of NO_X, and 0.036 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 3 ranges from $0.029 billion to $0.440 billion.

At TSL 3, the average LCC impact is a cost (LCC savings decrease) of $3.09. The median payback period is 13.2 years. The fraction of consumers experiencing an LCC benefit is 5 percent while the fraction of consumers experiencing an LCC cost is 95 percent.

At TSL 3, the projected change in INPV ranges from a decrease of $17.9 million to a decrease of $4.6 million. At TSL 3, DOE recognizes the risk of very large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high range of impacts is reached, as DOE expects, TSL 3 could result in a net loss of 40.5 percent in INPV to manufacturers of multiple-voltage EPSs. However, as DOE has not identified any domestic manufacturers of multiple-voltage EPSs, it does not project any immediate negative impacts on direct domestic jobs.

The Secretary tentatively concludes that at TSL 3 for multiple-voltage EPSs, the negative NPV of consumer benefits, the economic burden on a significant fraction of consumers due to the large increases in product cost, and the capital conversion costs and profit margin impacts that could result in a very large reduction in INPV outweigh the benefits of energy savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2. TSL 2 would save 0.0718 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefits would be $176 million, using a discount rate of 7 percent, and $330 million, using a discount rate of 3 percent. Additionally, TSL 2 yields the maximum NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions with a value of $248 million at a 7-percent discount rate and $405 million at a 3-percent discount rate.

At TSL 2, the average LCC impact is a gain (consumer savings) of $2.07. The median payback period is 4.7 years. The fraction of consumers experiencing an LCC benefit is 49 percent while the fraction of consumers experiencing an LCC cost is 51 percent.

The cumulative emissions reductions at TSL 2 are 3.38 Mt of CO_2, 2.79 kt of NO_X, and 0.018 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 2 ranges from $0.014 billion to $0.215 billion.

At TSL 2, the projected change in INPV ranges from a decrease of $12.8 million to a decrease of $12.0 million. At TSL 2, DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 2 could result in a net loss of 28.9 percent in INPV to manufacturers of multiple-voltage EPSs.

The Secretary tentatively concludes that at TSL 2 for multiple-voltage EPSs, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden on a significant fraction of consumers due to the increases in product cost and the capital conversion costs and profit margin impacts that could result in a reduction in INPV for manufacturers.

After considering the analysis, comments to the preliminary analysis and TSD, 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 today proposes to adopt TSL 2 for multiple-voltage EPSs. The proposed new and amended energy conservation standard for multiple-voltage EPSs, expressed as an equation for minimum average active-mode efficiency and maximum no-load input power, is shown in Table V–88.

Table V-88 Proposed Standards for Multiple-Voltage External Power Supplies

External Power Supplies – Product Class X: Multiple Voltage		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
0 to ≤ 1 watt	$\geq 0.497 * P_{out} + 0.067$	≤ 0.300
> 1 to ≤ 49 watts	$\geq 0.075 * \ln(P_{out}) + 0.561$	≤ 0.300
> 49 watts	≥ 0.860	≤ 0.300

c. Product Class H—High-Power External Power Supplies

Table V–89 presents a summary of the quantitative impacts estimated for each TSL for high-power EPSs. The efficiency levels contained in each TSL are described in section V.A.

Table V-89 Proposed Standards for High-Power External Power Supplies

Category	TSL 1	TSL 2	TSL 3
National Energy Savings (quads)	0.0013	0.0014	0.0015
NPV of Consumer Benefits (2010$ million)			
3% discount rate	9.4	9.7	7.6
7% discount rate	4.8	5.0	3.6
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumption[i] (2010$ million)			
3% discount rate	10.6	11.1	9.1
7% discount rate	6.1	6.3	5.1
Industry Impacts			
Product Class H			
Industry NPV Change (2010$ million)	(0.05) - (0.04)	(0.05) - (0.04)	(0.05) - (0.03)
Industry NPV (% change)	(45.5) - (32.7)	(44.0) - (33.8)	(47.3) - (24.4)
Cumulative Emissions Reduction			
CO_2 (Mt)	0.054	0.058	0.065
NO_X (kt)	0.045	0.048	0.053
Hg (t)	0.000	0.000	0.000
Value of Cumulative Emissions Reduction			
CO_2 (2010$ billion)*	0.000 to 0.004	0.000 to 0.004	0.000 to 0.004
NO_X – 3% discount rate (2010$ million)	0.013 to 0.135	0.014 to 0.145	0.016 to 0.161
NO_X – 7% discount rate (2010$ million)	0.007 to 0.069	0.007 to 0.074	0.008 to 0.082
Mean LCC Savings** (2010$)	124.82	129.08	92.96
Median PBP (years)	0.0	0.2	2.5
Distribution of Consumer LCC Impacts			
Net Cost (%)	0.0	0.0	16.9
No Impact (%)	0.0	0.0	0.0
Net Benefit (%)	100.0	100.0	83.1
Generation Capacity Reduction (GW)[†]	0.001	0.001	0.001

Parentheses indicate negative (-) values.

* Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

** For LCCs, a negative value means an increase in LCC by the amount indicated.

[i] Calculations based on the SCC series corresponding to a value of $22.3/ton in 2010, and a medium value for NO_x corresponding to $2,537/t in 2010$[†] Changes in 2042.

DOE first considered TSL 3, which represents the max-tech efficiency level. TSL 3 would save 0.0015 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefits would be $3.6 million, using a discount rate of 7 percent, and $7.6 million, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 0.065 Mt of CO_2, 0.053 kt of NO_X, and less than 0.0001 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 3 ranges from less than $0.0001 to $0.004 billion.

At TSL 3, the average LCC impact is a gain (consumer savings) of $92.96. The median payback period is 2.5 years. The fraction of consumers experiencing an LCC benefit is 83.1 percent while the fraction of consumers experiencing an LCC cost is 16.9 percent.

At TSL 3, the projected change in INPV ranges from a decrease of $0.05 million to a decrease of $0.03 million. At TSL 3, DOE recognizes the risk of very large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 3 could result in a net loss of 47.3 percent in INPV to manufacturers of high-power EPSs. However, as DOE has not identified any domestic manufacturers of high power EPSs, it does not project any immediate negative impacts on direct domestic jobs.

The Secretary tentatively concludes that at TSL 3 for high-power EPSs, the additional considerations of the potential negative impacts of a standard at this max-tech TSL outweigh the benefits of energy savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions. DOE notes that it scaled results for product class B to estimate the cost and efficiency of this max-tech CSL. Consequently, DOE is unaware of any product that can achieve this CSL in either product class B or H. Thus, although DOE's analysis indicates that the max-tech efficiency level is achievable, there is a risk that unforeseen obstacles remain to creating an EPS at this TSL.

Additionally, setting a standard at TSL 3 would create a discontinuity in the average efficiency standards for EPSs. For product class B devices, the average efficiency standard is constant for nameplate output power ratings greater than 49 watts up to 250 watts. At 250 watts, where product class H begins, the average efficiency standard would increase by 4 percent if DOE set standards for this product class at the max-tech TSL. This discontinuity in efficiency between the two product classes would be the result of the proposed standards for product class B EPSs being equivalent to the best-in-market CSL equation while the proposed standards for product class H would be equivalent to the max-tech CSL equation for high-power EPSs. DOE believes that setting a standard with a large discontinuity between these product classes is not consistent with EPS design trends.

In contrast, by applying the same level of stringency, scaled for the representative unit voltage, to all EPSs with output power greater than 250 watts, the achievable efficiency in EPS designs that have an output power above 49 watts remains nearly constant. This result occurs because the switching and conduction losses associated with the EPS remain proportionally the same with the increase in output power, which creates a relatively flat achievable efficiency above 49 watts. If DOE were to adopt a level that created a discontinuity in the efficiency levels, it would ignore this trend and set a higher efficiency standard between two product classes despite numerous technical similarities. Consequently, the Secretary has tentatively concluded that TSL 3 is not justified.

DOE then considered TSL 2. TSL 2 would save 0.0014 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefits would be $5.0 million, using a discount rate of 7 percent, and $9.7 million, using a discount rate of 3 percent.

At TSL 2, the average LCC impact is a gain (consumer savings) of $129.08. The median payback period is 0.2 years. The fraction of consumers experiencing an LCC benefit is 100 percent while the fraction of consumers experiencing an LCC cost is 0 percent.

The cumulative emissions reductions at TSL 2 are 0.058 Mt of CO_2, 0.048 kt of NO_X, and less than 0.0001 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 2 ranges from less than $0.0001 to $0.004 billion. Additionally, TSL 2 yields the maximum NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions with a value of $6.3 million at a 7-percent discount rate and $11.1 million at a 3-percent discount rate.

At TSL 2, the projected change in INPV ranges from a decrease of $0.04 million to a decrease of $0.04 million. At TSL 2, DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 2 could result in a net loss of 44.0 percent in INPV to manufacturers of high-power EPSs.

The Secretary tentatively concludes that at TSL 2 for high-power EPSs, the benefits of energy savings, positive NPV of consumer benefits, positive LCC savings for all consumers, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden of the capital conversion costs and profit margin impacts that could result in a reduction in INPV for manufacturers. The Secretary also 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 today proposes to adopt TSL 2 for high-power EPSs. The proposed new and amended energy conservation standards for high-power EPSs, expressed as a discrete standard for minimum average active-mode efficiency and maximum no-load input power, are shown in Table V–90.

Table V-90 Proposed Standards for High-Power External Power Supplies

External Power Supplies – Product Class H: High-Power		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
> 250 watts	0.875	0.500

d. Product Class N—Indirect-Operation External Power Supplies

Product class N consists of indirect-operation EPSs, which are EPSs that serve only as battery charger components and do not operate an end-use consumer product or power any auxiliary functions of an end-use consumer product on their own. See section IV.A.3 above. The applications that use these EPSs consist of applications using motors and detachable batteries, which correspond to MADB non-Class A EPSs and other applications that use Class A EPSs. DOE believes that the Class A and non-Class A devices in product class N are technically equivalent. Because of this technical equivalency, DOE believes that EPSs of both types can achieve the same efficiency level for the same cost and, thus, grouped these EPSs into one product class for analysis. DOE is not aware of any capacity- or performance-related features of the non-Class A devices in product class N that would enable DOE to create a separate class for this group of devices. 42 U.S.C. 6295(q)

Of the estimated 75 million EPSs in this product class sold annually, 46 percent are Class A and are already subject to the Federal standards prescribed by EISA 2007. The remaining 54 percent are non-Class A EPSs, which are not currently subject to Federal standards. Table V–91 lists those applications that DOE has identified as product class N EPSs and indicates how many of each are subject to the current Federal standard for Class A EPSs and how many are non-Class A devices. DOE seeks comment on the accuracy of its estimates regarding the proportions of these applications that ship with indirect-operation EPSs versus direct-operation EPSs. (See Issue 17 under ''Issues on Which DOE Seeks Comment'' in Section VII.E of this notice.)

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Table V-91 Applications of Indirect Operation External Power Supplies

Status	Application	Estimated EPS Shipment Volume in 2009 (thousands of units)	
		Indirect Operation (Product Class N)	Direct Operation (Other Product Classes)
Currently Subject to Federal Standards (Class A)	MP3 Players	3,609	401
	Personal Digital Assistants	525	1,225
	In-Vehicle GPS	2,845	316
	Handheld GPS	136	15
	Bluetooth Headsets	13,900	0
	Mobile Phones	4,712	42,408
	Smartphones	6,174	14,407
	Digital Cameras	2,470	1,567
Not Currently Subject to Federal Standards (Non-Class A)	RC Toys	350	0
	Handheld Vacuums	4,000	0
	Stick Vacuums	1,000	0
	Robotic Vacuums	2,615	0
	Air Mattress Pumps	250	0
	Flashlights/Lanterns	100	0
	Rechargeable Garden Care Products	8	0
	Lawn Mowers	15	0
	Rechargeable Toothbrushes	15,000	0
	Rechargeable Water Jets	100	0
	Beard and Moustache Trimmers	1,763	5,288
	Hair Clippers	3,413	1,138
	Shavers	6,492	2,164
	DIY Power Tools (Integral)	4,675	0
	DIY Power Tools (External)	351	0
	Electric Scooters	175	0
	Motorized Bicycles	105	0

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First, DOE considered setting standards for EPSs in product class N at an efficiency level greater than the level prescribed by EISA for all Class A EPSs. While such a standard would theoretically yield energy savings, DOE tentatively believes that these savings would not be cost justified. In the case of these particular devices, DOE believes that a more effective way to obtain additional energy savings is to regulate the battery chargers of which product class N EPSs are a part, since all of the power flowing through an indirect-operation EPS flows to the battery charger. In contrast, a direct-operation EPS's output power flows to both a battery charger and an end-use consumer product, which means that regulating only the battery charger would not adequately address the entire system. Thus, by not setting new standards for product class N EPSs beyond the existing EISA standard level, DOE believes that manufacturers will have greater flexibility in designing more efficient battery chargers without adversely impacting their utility and performance. This approach would help ensure that consumers and the Nation as a whole will realize cost-effective savings either through improvements to the EPS or other components in the battery charger. Thus, DOE tentatively believes that any cost-effective energy savings for these products will be realized through the battery charger standard itself.

Next, DOE considered standards equivalent to the current EISA standards for Class A EPSs. This approach would represent no change in standards for Class A devices and a new standard for non-Class A devices in product class N. (Note that all Class A EPSs, including those in product class N, cannot, by virtue of EPCA's anti-backsliding provision, be subject to a standard less stringent than the current Class A standard prescribed by EISA 2007 (see 42 U.S.C. 6295(o)(1)).)

As indicated in section IV.A.1 above, DOE has not identified any non-Class A EPSs in product class N that are not already subject to the California EPS standard. As a result, all of these non-Class A EPSs that fall into product class N must already comply with the California standard. The California standard for non-Class A EPSs is at the same efficiency level as the Federal Class A EPS standard. California also relies on the Federal test procedure to verify compliance with its EPS standards. Since California requires identical standards and test methods for non-Class A EPSs as DOE does for Class A, DOE considers these standards to be equivalent.

Additionally, manufacturers have alluded informally to DOE that the California standard is the ''de facto'' national standard for their non-Class A EPSs because they typically sell the same EPS for a given product line throughout the country. The California IOUs concurred with this view. (California IOUs, No. 43 at p. 9) Thus, DOE believes that the non-Class A EPSs in product class N already meet the Federal standards currently in place for Class A EPSs and seeks comment on the accuracy of this belief. (See Issue 18 under ''Issues on Which DOE Seeks Comment'' in section VII.E of this notice.)

Under the assumption that all non-Class A EPSs in product class N already meet the Federal standards currently in place for Class A EPSs, a new standard at the EISA level for these products would not yield significant energy savings and, therefore, would not be cost-justified. Therefore, DOE is not proposing new standards for indirect operation EPSs today. If DOE receives new information indicating that this assumption is incorrect, i.e., that manufacturers are not producing all indirect operation EPSs at or above the EISA efficiency levels, DOE will reconsider this decision and evaluate potential new standards for this product class.

2. Battery Chargers

a. Low-Energy, Inductive Charging Battery Chargers, Product Class 1

Table V–92 presents a summary of the quantitative impacts estimated for each TSL for low-energy, inductive charging battery chargers. The efficiency levels contained in each TSL are described in section V.A.

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Table V-92 Summary of Results for Battery Charger Product Class 1

Category	**TSL 1**	**TSL 2**	**TSL 3**
National Energy Savings (quads)	0.0557	0.1298	0.1775
NPV of Consumer Benefits (2010$ million)			
3% discount rate	294	606	(781)
7% discount rate	157	318	(527)
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumption[i] (2010$ million)			
3% discount rate	352	741	(596)
7% discount rate	213	450	(347)
Industry Impacts			
Battery Charger-Product Class 1			
Industry NPV Change (2010$ million)	(41) - 1	(101) – 1	(441) – 29
Industry NPV (% change)	(8.4) - 0.1	(20.6) – 0.3	(89.7) – 5.9
Cumulative Emissions Reduction			
CO_2 (Mt)	2.62	6.11	8.36
NO_X (kt)	2.17	5.05	6.9
Hg (t)	0.014	0.032	0.044
Value of Cumulative Emissions Reduction			
CO_2 (2010$ billion)*	0.011 to 0.167	0.026 to 0.388	0.035 to 0.531
NO_X – 3% discount rate (2010$ million)	1 to 6	1 to 15	2 to 20
NO_X – 7% discount rate (2010$ million)	0 to 4	1 to 8	1 to 11
Mean LCC Savings** (2010$)	0.76	1.52	(2.87)
Median PBP (years)	1.2	1.7	8.5
Distribution of Consumer LCC Impacts			
Net Cost (%)	0.0	0.0	98.2
No Impact (%)	22.2	11.1	0.0
Net Benefit (%)	77.8	88.9	1.8
Generation Capacity Reduction (GW)[†]	0.031	0.072	0.099

Parentheses indicate negative (-) values.

* Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

** For LCCs, a negative value means an increase in LCC by the amount indicated.

[i] Calculations based on the SCC series corresponding to a value of \$22.3/ton in 2010, and a medium value for NO_x corresponding to \$2,537/t in 2010\$[†] Changes in 2042.

DOE first considered TSL 3, which represents the max-tech efficiency level. TSL 3 would save 0.178 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefits would be −\$527 million, using a discount rate of 7 percent, and −\$781 million, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 8.36 Mt of CO_2, 6.90 kt of NO_X, and 0.044 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 3 ranges from \$0.035 billion to \$0.531 billion.

At TSL 3, the average LCC impact is a cost (LCC savings decrease) of \$2.87 for low-energy inductive charging battery chargers. The median payback period is 8.5 years. The fraction of consumers experiencing an LCC benefit is 1.8 percent and the fraction of consumers experiencing an LCC cost is 98.2 percent.

At TSL 3, the projected change in INPV ranges from a decrease of \$441 million to an increase of \$29 million. At TSL 3, DOE recognizes the risk of very large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 3 could result in a net loss of 89.7 percent in INPV to manufacturers of battery chargers.

The Secretary tentatively concludes that at TSL 3 for low-energy, inductive charging 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 negative NPV of consumer benefits, the economic burden on a significant fraction of consumers due to the large increases in product cost, and the capital conversion costs and profit margin impacts that could result in a very large reduction in INPV for the manufacturers. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2. TSL 2 would save 0.130 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefits would be \$318 million, using a discount rate of 7 percent, and \$606 million, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 6.11 Mt of CO_2, 5.05 kt of NO_X, and 0.032 t of Hg. The estimated monetary value of the cumulative CO_2

emissions reductions at TSL 2 ranges from $0.026 billion to $0.388 billion. Additionally, the NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions is maximized with a value of $741 million at a 3-percent discount rate and $450 million at a 7-percent discount rate at TSL 2.

At TSL 2, the average LCC impact is a savings of $1.52 for low-energy inductive charging battery chargers. The median payback period is 1.7 years. The fraction of consumers experiencing an LCC benefit is 88.9 percent and the fraction of consumers experiencing an LCC cost is 0 percent.

At TSL 2, the projected change in INPV ranges from a decrease of $101 million to an increase of $1 million. DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 2 could result in a net loss of 20.6 percent in INPV to manufacturers of low-energy inductive charging battery chargers.

The Secretary tentatively concludes that at TSL 2 for low-energy, inductive charging battery chargers, the benefits of energy savings, positive NPV of consumer benefits, positive mean LCC savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden of the capital conversion costs and profit margin impacts that could result in a reduction in INPV for manufacturers.

After considering the analysis, comments to the September 2010 notice and the preliminary TSD, 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 today proposes to adopt TSL 2 for low-energy inductive charging battery chargers. The proposed new energy conservation standard for low-energy inductive charging battery chargers is shown in Table V–97.

TABLE V–93—PROPOSED STANDARD FOR PRODUCT CLASS 1

Product class	Maximum unit energy consumption (kWh/yr)
1 (Low-Energy, Inductive)	3.04

b. Low-Energy, Non-Inductive Charging Battery Chargers, Product Classes 2, 3, and 4

Table presents a summary of the quantitative impacts estimated for each TSL for low-energy, non-inductive charging battery chargers. The efficiency levels contained in each TSL are described in section V.A.

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Table V-94 Summary of Results for Battery Charger Product Classes 2, 3, and 4

Category	**TSL 1**	**TSL 2**	**TSL 3**	**TSL 4**
National Energy Savings (quads)	0.3091	0.7588	1.7967	1.9971
NPV of Consumer Benefits (2010$ million)				
3% discount rate	1,255	(367)	(14,159)	(38,442.72)
7% discount rate	664	(435)	(8,973)	(23,542.09)
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumptions[i] (2010$ million)				
3% discount rate	1,576	421	(12,293)	(36,368)
7% discount rate	977	333	(7,156)	(21,522)
Industry Impacts				
Battery Charger -Product Classes 2, 3, and 4				
Industry NPV Change (2010$ million)	(4,897) – 15	(6,055) – 134	(10,863) – 528	(14,562) - 975
Industry NPV (% change)	(11.2) - 0.0	(13.8) – 0.3	(24.8) – 1.2	(33.2) – 2.2
Cumulative Emissions Reduction				
CO_2 (Mt)	14.7	35.9	85.1	94.6
NO_X (kt)	12.1	29.7	70.3	78.1
Hg (t)	0.078	0.191	0.452	0.502
Value of Cumulative Emissions Reduction				
CO_2 (2010$ billion)*	0.062 to 0.921	0.151 to 2.260	0.358 to 5.352	0.398 to 5.949
NO_X – 3% discount rate (2010$ million)	3 to 35	8 to 87	20 to 206	22 to 229
NO_X – 7% discount rate (2010$ million)	2 to 20	5 to 49	11 to 116	13 to 129
Mean LCC Savings** (2010$)				
PC2 – Low-Energy, Low-Voltage	0.16	(0.12)	(1.81)	(4.54)
PC3 – Low-Energy, Medium-Voltage	0.35	0.35	(2.12)	(2.15)
PC4 – Low-Energy, High-Voltage	0.43	0.43	(2.73)	(10.14)
Median PBP (years)				
PC2 – Low-Energy, Low-Voltage	0.5	5.2	8.5	16.9
PC3 – Low-Energy, Medium-Voltage	3.9	3.9	21.9	21.5
PC4 – Low-Energy, High-Voltage	3.0	3.0	13.8	37.6
Distribution of Consumer LCC Impacts				
PC2 – Low-Energy, Low-Voltage				
Net Cost (%)	1.0	26.8	87.1	96.8
No Impact (%)	82.0	60.1	2.9	0.0
Net Benefit (%)	17.0	13.1	10.0	3.2
PC3 – Low-Energy, Medium-Voltage				
Net Cost (%)	8.9	8.9	65.8	85.8
No Impact (%)	82.8	82.8	20.9	0.0
Net Benefit (%)	8.3	8.3	13.3	14.2
PC4 – Low-Energy, High-Voltage				
Net Cost (%)	3.4	3.4	46.4	98.2
No Impact (%)	90.7	90.7	51.5	0.0
Net Benefit (%)	5.8	5.8	2.2	1.8
Generation Capacity Reduction (GW)[†]	0.17	0.42	1.00	1.11

Parentheses indicate negative (-) values.

* Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

** For LCCs, a negative value means an increase in LCC by the amount indicated.

[i] Calculations based on the SCC series corresponding to a value of \$22.3/ton in 2010, and a medium value for NO_x corresponding to \$2,537/t in 2010\$[†] Changes in 2042.

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DOE first considered TSL 4, which represents the max-tech efficiency level. TSL 4 would save 1.9971 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefits would be −$23.54 billion, using a discount rate of 7 percent, and −$38.44 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 94.6 Mt of CO_2, 78.1 kt of NO_X, and 0.502 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 4 ranges from $0.398 billion to $5.949 billion.

At TSL 4, the average LCC impact is a cost (LCC savings decrease) of $4.54, $2.15, and $10.14 for low-energy non-inductive charging battery charger product classes 2, 3, and 4 respectively. The median payback period is 16.9, 21.5, and 37.6 years for product classes 2, 3, and 4 respectively. The fraction of consumers experiencing an LCC benefit is 3.2, 14.2, and 1.8 percent for each product class and the fraction of consumers experiencing an LCC cost is 96.8, 85.8, and 98.2 percent for each product class.

At TSL 4, the projected change in INPV ranges from a decrease of $14.56 billion to an increase of $0.98 billion. At TSL 4, DOE recognizes the risk of very large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 4 could result in a net loss of 33.2 percent in INPV to manufacturers of battery chargers.

The Secretary tentatively concludes that at TSL 4 for low-energy, non-inductive charging 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 negative NPV of consumer benefits, the economic burden on a significant fraction of consumers due to the large increases in product cost, and the capital conversion costs and profit margin impacts that could result in a very large reduction in INPV for the manufacturers. Consequently, the Secretary has tentatively concluded that TSL 4 is not economically justified.

DOE then considered TSL 3, which represents the best-in-market efficiency level. TSL 3 would save 1.797 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefits would be −$8.97 billion, using a discount rate of 7 percent, and −$14.16 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 85.1 Mt of CO_2, 70.3 kt of NO_X, and 0.452 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 3 ranges from $0.358 billion to $5.352 billion.

At TSL 3, the average LCC impact is a cost (LCC savings decrease) of $1.81, $2.12, and $2.73 for low-energy non-inductive charging battery charger product classes 2, 3, and 4 respectively. The median payback period is 8.5, 21.9, and 13.8 years for product classes 2, 3, and 4 respectively. The fraction of consumers experiencing an LCC benefit is 10.0, 13.3, and 2.2 percent for each product class and the fraction of consumers experiencing an LCC cost is 87.1, 65.8, and 46.4 percent for each product class.

At TSL 3, the projected change in INPV ranges from a decrease of $10.86 billion to an increase of $0.53 billion. At TSL 3, DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 3 could result in a net loss of 24.8 percent in INPV to manufacturers of battery chargers.

The Secretary tentatively concludes that at TSL 3 for low-energy, non-inductive charging 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 negative NPV of consumer benefits, the economic burden on a significant fraction of consumers due to the large increases in product cost, and the capital conversion costs and profit margin impacts that could result in a very large reduction in INPV for the manufacturers. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2, which represents an intermediate efficiency level. TSL 2 would save 0.759 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefits would be −$435 million, using a discount rate of 7 percent, and −$367 million, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 35.9 Mt of CO_2, 29.7 kt of NO_X, and 0.191 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 2 ranges from $0.151 billion to $2.260 billion.

At TSL 2, the average LCC impact is a cost (LCC savings decrease) of $0.12 for product class 2 and a savings (LCC savings increase) of $0.35 and $0.43 product classes 3 and 4 respectively. The median payback period is 5.2, 3.9, and 3.0 years for product classes 2, 3, and 4 respectively. The fraction of consumers experiencing an LCC benefit is 17.0, 8.3, and 5.8 percent for each product class and the fraction of consumers experiencing an LCC cost is 26.8, 8.9, and 3.4 percent for each product class.

At TSL 2, the projected change in INPV ranges from a decrease of $6.06 billion to an increase of $0.13 billion. At TSL 2, DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 2 could result in a net loss of 13.8 percent in INPV to manufacturers of battery chargers.

The Secretary tentatively concludes that at TSL 2 for low-energy, non-inductive charging 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 negative NPV of consumer benefits, the economic burden on a significant fraction of consumers due to the increases in product cost, and the capital conversion costs and profit margin impacts that could result in a large reduction in INPV for the manufacturers. Consequently, the Secretary has tentatively concluded that TSL 2 is not economically justified.

DOE then considered TSL 1, which represents another intermediate efficiency level. Relative to TSL 2, the efficiency level for product class 2 has decreased, while the efficiency levels for product classes 3 and 4 are the same. TSL 1 would save 0.309 quads of energy, an amount DOE considers significant. Under TSL 1, the NPV of consumer benefits would be $664 million, using a discount rate of 7 percent, and $1.255 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 1 are 14.7 Mt of CO_2, 12.1 kt of NO_X, and 0.078 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 1 ranges from $0.062 billion to $0.921 billion. Additionally, the NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions is maximized with a value of $1.576 billion at a 3-percent discount rate and $0.977 billion at a 7-percent discount rate at TSL 1.

At TSL 1, the average LCC impact is a savings (LCC savings increase) of $0.16, $0.35, and $0.43 for low-energy non-inductive charging battery charger product classes 2, 3, and 4 respectively. The median payback period is 0.5, 3.9, and 3.0 years for product classes 2, 3, and 4 respectively. The fraction of consumers experiencing an LCC benefit is 17.0, 8.3, and 5.8 percent for each product class and the fraction of consumers experiencing an LCC cost is 1.0, 8.9, and 3.4 percent for each product class.

At TSL 1, the projected change in INPV ranges from a decrease of $4.90 billion to an increase of $0.02 billion. DOE recognizes the risk of negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, TSL 1 could result in a net loss of 11.2 percent in INPV to manufacturers of low-energy non-inductive charging battery chargers.

The Secretary tentatively concludes that at TSL 1 for low-energy, non-inductive charging battery chargers, the benefits of energy savings, positive NPV of consumer benefits, positive mean LCC savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden of the capital conversion costs and profit margin impacts that could result in a reduction in INPV for manufacturers.

After considering the analysis, comments to the September 2010 notice and the preliminary TSD, and the benefits and burdens of TSL 1, 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 today proposes to adopt TSL 1 for low-energy non-inductive charging battery chargers. The proposed new energy conservation standards for low-energy, non-inductive charging battery chargers, expressed as equations for minimum unit energy consumption, are shown in Table V–99.

Table V-95 Proposed Standard for Product Classes 2, 3, and 4

Product Class	Maximum Unit Energy Consumption(kWh/yr)
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 $E_{batt} \geq 9.74$ Wh, $= 0.0933(E_{batt}) + 3.77$
4 (Low-Energy, High-Voltage)	For $E_{batt} < 9.71$ Wh, $= 9.03$ For $E_{batt} \geq 9.71$ Wh, $= 0.2411(E_{batt}) + 6.69$

c. Medium-Energy Battery Chargers, Product Classes 5 and 6

Table V–96 presents a summary of the quantitative impacts estimated for each TSL for medium-energy battery chargers. The efficiency levels contained in each TSL are described in section V.A.

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Table V-96 Summary of Results for Battery Charger Product Classes 5 and 6

Category	**TSL 1**	**TSL 2**	**TSL 3**
National Energy Savings (quads)	0.2679	0.5962	0.7809
NPV of Consumer Benefits (2010$ million)			
3% discount rate	1,628	4,648	(11,123)
7% discount rate	867	2,539	(6,961)
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumptions[i] (2010$ million)			
3% discount rate	1,905	5,264	(10,315)
7% discount rate	1,137	3,139	(6,176)
Industry Impacts			
Battery Charger -Product Classes 5 and 6			
Industry NPV Change (2010$ million)	(327) – 6	(225) – (40)	(1,314) – 692
Industry NPV (% change)	(21.0) – 0.3	(14.5) – (2.5)	(84.8) – 43.7
Cumulative Emissions Reduction			
CO_2 (Mt)	12.4	27.4	35.9
NO_X (kt)	10.2	22.6	29.6
Hg (t)	0.065	0.143	0.187
Value of Cumulative Emissions Reduction			
CO_2 (2010$ billion)*	0.053 to 0.795	0.118 to 1.770	0.154 to 2.318
NO_X – 3% discount rate (2010$ million)	3 to 30	7 to 67	9 to 88
NO_X – 7% discount rate (2010$ million)	2 to 16	4 to 37	5 to 48
Mean LCC Savings** (2010$)			
PC5 – Medium-Energy, Low-Voltage	9.69	33.79	(104.58)
PC6 – Medium-Energy, High-Voltage	9.96	40.78	(86.76)
Median PBP (years)			
PC5 – Medium-Energy, Low-Voltage	1.7	0.0	53.4
PC6 – Medium-Energy, High-Voltage	1.2	0.0	20.8
Distribution of Consumer LCC Impacts			
PC5 – Medium-Energy, Low-Voltage			
Net Cost (%)	1.3	0.0	78.6
No Impact (%)	72.0	20.1	13.0
Net Benefit (%)	26.8	79.9	8.4
PC6 – Medium-Energy, High-Voltage			
Net Cost (%)	0.0	0.0	85.4
No Impact (%)	64.6	35.2	13.0
Net Benefit (%)	35.4	64.8	1.6
Generation Capacity Reduction (GW)[†]	0.15	0.33	0.43

Parentheses indicate negative (-) values.

* Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

** For LCCs, a negative value means an increase in LCC by the amount indicated.

[i] Calculations based on the SCC series corresponding to a value of $22.3/ton in 2010, and a medium value for NO_x corresponding to $2,537/t in 2010$[†] Changes in 2042.

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DOE first considered TSL 3, which represents the max-tech efficiency level. TSL 3 would save 0.781 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefits would be −$6.96 billion, using a discount rate of 7 percent, and −$11.12 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 35.9 Mt of CO_2, 29.6 kt of NO_X, and 0.187 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 3 ranges from $0.154 billion to $2.318 billion.

At TSL 3, the average LCC impact is a cost (LCC savings decrease) of $104.58 and $86.76 for medium-energy battery charger product classes 5 and 6 respectively. The median payback period is 53.4 and 20.8 years for product classes 5 and 6 respectively. The fraction of consumers experiencing an

LCC benefit is 8.4 and 1.6 percent for product classes 5 and 6, respectively, and the fraction of consumers experiencing an LCC cost is 78.6 and 85.4 percent for product classes 5 and 6, respectively.

At TSL 3, the projected change in INPV ranges from a decrease of $1.31 billion to an increase of $0.69 billion. At TSL 3, DOE recognizes the risk of very large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 3 could result in a net loss of 84.8 percent in INPV to manufacturers of battery chargers.

The Secretary tentatively concludes that at TSL 3 for medium-energy 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 negative NPV of consumer benefits, the economic burden on a significant fraction of consumers due to the large increases in product cost, and the capital conversion costs and profit margin impacts that could result in a very large reduction in INPV for manufacturers. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2, which represents the best-in-market efficiency level. TSL 2 would save 0.596 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefits would be $2.54 billion, using a discount rate of 7 percent, and $4.65 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 27.4 Mt of CO_2, 22.6 kt of NO_X, and 0.143 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 2 ranges from $0.118 billion to $1.770 billion. Additionally, the NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions is maximized with a value of $5.264 billion at a 3-percent discount rate and $3.139 billion at a 7-percent discount rate at TSL 2.

At TSL 2, the average LCC impact is a savings (LCC savings increase) of $33.79 and $40.78 for medium-energy battery charger product classes 5 and 6, respectively. The median payback period is 0.0 and 0.0 years for product classes 5 and 6, respectively. The fraction of consumers experiencing an LCC benefit is 79.9 and 64.8 percent for each product class and the fraction of consumers experiencing an LCC cost is 0.0 and 0.0 percent for each product class.

At TSL 2, the projected change in INPV ranges from a decrease of $225 million to a decrease of $40 million. DOE recognizes the risk of negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, TSL 2 could result in a net loss of 14.5 percent in INPV to manufacturers of medium-energy battery chargers.

The Secretary tentatively concludes that at TSL 2 for medium-energy battery chargers, the benefits of energy savings, positive NPV of consumer benefits, positive mean LCC savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden of the capital conversion costs and profit margin impacts that could result in a reduction in INPV for manufacturers.

After considering the analysis, comments to the September 2010 notice and the preliminary TSD, 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 today proposes to adopt TSL 2 for medium-energy battery chargers. The proposed new energy conservation standards for medium-energy battery chargers, expressed as equations for minimum unit energy consumption, are shown in Table V–101.

Table V-97 Proposed Standard for Product Classes 5 and 6

Product Class	Maximum Unit Energy Consumption (kWh/yr)
5 (Medium-Energy, Low-Voltage)	For $E_{batt} < 355.18$ Wh, = 20.06 For $E_{batt} \geq 355.18$ Wh, = $0.0219(E_{batt}) + 12.28$
6 (Medium-Energy, High-Voltage)	For $E_{batt} < 239.48$ Wh, = 30.37 For $E_{batt} \geq 239.48$ Wh, = $0.0495(E_{batt}) + 18.51$

d. High-Energy Battery Chargers, Product Class 7

Table V–98 presents a summary of the quantitative impacts estimated for each TSL for high-energy battery chargers. The efficiency levels contained in each TSL are described in section V.A.

Table V-98 Summary of Results for Battery Charger Product Class 7

Category	**TSL 1**	**TSL 2**
National Energy Savings (quads)	0.0067	0.0209
NPV of Consumer Benefits (2010$ million)		
3% discount rate	119	(493)
7% discount rate	70	(299)
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumptions[i] (2010$ million)		
3% discount rate	126	(472)
7% discount rate	76	(279)
Industry Impacts		
Battery Charger-Product Class 7		
Industry NPV Change (2010$ million)	(4) – 47	(136) – 23
Industry NPV (% change)	(0.4) – 4.5	(13.1) – 2.2
Cumulative Emissions Reduction		
CO_2 (Mt)	0.312	0.975
NO_X (kt)	0.259	0.808
Hg (t)	0.002	0.006
Value of Cumulative Emissions Reduction		
CO_2 (2010$ billion)*	0.001 to 0.019	0.004 to 0.061
NO_X – 3% discount rate (2010$ million)	0.073 to 1	0.229 to 2
NO_X – 7% discount rate (2010$ million)	0.042 to 0.431	0.131 to 1
Mean LCC Savings** (2010$)	38.26	(127.30)
Median PBP (years)	0.0	27.2
Distribution of Consumer LCC Impacts		
Net Cost (%)	0.0	100.0
No Impact (%)	56.6	0.0
Net Benefit (%)	43.5	0.0
Generation Capacity Reduction (GW)†	0.003	0.010

Parentheses indicate negative (-) values.

* Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

** For LCCs, a negative value means an increase in LCC by the amount indicated.

[i] Calculations based on the SCC series corresponding to a value of $22.3/ton in 2010, and a medium value for NO_x corresponding to $2,537/t in 2010$† Changes in 2042.

DOE first considered TSL 2, which represents the max-tech efficiency level. TSL 2 would save 0.021 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefits would be −$299 million, using a discount rate of 7 percent, and −$493 million, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 0.975 Mt of CO_2, 0.808 kt of NO_X, and 0.006 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 2 ranges from $0.004 billion to $0.061 billion.

At TSL 2, the average LCC impact is a cost (LCC savings decrease) of $127.30 for high-energy battery chargers. The median payback period is 27.2 years. The fraction of consumers experiencing an LCC benefit is 0.0 percent and the fraction of consumers experiencing an LCC cost is 100.0 percent.

At TSL 2, the projected change in INPV ranges from a decrease of $136 million to an increase of $23 million. At TSL 2, DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 2 could result in a net loss of 13.1 percent in INPV to manufacturers of battery chargers.

The Secretary tentatively concludes that at TSL 2 for high-energy 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 negative NPV of consumer benefits, the economic burden on a significant fraction of consumers due to the large increases in product cost, and the capital conversion costs and profit margin impacts that could result in a large reduction in INPV for the manufacturers. Consequently, the Secretary has tentatively concluded that TSL 2 is not economically justified.

DOE then considered TSL 1, which is the best-in-market efficiency level. TSL 1 would save 0.007 quads of energy, an amount DOE considers significant. Under TSL 1, the NPV of consumer benefits would be $70 million, using a discount rate of 7 percent, and $119 million, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 1 are 0.312 Mt of CO_2, 0.259 kt of NO_X, and 0.002 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 1 ranges from $0.001 billion to $0.019 billion. Additionally, the NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions is maximized with a value of $126 million at a 3-percent discount rate and $76 million at a 7-percent discount rate at TSL 1.

At TSL 1, the average LCC impact is a savings of $38.26 for high-energy battery chargers. The median payback period is 0.0 years. The fraction of consumers experiencing an LCC benefit is 43.5 percent and the fraction of consumers experiencing an LCC cost is 0.0 percent.

At TSL 1, the projected change in INPV ranges from a decrease of $4 million to an increase of $47 million. DOE recognizes the risk of negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 1 could result in a net loss of 0.4 percent in INPV to manufacturers of high-energy battery chargers.

The Secretary tentatively concludes that at TSL 1 for high-energy battery chargers, the benefits of energy savings, positive NPV of consumer benefits, positive mean LCC savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden associated with the potential direct employment losses, capital conversion costs and profit margin impacts that could result in a reduction in INPV for manufacturers.

After considering the analysis, comments to the September 2010 notice and the preliminary TSD, and the benefits and burdens of TSL 1, 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 today proposes to adopt TSL 1 for high-energy battery chargers. The proposed new energy conservation standard for high-energy battery chargers, expressed as an equation for minimum unit energy consumption, is shown in Table V–103.

Table V-99 Proposed Standard for Product Class 7

Product Class	Maximum Unit Energy Consumption (kWh/yr)
7 (High-Energy)	$= 0.502(E_{batt}) + 4.53$

e. Battery Chargers With a DC Input of Less Than 9 V, Product Class 8

Table V–100 presents a summary of the quantitative impacts estimated for each TSL for battery chargers with a DC input less than 9 V. The efficiency levels contained in each TSL are described in section V.A.

Table V-100 Summary of Results for Battery Charger Product Class 8

Category	TSL 1	TSL 2	TSL 3
National Energy Savings (quads)	0.0096	0.0408	0.0453
NPV of Consumer Benefits (2010$ million)			
3% discount rate	2,780	(1,654)	(2,001)
7% discount rate	1,659	(1,000)	(1,208)
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumptions[i] (2010$ million)			
3% discount rate	2,790	(1,612)	(1,954)
7% discount rate	1,669	(958)	(1,162)
Industry Impacts			
Battery Charger -Product Class 8			
Industry NPV change (2010$ million)	(75) - 1,300	4 – 78	(61) - (30)
Industry NPV (% change)	(1.3) - 22.8	0.1 – 1.4	(1.1) - (0.5)
Cumulative Emissions Reduction			
CO_2 (Mt)	0.46	1.95	2.16
NO_X (kt)	0.38	1.61	1.78
Hg (t)	0.002	0.010	0.011
Value of Cumulative Emissions Reduction			
CO_2 (2010$ billion)*	0.002 to 0.029	0.008 to 0.122	0.009 to 0.136
NO_X – 3% discount rate (2010$ million)	0 to 1	0 to 5	1 to 5
NO_X – 7% discount rate (2010$ million)	0 to 1	0 to 3	0 to 3
Mean LCC Savings** (2010$)	3.04	(1.96)	(2.31)
Median PBP (years)	0.0	0.0	24.9
Distribution of Consumer LCC Impacts			
Net Cost (%)	0.0	40.0	55.4
No Impact (%)	50.0	10.0	0.0
Net Benefit (%)	50.0	50.0	44.6
Generation Capacity Reduction (GW)[†]	0.005	0.023	0.025

Parentheses indicate negative (-) values.

* Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

** For LCCs, a negative value means an increase in LCC by the amount indicated.

[i] Calculations based on the SCC series corresponding to a value of $22.3/ton in 2010, and a medium value for NO_x corresponding to $2,537/t in 2010$[†] Changes in 2042.

DOE first considered TSL 3, which represents the max-tech efficiency level. TSL 3 would save 0.045 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefits would be −$1.21 billion, using a discount rate of 7 percent, and −$2.00 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 2.16 Mt of CO_2, 1.78 kt of NO_X, and 0.011 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 3 ranges from $0.009 billion to $0.136 billion.

At TSL 3, the average LCC impact is a cost (LCC savings decrease) of $2.31 for battery chargers with a DC input of less than 9 V. The median payback period is 24.9 years. The fraction of consumers experiencing an LCC benefit is 44.6 percent and the fraction of consumers experiencing an LCC cost is 55.4 percent.

At TSL 3, the projected change in INPV ranges from a decrease of $61 million to a decrease of $30 million. At TSL 3, DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 3 could result in a net loss of 1.1 percent in INPV to manufacturers of battery chargers.

The Secretary tentatively concludes that at TSL 3 for battery chargers with a DC input of less than 9 V, the benefits of energy savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions would be outweighed by the negative NPV of consumer benefits and the economic burden on a significant fraction of consumers due to the large increases in product cost, and the capital conversion costs and profit margin impacts that could result in a reduction in INPV for the manufacturers. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2, which represents the best-in-market efficiency level. TSL 2 would save 0.041 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefits would be −$1.00 billion, using a discount rate of 7 percent, and −$1.65 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 1.95 Mt of CO_2, 1.61 kt of NO_X, and 0.010 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 2 ranges from $0.008 billion to $0.122 billion.

At TSL 2, the average LCC impact is a cost (LCC savings decrease) of $1.96 for battery chargers with a DC input of less than 9 V. The median payback period is 0.0 years. The fraction of consumers experiencing an LCC benefit is 50.0 percent and the fraction of consumers experiencing an LCC cost is 40.0 percent.

At TSL 2, the projected change in INPV ranges from an increase of $4 million to an increase of $78 million. At TSL 2, DOE believes there are minimal risks of negative impacts on manufacturers and expects that TSL 2 could result in a net gain of 0.1 percent in INPV to manufacturers of battery chargers.

The Secretary tentatively concludes that at TSL 2 for battery chargers with a DC input of less than 9 V, the benefits of energy savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions would be outweighed by the negative NPV of consumer benefits and the economic burden on a significant fraction of consumers due to the large increases in product cost. Consequently, the Secretary has tentatively concluded that TSL 2 is not economically justified.

DOE then considered TSL 1, which is an intermediate efficiency level. TSL 1 would save 0.010 quads of energy, an amount DOE considers significant. Under TSL 1, the NPV of consumer benefits would be $1.66 billion, using a discount rate of 7 percent, and $2.78 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 1 are 0.46 Mt of CO_2, 0.38 kt of NO_X, and 0.002 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 1 ranges from $0.002 billion to $0.029 billion. Additionally, the NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions is maximized with a value of $2.790 billion at a 3-percent discount rate and $1.669 billion at a 7 percent discount rate at TSL 1.

At TSL 1, the average LCC impact is a savings of $3.04 for battery chargers with a DC input of less than 9 V. The median payback period is 0.0 years. The fraction of consumers experiencing an LCC benefit is 50.0 percent and the fraction of consumers experiencing an LCC cost is 0.0 percent.

At TSL 1, the projected change in INPV ranges from a decrease of $75 million to an increase of $1,300 million. DOE recognizes the risk of negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 1 could result in a net loss of 1.3 percent in INPV to manufacturers of battery chargers with a DC input less than 9 V.

The Secretary tentatively concludes that at TSL 1 for battery chargers with a DC input of less than 9 V, the benefits of energy savings, positive NPV of consumer benefits, positive mean LCC savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden associated with the capital conversion costs and profit margin impacts that could result in a reduction in INPV for manufacturers.

After considering the analysis, comments to the September 2010 notice and the preliminary TSD, and the benefits and burdens of TSL 1, 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 today proposes to adopt TSL 1 for battery chargers with a DC input less than 9 V. The proposed new energy conservation standard for battery chargers with a DC input less than 9 V is shown in Table V–105.

TABLE V–101—PROPOSED STANDARD FOR PRODUCT CLASS 8

Product class	Maximum unit energy consumption (kWh/yr)
8 (Low-Voltage DC Input)	0.66

DOE is also considering an alternative approach for product class 8 because of the considerations expressed in section IV.C.2.i above. This approach is same as the proposal that DOE has for product class 9, discussed in the following section.

f. Battery Chargers With a DC Input Greater Than 9 V, Product Class 9

DOE ran a number of analyses in an attempt to ascertain whether an appropriate efficiency level could be created for product class 9. A battery charger is in product class 9 if it operates using a DC input source greater than 9 V, 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. Such products would be in-vehicle battery chargers that can operate outside of a vehicle. After completing its engineering analysis for these products, DOE ran the LCC analysis. These analyses projected that no efficiency level would be likely to exhibit a positive LCC savings. The LCC results showed a cost (LCC savings decrease) of $0.08 and $0.24 for CSLs 1 and 2 respectively. That fact, combined with the minimal UECs found for products in this category, leads DOE to tentatively believe that there would be no economically justifiable TSLs that correspond to the efficiency levels found in the engineering analysis for this product class.

g. AC Output Battery Chargers, Product Class 10

Table V–102 presents a summary of the quantitative impacts estimated for each TSL for battery chargers with an AC output. The efficiency levels contained in each TSL are described in section V.A.

Table V-102 Summary of Results for Battery Charger Product Class 10

Category	**TSL 1**	**TSL 2**	**TSL 3**
National Energy Savings (quads)	0.2308	0.2678	0.3124
NPV of Consumer Benefits (2010$ million)			
3% discount rate	1,192	1,354	1,550
7% discount rate	611	692	789
NPV of Consumer Benefits added to the Value of Emissions Reductions Using Medium Assumptions[i] (2010$ million)			
3% discount rate	1,427	1,626	1,866
7% discount rate	839	956	1,097
Industry Impacts			
Battery Charger-Product Class 10			
Industry NPV Change (2010$ million)	(81) - (0)	(100) - (2)	(126) - (5)
Industry NPV (% change)	(13.2) - (0.1)	(16.4) - (0.4)	(20.5) - (0.9)
Cumulative Emissions Reduction			
CO_2 (Mt)	10.3	11.9	13.9
NO_X (kt)	8.46	9.81	11.5
Hg (t)	0.068	0.079	0.092
Value of Cumulative Emissions Reduction			
CO_2 (2010$ billion)*	0.045 to 0.672	0.052 to 0.780	0.060 to 0.910
NO_X – 3% discount rate (2010$ million)	2 to 25	3 to 29	3 to 34
NO_X – 7% discount rate (2010$ million)	1 to 14	2 to 16	2 to 18
Mean LCC Savings** (2010$)	6.41	7.26	8.30
Median PBP (years)	1.3	1.4	1.5
Distribution of Consumer LCC Impacts			
Net Cost (%)	0.0	0.0	0.0
No Impact (%)	13.0	13.0	13.0
Net Benefit (%)	87.0	87.0	87.0
Generation Capacity Reduction (GW)[†]	0.11	0.12	0.14

Parentheses indicate negative (-) values.

* Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

** For LCCs, a negative value means an increase in LCC by the amount indicated.

[i] Calculations based on the SCC series corresponding to a value of $22.3/ton in 2010, and a medium value for NO_x corresponding to $2,537/t in 2010$[†] Changes in 2042.

DOE first considered TSL 3, which is the max-tech efficiency level. TSL 3 would save 0.312 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefits would be $789 million, using a discount rate of 7 percent, and $1.55 billion, using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 13.9 Mt of CO_2, 11.5 kt of NO_X, and 0.092 t of Hg. The estimated monetary value of the cumulative CO_2 emissions reductions at TSL 3 ranges from $0.060 billion to $0.910 billion. Additionally, the NPV of consumer benefits added to the social cost of carbon and monetized NO_X emissions reductions is maximized with a value of $1.866 billion at a 3-percent discount rate and $1.097 billion at a 7-percent discount rate at TSL 3.

At TSL 3, the average LCC impact is a savings of $8.30 for AC battery output battery chargers. The median payback period is 1.5 years. The fraction of consumers experiencing an LCC benefit is 87.0 percent and the fraction of consumers experiencing an LCC cost is 13.0 percent.

At TSL 3, the projected change in INPV ranges from a decrease of $126 million to a decrease of $5 million. DOE recognizes the risk of large negative impacts if manufacturers' expectations concerning reduced profit margins are realized. If the high end of the range of impacts is reached, as DOE expects, TSL 3 could result in a net loss of 20.5 percent in INPV to manufacturers of AC output battery chargers.

The Secretary tentatively concludes that at TSL 3 for AC output battery chargers, the benefits of energy savings, positive NPV of consumer benefits, positive mean LCC savings, emission reductions, and the estimated monetary value of the CO_2 emissions reductions outweigh the economic burden associated with the capital conversion costs and profit margin impacts that could result in a reduction in INPV for manufacturers.

After considering the analysis, comments to the September 2010 notice and the preliminary TSD, and the benefits and burdens of TSL 3, 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 today proposes to adopt TSL 3 for AC output battery chargers. The proposed new energy conservation standards for AC output battery chargers is shown in Table V–108.

Table V-103 Proposed Standard for Product Class 10

Product Class	Maximum Unit Energy Consumption (kWh/yr)
10a (AC Input, AC Output, without AVR)	For $E_{batt} < 37.2$ Wh, = 2.54 For $E_{batt} \geq 37.2$ Wh, = $0.0733(E_{batt}) - 0.18$
10b (AC Input, AC Output, with AVR)	For $E_{batt} < 37.2$ Wh, = 6.18 For $E_{batt} \geq 37.2$ Wh, = $0.0733(E_{batt}) + 3.45$

3. Summary of Benefits and Costs (Annualized) of Proposed Standards for External Power Supplies

The benefits and costs of today's proposed standards for EPSs can also be expressed in terms of annualized values over the 2013–2042 period. The annualized monetary values are the sum of: (1) The annualized national economic value (expressed in 2010$) of the benefits from operating products that meet the proposed standards (consisting primarily of operating cost savings from using less energy, minus increases in equipment purchase costs, which is another way of representing consumer NPV); and (2) the monetary value of the benefits of emission reductions, including CO_2 emission reductions.[71] The value of the CO_2 reductions, otherwise known as the Social Cost of Carbon (SCC), is calculated using a range of values per metric ton of CO_2 developed by a recent Federal interagency process. The monetary costs and benefits of cumulative emissions reductions are reported in 2010$ to permit comparisons with the other costs and benefits in the same dollar units.

Although combining the values of operating savings and CO_2 reductions provides a useful perspective, two issues should be considered. First, the national operating savings are domestic U.S. consumer 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 CO_2 savings are performed with different methods that use quite different time frames for analysis. The national operating cost savings is measured for the lifetime of products shipped in 2013–2042. The SCC values, on the other hand, reflect the present value of future climate-related impacts resulting from the emission of one metric ton of carbon dioxide in each year. These impacts go well beyond 2100.

Estimates of annualized benefits and costs of the proposed standards for EPSs are shown in Table V–104. Using a 7-percent discount rate and the SCC value of $22.3/ton in 2010 (in 2010$), the cost of the energy efficiency standards proposed in today's NOPR is $251.9 million per year in increased equipment installed costs, while the annualized benefits are $325.2 million per year in reduced equipment operating costs, $52.3 million in CO_2 reductions, and $3.2 million in reduced NO_X emissions. In this case, the net benefit amounts to $128.7 million per year. Using a 3-percent discount rate and the SCC value of $22.3/metric ton in 2010 (in 2010$), the cost of the energy efficiency standards proposed in today's NOPR is $247.3 million per year in increased equipment installed costs, while the benefits are $348.2 million per year in reduced operating costs, $52.3 million in CO_2 reductions, and $3.3 million in reduced NO_X emissions. At a 3-percent discount rate, the net benefit amounts to $156.6 million per year.

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[71] DOE used a two-step calculation process to convert the time-series of costs and benefits into annualized values. First, DOE calculated a present value in 2011, the year used for discounting the NPV of total consumer costs and savings, for the time-series of costs and benefits using discount rates of three and seven percent for all costs and benefits except for the value of CO_2 reductions. For the latter, DOE used a range of discount rates. From the present value, DOE then calculated the fixed annual payment over a 30-year period, starting in 2013, which yields the same present value. The fixed annual payment is the annualized value. Although DOE calculated annualized values, this does not imply that the time-series of cost and benefits from which the annualized values were determined would be a steady stream of payments.

Table V-104 Annualized Benefits and Costs of Proposed Standards for EPSs

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*	High Net Benefits Estimate*
		Monetized (million 2010$/year)		
Benefits				
Operating Cost Savings	7%	325.2	309.1	341.1
	3%	348.2	329.5	367.3
CO_2 Reduction at $4.9/t**	5%	14.1	14.1	14.1
CO_2 Reduction at $22.3/t**	3%	52.3	52.3	52.3
CO_2 Reduction at $36.5/t**	2.5%	81.4	81.4	81.4
CO_2 Reduction at $67.6/t**	3%	159.6	159.6	159.6
NO_X Reduction at $2,537/t**	7%	3.2	3.2	3.2
	3%	3.3	3.3	3.3
Total†	7% plus CO_2 range	342.5 to 488.0	326.4 to 471.9	358.4 to 503.9
	7%	380.7	364.6	396.6
	3%	403.9	385.1	422.9
	3% plus CO_2 range	365.7 to 511.2	346.9 to 492.5	384.7 to 530.3
Costs				
Incremental Product Costs	7%	251.9	251.9	251.9
	3%	247.3	247.3	247.3
Total Net Benefits				
Total†	7% plus CO_2 range	90.5 to 236.1	74.4 to 220.0	106.5 to 252.0
	7%	128.7	112.6	144.7
	3%	156.6	137.9	175.7
	3% plus CO_2 range	118.4 to 264.0	99.7 to 245.2	137.5 to 283.0

* 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 analysis.

† 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.

4. Summary of Benefits and Costs (Annualized) of Proposed Standards for Battery Chargers

The benefits and costs of today's proposed standards for battery chargers can also be expressed in terms of annualized values over the 2013–2042 period. The annualized monetary values are the sum of: (1) The annualized national economic value (expressed in 2010$) of the benefits from operating products that meet the proposed standards (consisting primarily of operating cost savings from using less energy, minus increases in equipment purchase costs, which is another way of representing consumer NPV); and (2) the monetary value of the benefits of emission reductions, including CO_2 emission reductions.[72] The value of the CO_2 reductions, otherwise known as the Social Cost of Carbon (SCC), is calculated using a range of values per metric ton of CO_2 developed by a recent Federal interagency process. The monetary costs and benefits of cumulative emissions reductions are reported in 2010$ to permit comparisons with the other costs and benefits in the same dollar units.

Although combining the values of operating savings and CO_2 reductions provides a useful perspective, two issues should be considered. First, the national operating savings are domestic U.S. consumer 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 CO_2 savings are performed with different methods that use quite different time frames for analysis. The national operating cost savings is measured for the lifetime of products shipped in 2013–2042. The SCC values, on the other hand, reflect the present value of future climate-related impacts resulting from the emission of one metric ton of carbon dioxide in each year. These impacts go well beyond 2100.

Estimates of annualized benefits and costs of the proposed standards for battery chargers are shown in Table V–104. Using a 7-percent discount rate and the SCC value of $22.3/ton in 2010 (in 2010$), the standards proposed in today's NOPR result in $110.0 million per year in equipment costs savings, and the annualized benefits are $447.2 million per year in reduced equipment operating costs, $71.6 million in CO_2 reductions, and $4.3 million in reduced NO_X emissions. In this case, the net benefit amounts to $633.0 million per year. Using a 3-percent discount rate and the SCC value of $22.3/metric ton in 2010 (in 2010$), the standards proposed in today's NOPR result in $107.9 million per year in equipment costs savings, and the benefits are $485.2 million per year in reduced operating costs, $71.6 million in CO_2 reductions, and $4.5 million in reduced NO_X emissions. At a 3-percent discount rate, the net benefit amounts to $669.3 million per year.

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[72] DOE used a two-step calculation process to convert the time-series of costs and benefits into annualized values. First, DOE calculated a present value in 2011, the year used for discounting the NPV of total consumer costs and savings, for the time-series of costs and benefits using discount rates of three and seven percent for all costs and benefits except for the value of CO_2 reductions. For the latter, DOE used a range of discount rates, as shown in Table I.3. From the present value, DOE then calculated the fixed annual payment over a 30-year period, starting in 2013 that yields the same present value. The fixed annual payment is the annualized value. Although DOE calculated annualized values, this does not imply that the time-series of cost and benefits from which the annualized values were determined would be a steady stream of payments.

Table V-105 Annualized Benefits and Costs of Proposed Standards for Battery Chargers

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*	High Net Benefits Estimate*
		Monetized (million 2010$/year)		
Benefits				
Operating Cost Savings	7%	447.2	425.6	468.8
	3%	485.2	459.7	511.2
CO_2 Reduction at $4.9/t**	5%	19.3	19.3	19.3
CO_2 Reduction at $22.3/t**	3%	71.6	71.6	71.6
CO_2 Reduction at $36.5/t**	2.5%	111.5	111.5	111.5
CO_2 Reduction at $67.6/t**	3%	218.5	218.5	218.5
NO_X Reduction at $2,537/t**	7%	4.3	4.3	4.3
	3%	4.5	4.5	4.5
Total†	7% plus CO_2 range	470.7 to 670.0	449.1 to 648.4	492.4 to 691.6
	7%	523.1	501.5	544.7
	3%	561.3	535.8	587.4
	3% plus CO_2 range	509.0 to 708.2	483.5 to 682.7	535.0 to 734.3
Costs				
Incremental Product Costs	7%	(110.0)	(110.0)	(110.0)
	3%	(107.9)	(107.9)	(107.9)
Total Net Benefits				
Total †	7% plus CO_2 range	580.7 to 780.0	559.1 to 758.3	602.3 to 801.6
	7%	633.0	611.4	654.7
	3%	669.3	643.8	695.3
	3% plus CO_2 range	616.9 to 816.2	591.4 to 790.7	643.0 to 842.2

* 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 analysis.

† 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.

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VI. Procedural Issues and Regulatory Review

A. Review Under Executive Order 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 today's standards address are as follows:

(1) There is a lack of consumer information and/or information processing capability about energy efficiency opportunities in the home appliance market.

(2) There is asymmetric information (one party to a transaction has more and better information than the other) and/or high transactions costs (costs of gathering information and effecting exchanges of goods and services) in the home appliance market.

(3) There are external benefits resulting from improved energy efficiency of battery chargers and EPSs that are not captured by the users of such equipment. These benefits include externalities related to environmental protection and energy security that are not reflected in energy prices, such as reduced emissions of greenhouse gases.

In addition, DOE has determined that today's regulatory action is an ''economically significant regulatory action'' under section 3(f)(1) of Executive Order 12866. Accordingly, section 6(a)(3) of the Executive Order requires that DOE prepare a regulatory impact analysis (RIA) on today's rule and that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB) review this rule. In the RIA, DOE identified and analyzed six alternatives to standards, including consumer rebates, consumer tax credits, manufacturer tax credits, voluntary energy efficiency targets, an early replacement program, and a bulk government purchasing program. DOE quantified the NES and NPV for these alternatives and did not find any alternatives to be more beneficial than standards for any BC or EPS product class.

DOE presented to OIRA for review the draft rule and other documents prepared for this rulemaking, including the RIA,[73] and has included these documents in the rulemaking record. The assessments prepared pursuant to Executive Order 12866 can be found in the technical support document for this rulemaking. They are available for public review in the Resource Room of DOE's Building Technologies Program, 950 L'Enfant Plaza SW., Suite 600, Washington, DC 20024, (202) 586–2945, between 9 a.m. and 4 p.m., Monday through Friday, except Federal holidays.

DOE has also reviewed this regulation pursuant to Executive Order 13563, issued on January 18, 2011 (76 FR 3281 (Jan. 21, 2011)). EO 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.

We emphasize 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 today's notice of proposed rulemaking is consistent with these principles, including that, to the extent permitted by law, agencies adopt a regulation only upon a reasoned determination that its benefits justify its costs and select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits.

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 (*www.gc.doe.gov*). DOE reviewed the potential standard levels considered in today's NOPR under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003.

As a result of this review, DOE has prepared an IRFA addressing the impacts on small manufacturers with respect to the battery charger portion of this proposal. 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 below, 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. Because DOE did not find any small business EPS manufacturers, DOE did not prepare an IRFA regarding the impacts on EPS manufacturers from this proposal.

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

1. Description and Estimated Number of Small Entities Regulated

a. Methodology for Estimating the Number of Small Entities

For manufacturers of EPSs and battery chargers, the SBA has set a size

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[73] The Regulatory Impact Analysis is also available at: *http://www1.eere.energy.gov/buildings/appliance_standards/residential/battery_external_preliminaryanalysis_tsd.html#tsd.*

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, 30850 (May 15, 2000), as amended at 65 FR 53533, 53545 (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/idc/groups/public/documents/sba_homepage/serv_sstd_tablepdf.pdf.* EPS and 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 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 EPSs and 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 EPSs or 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.

DOE did not identify any small business manufacturers of EPSs. DOE also did not identify any domestic manufacturers of EPSs, which indicates that all residential EPSs sold in the United States are imported. Because there are no small business manufacturers of EPSs, DOE certifies that the standards for EPSs set forth in the proposed rule, if promulgated, would not have a significant economic impact on a substantial number of small entities. Accordingly, DOE has not prepared a regulatory flexibility analysis for the EPS portion of this rulemaking. DOE will transmit the certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

DOE requests comment on the above analysis, as well as any information concerning small businesses that could be impacted by this rulemaking and the nature and extent of those potential impacts of the proposed energy conservation standards on small EPS manufacturers. (See Issue 30 under ''Issues on Which DOE Seeks Comment'' in section VII.E of this NOPR.)

The following sections address the IFRA for small business manufacturers of battery chargers.

b. Manufacturer Participation

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

c. Battery Charger 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. Specifically, the company manufactures battery chargers predominantly intended for golf cars (product class 7) and wheelchairs (product classes 5 and 6).

A high level of concentration exists in both battery charger markets. Two players account for the vast majority of the golf car battery charger market and each has a similar share. Both competitors in the golf car battery charger market are small businesses: One is foreign-owned and operated, while the other is a domestic small business. Despite this concentration, there is considerable competition for three main reasons. First, each manufacturer sells into a market that is almost as equally concentrated: Three golf car manufacturers supply the majority of the golf cars sold domestically. Second, while there are currently only two major suppliers of 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 have the ever-present option of not building electric golf cars altogether (and thus 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 TSD to assess this possibility. Currently, roughly three-quarters of the golf car market is electric, 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. These latter-sourced battery chargers are typically high frequency designs, while line frequency designs, which are usually less efficient, are made domestically. 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 above, there are two major suppliers in the golf car battery charger market. Both are small businesses, although one is foreign-owned and operated. 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 manufactures battery chargers for golf cars (product class 7) and wheelchairs (product classes 5 and 6), as well as industrial lifts (which are not covered by this rulemaking). DOE anticipates the proposed rule will require both capital and product conversion costs to achieve compliance. Various combinations of selected TSLs for product classes 5 and 6 (which are combined under a single TSL) and product class 7 will drive different levels of small business impacts. The compliance costs associated with this combination of potential TSLs are present in tables Table VI–1. Compared to the product development (R&D) efforts required to achieve the proposed levels, DOE does not expect the various potential combinations of TSLs 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 below for the estimated capital conversion costs for a typical small business.

Table VI–1The product conversion costs associated with standards are more significant for the small business manufacturer at issue than the projected capital costs. As discussed in section V.B.2.a.ii of this notice, TSL 1 for product class 7 reflects a technology change from a linear battery charger at the baseline to a switch-mode or high-frequency design. This change would require manufacturers that produce linear battery chargers to invest heavily 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. See the table below for estimated product conversion costs for a typical small business.

Table VI–2, and Table VI–3 below, accompanied by a description of these and other impacts.

a. Capital Conversion Costs

Compared to the product development (R&D) efforts required to achieve the proposed levels, DOE does not expect the various potential combinations of TSLs 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 below for the estimated capital conversion costs for a typical small business.

Table VI-1 Estimated Capital Conservation Costs for a Typical Small Business (2010$ million)

Alternatives	1	2*	3	4**
If the TSL for PC 5 & 6 is…	TSL 1	TSL 2	TSL 2	TSL 3
And the TSL for PC 7 is…	TSL 1	TSL 1	TSL 2	TSL 2
Estimated Capital Conversion Costs	$0.1	$0.1	$0.1	$0.1

*This alternative reflects the combination of TSLs proposed in today's rulemaking.

**Reflects max-tech.

b. Product Conversion Costs

The product conversion costs associated with standards are more significant for the small business manufacturer at issue than the projected capital costs. As discussed in section V.B.2.a.ii of this notice, TSL 1 for product class 7 reflects a technology change from a linear battery charger at the baseline to a switch-mode or high-frequency design. This change would require manufacturers that produce linear battery chargers to invest heavily 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. See the table below for estimated product conversion costs for a typical small business.

Table VI-2 Estimated Product Conversion Costs for a Typical Small Business (2010$ million)

Alternatives	1	2*	3	4**
If the TSL for PC 5 & 6 is…	TSL 1	TSL 2	TSL 2	TSL 3
And the TSL for PC 7 is…	TSL 1	TSL 1	TSL 2	TSL 2
Estimated Product Conversion Costs	$2.5	$2.7	$4.8	$5.1

*This alternative reflects the combination of TSLs proposed in today's rulemaking.

**Reflects max-tech.

c. Summary of Compliance Impacts

Table VI-3 Estimated Total Conversion Costs for a Typical Small Business (2010$ million)

Alternatives	1	2*	3	4**
If the TSL for PC 5 & 6 is…	TSL 1	TSL 2	TSL 2	TSL 3
And the TSL for PC 7 is…	TSL 1	TSL 1	TSL 2	TSL 2
Estimated Total Conversion Costs	$2.6	$2.8	$4.9	$5.2

*This alternative reflects the combination of TSLs proposed in today's rulemaking.

**Reflects max-tech.

Based on its engineering analysis, manufacturer interviews and public comments, DOE believes TSL 1 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 needs 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 (see Table IV–22). Because, in this case, the small business manufacturer is positioned as a vertically integrated supplier of linear battery chargers, any energy conservation standard that effectively required switch-mode technology would likely cause significant adverse impacts on that manufacturer. All products currently manufactured in-house by this manufacturer would likely require complete redesigns.

The potential impacts of a standard on the small business manufacturer are not entirely captured by the conversion costs estimates, however. While standard linear battery chargers typically have much higher associated material costs relative to the switch-mode battery chargers, the manufacturing process of switch-mode designs is more labor intensive. Therefore, in high-wage countries like the United States, a manufacturer is at a relative cost-disadvantage in producing switch-mode battery chargers. It is most likely for this reason that DOE was unable to identify any domestic manufacturing of switch-mode battery chargers.

At the proposed efficiency levels, the small business manufacturer will face a difficult decision on whether to attempt to manufacture switch-mode battery chargers in-house and likely compete on factors other than price, move production to lower-wage regions, or source their battery charger manufacturing to a foreign company and rebrand these battery chargers. Given the lack of domestic switch-mode battery charger manufacturers, one of the latter two strategies would appear the more likely course.

3. Duplication, Overlap, and Conflict With Other Rules and Regulations

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

4. Significant Alternatives to the Proposed Rule

The discussion above analyzes impacts on small businesses that would result from the other TSLs DOE considered. Though TSLs lower than the proposed TSLs 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 NOPR TSD includes a regulatory impact analysis in chapter 17. For battery chargers, this report discusses the following policy alternatives: (1) No standard, (2) consumer rebates, (3) consumer tax credits, (4) manufacturer tax credits, and (5) early replacement. DOE does not intend to consider these alternatives further because they are either not feasible to implement, or not expected to result in energy savings as large as those that would be achieved by the standard levels under consideration.

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

Manufacturers of battery chargers and EPSs must certify to DOE that their product complies with any applicable energy conservation standard. In certifying compliance, manufacturers must test their products according to the DOE test procedure for battery chargers and EPSs, including any amendments adopted for that test procedure. DOE has proposed regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including EPSs 75 FR 56796 (Sept. 16, 2010). 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 submitted to OMB for approval and only applies to Class A EPSs. As discussed, new reporting requirements for battery chargers and non-Class A EPSs will be proposed and a collection-of-information requirement for the certification and recordkeeping subject to review and approval by OMB under the PRA will be submitted as part of a future certification, compliance, and enforcement rule promulgated by DOE. Public reporting burden for the certification is estimated to average 20 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.

Public comment is sought regarding: whether this proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility; the accuracy of the burden estimate; ways to enhance the quality, utility, and clarity of the information to be collected; and ways to minimize the burden of the collection of information, including through the use of automated collection techniques or other forms of information technology. Send comments on these or any other aspects of the collection of information to Victor Petrolati (see **ADDRESSES**) and by email to *Chad_S_Whiteman@omb.eop.gov.*

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

D. Review Under the National Environmental Policy Act of 1969

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

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 10, 1999) imposes certain requirements on 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. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of today's 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) 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; and (3) provide a clear legal standard for affected conduct rather than a general standard and promote simplification and burden reduction. 61 FR 4729 (Feb. 7, 1996). 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 small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at *http://www.gc.doe.gov.*

Although today's proposed rule does not contain a Federal intergovernmental mandate, it may impose expenditures of $100 million or more on the private sector. Specifically, the proposed rule will likely result in a final rule that could impose expenditures of $100 million or more. Such expenditures may include (1) investment in research and development and in capital expenditures by battery charger and EPS manufacturers in the years between the final rule and the compliance date for the new standard, and (2) incremental additional expenditures by consumers to purchase higher-efficiency battery chargers and EPSs, starting in 2013.

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

Under section 205 of UMRA, the Department is obligated to identify and consider a reasonable number of regulatory alternatives before promulgating a rule for which a written statement under section 202 is required. 2 U.S.C. 1535(a). DOE is required to select from those alternatives the most cost-effective and least burdensome alternative that achieves the objectives of the 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(u), today's proposed rule would establish energy conservation standards for battery chargers and EPSs 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 TSD for today's 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

DOE has determined, under Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights'' 53 FR 8859 (March 18, 1988), that this proposed regulation 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 agencies to review most disseminations of information to the public under 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 today's NOPR under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use'' 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OIRA at OMB, a Statement of Energy Effects for any proposed significant energy action. A ''significant energy action'' is defined as any action by an agency that promulgates or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy, or (3) is designated by the Administrator of OIRA as a significant energy action. For any proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

DOE has tentatively concluded that today's proposed regulatory action, which sets forth proposed energy conservation standards for battery chargers and EPSs, 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 the 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 (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: *http://www1.eere.energy.gov/buildings/appliance_standards/peer_review.html.*

VII. Public Participation

A. Attendance at Public Meeting

The time, date and location of the public meeting are listed in the **DATES** and **ADDRESSES** sections at the beginning of this document. If you plan to attend the public meeting, please notify Ms. Brenda Edwards at (202) 586–2945 or *Brenda.Edwards@ee.doe.gov.* As explained in the **ADDRESSES** section, foreign nationals visiting DOE Headquarters are subject to advance security screening procedures.

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 *http://www1.eere.energy.gov/buildings/appliance_standards/residential/battery_external.html.* 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 a follow-up contact, if needed.

C. Conduct of 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 permit, as time permits, other participants to comment briefly on any general statements.

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly 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 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 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. 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.

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

Include contact information each time you submit comments, data, documents, and other information to DOE. Email submissions are preferred. If you submit via mail or hand delivery, 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, written in English and 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 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 interested party feedback, including any substantive data, regarding today's proposed standard levels and the potential for lessening of utility or performance related features.

2. DOE requests interested party feedback on whether the standards proposed in today's rule would necessitate the use of any proprietary designs or patented technologies.

3. DOE seeks comment on its analysis of the costs and benefits of the standards proposed in this rulemaking, including but not limited to DOE's analytic assumptions as highlighted in the list of issues herein. More specifically, DOE seeks comment on the Agency's estimate that the proposed standard for battery chargers lead to between $92.8 million and $98.3 million in cost savings (i.e. negative costs) relative to the assumed baseline. Recognizing that the cost models used for this analysis have certain limitations, DOE seeks comment on the assumed market failure the agency has identified as the underlying reason that private markets have not taken advantage of these cost savings in the absence of this proposed rulemaking. DOE also seeks comment on key assumptions that contributed to this estimate, including but not limited to assumptions regarding energy consumption, shipments, and manufacturer costs, treatment of existing regulatory requirements for battery chargers and EPSs, and treatment of Energy Star and other emerging technologies in both the baseline and standards cases. Finally, DOE seeks comment on the assumption that incremental product costs for battery chargers are negative because of a shift in technology from linear power supplies to switch mode power for the larger battery chargers in product classes 5, 6, and 7.

4. DOE seeks comment on its estimates of battery charger and EPS shipments, lifetimes, and efficiency distributions for each application and product class. DOE is especially interested in receiving comment on its assumption that EPSs for mobile phones and smartphones are likely to standardize around a common connection standard and, as a result, remain in use beyond the lifetimes of their associated applications (an average lifetime of 4 years as opposed to an average lifetime of 2 years).

5. DOE seeks comment and related data on which battery charger and EPS applications are used in the commercial sector, what fraction of shipments are to the commercial sector, and how product lifetimes and usage may differ between residential and commercial settings.

6. DOE seeks comment on its proposed approach in classifying EPSs that indirectly operate consumer products and whether that approach requires modifications. If changes are required, DOE seeks specific suggestions on how the proposed approach should be altered.

7. DOE welcomes comment on whether there are any performance-related features characteristic of either Class A or non-Class A devices (but not both) in product class N that would justify different standard levels for the two groups. DOE also seeks comment on the merits of applying a standard to EPSs falling into product class N. DOE also welcomes comment on the proposed compliance dates for non-Class A EPSs.

8. DOE seeks comment, information, and/or data on whether the proposed standards would impact any features in the regulated products or in their associated complimentary applications. If so, DOE seeks comment as to whether these impacts would impact the utility of either the product or the application, and on whether, how, and to what degree consumer welfare might be impacted by the proposed standards.

9. DOE requests any information regarding existing products that may seem to be able to be classified in multiple product classes.

10. DOE seeks comment on possible issues of electromagnetic interference and/or radio frequency interference associated with switch-mode power supplies (SMPS) used with amateur radios, including design options for reducing or eliminating interference.

11. DOE would like to request any feedback on the proposed approach to determining the average efficiency for multiple-voltage EPSs.

12. DOE seeks comment on its methodology for generating CSL3 and CSL4 for high-power EPSs.

13. DOE seeks comment on its proposal to set a standard for multiple-voltage EPSs as a continuous function of output power.

14. DOE seeks comment on its proposed approach in calculating unit energy consumption for battery chargers and the appropriateness of the various equations to calculate this consumption that are presented in today's proposal.

15. DOE seeks information, including any substantive data, to help it assess factors of durability, reliability, and preference of transformer based battery chargers versus those incorporating switch-mode power supplies.

16. DOE seeks comment on its proposed approach in developing a cost-efficiency relationship for battery charger product class 6.

17. DOE requests comment on the results of its LCC and PBP analyses, particularly with respect to the projected results for multiple voltage EPSs (i.e., product class X). In addition, DOE requests comment regarding the Agency's approach of calculating LCC by averaging estimated installation costs within subproduct categories. Further, DOE requests comment on the household debt equity discount rate applied specifically to the LCC cost analysis. Finally, DOE requests comment regarding the segregation of the LCC analysis and consumer price impacts, which are separately addressed in a shipment-based analysis.

18. DOE seeks comment on its treatment of the market path, markups, and MSP estimates.

19. DOE seeks comment on its use of a roll-up market response, which projects that only those products which fall below a standard will improve in efficiency, and that the same products will only improve in efficiency so as to meet, but not exceed, the efficiency required by the standard. DOE further seeks comments on the assumptions regarding efficiency distributions in the baseline, such as the extent to which the worst and best energy performers are and are not represented in the baseline.

20. DOE seeks comment on whether, and to what extent, battery charger efficiency would be likely to improve in the absence of standards, including the assumption that battery charger efficiency will not improve between today and the compliance date in 2013.

21. DOE seeks comment on its assumptions about the extent to which, if at all, EPS efficiency will improve for product classes B, C, D, E, X and H in the absence of mandatory standards, both prior to and after 2013.

22. DOE recognizes that significant variation in use exists for battery chargers, EPSs, and the applications they power. In an effort to ensure the accuracy of its assumed usage profiles, DOE seeks substantiated estimates, with supporting data, of usage profiles for battery chargers, EPSs, and the applications they power.

23. DOE seeks comment on its EPS loading points, as well as test results that will allow it to improve the accuracy of those loading points.

24. DOE seeks comment on its estimate that shipments of EPSs and battery chargers are inelastic and on other elasticity assumptions DOE has made. DOE further seeks comment, information, and data regarding DOE's market assessment of EPSs and battery chargers via complimentary applications with which these products are nearly always bundled.

25. DOE seeks comment on its estimate that substitution impacts for EPSs and battery chargers are negligible.

26. DOE seeks comment on the methodology employed for conducting the National Impact Analysis, including the calculations of National Inventory, National Energy Savings, and Net Present Value.

27. DOE seeks comment on its estimates regarding the proportions of certain applications—including mobile phones, MP3 players, GPS equipment, and personal care products—that ship with EPSs designed to directly operate the application versus indirectly operate the application.

28. DOE seeks comment on what level of efficiency EPSs in product class N already meet and whether EPSs sold in California are different in terms of their energy efficiency than EPSs sold in other States.

29. DOE seeks comment on the accuracy of its distribution models for battery chargers and EPSs, as well as its estimates off battery charger and EPS markups. To the extent that these models and estimates can be improved, DOE seeks specific suggestions and supporting data.

30. DOE seeks information concerning small businesses that could be impacted by this rulemaking and the nature and extent of those potential impacts. For example, DOE is interested in information concerning impacts on the golf cart industry that have not been captured in the current rulemaking analysis. Further, DOE seeks further information and data regarding the 'double jeopardy' EPS and battery charger impacts on small businesses as raised by commenters.

31. DOE seeks comment on whether the proposed standards would lead to lessening of market competition in the regulated industries.

32. DOE seeks comment on whether there are any products on the market that are not already subject to California or Federal energy efficiency standards that would be covered by the new EPS standards being proposed for product class N today. DOE welcomes specific examples of such products, if they exist.

33. DOE invites comment on solid-state lighting EPSs, specifically on whether there are any differences between SSL EPSs and other EPSs that might warrant treating them as a separate product class, the size of the market for these products, what proportion of SSL luminaires use EPSs, the efficiency of those EPSs, and usage patterns.

34. DOE seeks comment on whether any battery chargers exist that can only be operated on 12V input, whether a device that can be powered only from a 12V power outlet can be assumed to be designed solely for use in recreational vehicles (RVs) and other mobile equipment, and whether there are battery chargers with DC inputs other than 5V and 12V.

35. DOE welcomes comment on any and all issues related to efficiency markings for battery chargers and EPSs.

36. DOE is interested in receiving comments from industry, states, and other interested parties on the best ways to ensure a smooth transition from the battery charger standards established in California to the national standards addressed in this proposed rule.

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of today's proposed rule.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Reporting and recordkeeping requirements, Small businesses.

Issued in Washington, DC, on March 8, 2012.

Henry Kelly,

Acting Assistant Secretary of Energy, Energy Efficiency and Renewable Energy.

For the reasons set forth in the preamble, DOE proposes to amend 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 for part 430 continues to read as follows:

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

2. Section 430.2 is amended by adding definitions for *AC–AC external power supply, AC–DC external power supply, basic-voltage external power supply, direct operation external power supply, indirect operation external power supply, low-voltage external power supply,* and *multiple-voltage external power supply* in alphabetical order to read as follows:

§ 430.2 Definitions.

* * * * *

AC–AC external power supply means an external power supply that is used to convert household electric current into a single lower-voltage AC current.

AC–DC external power supply means an external power supply that is used to convert household electric current into a single lower-voltage DC current.

* * * * *

Basic-voltage external power supply means an external power supply that is not a low-voltage power supply.

* * * * *

Direct operation external power supply means an external power supply that can operate a consumer product that is not a battery charger without the assistance of a battery.

* * * * *

Indirect operation external power supply means an external power supply that cannot operate a consumer product that is not a battery charger without the assistance of a battery as determined by the following steps:

(1) If a product can be connected to an end-use consumer product and that consumer product can be operated using battery power, the method for determining if an EPS can directly power an application is as follows:

(i) Charge the battery in the application via the EPS such that the application can operate as intended before taking any additional steps.

(ii) Disconnect the EPS from the application. From an off mode state, turn on the application and record the time necessary for it to become operational to the nearest five second increment (5 sec, 10 sec, etc.).

(iii) Operate the application using power only from the battery until the application stops functioning due to the battery discharging.

(iv) Connect the EPS first to mains and then to the application. Immediately attempt to operate the application. Record the time for the application to become operational to the nearest five second increment (5 sec, 10 sec, etc.).

(2) If the time recorded in paragraph (1)(iv) of this definition is less than or equal to the summation of the time recorded in paragraph (1)(ii) of this definition and five seconds, the EPS can operate the application directly and is not in product class N. Otherwise, it is an indirect operation EPS and is subject to the standards of product class N in § 430.32(w).

* * * * *

Low-voltage external power supply means an external power supply with a nameplate output voltage less than 6 volts and nameplate output current greater than or equal to 550 milliamps.

* * * * *

Multiple-voltage external power supply means an external power supply that is used to convert household electric current into multiple simultaneous output currents.

* * * * *

3. Section 430.32 is amended by revising the paragraph (w) heading and adding paragraphs (w)(1)(iv), (w)(2), (w)(3), (w)(4), (w)(5) and (y) to read as follows:

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

* * * * *

(w) *External Power Supplies.*

(1) * * *

(iv) Except as provided in this paragraph (w)(1)(iii) of this section, all direct operation external power supplies manufactured on or after July 1, 2013, shall meet the following standards:

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AC-DC, Basic-Voltage External Power Supply

Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
0 to ≤ 1 watt	$\geq 0.5 * P_{out} + 0.16$	≤ 0.100
> 1 to ≤ 49 watts	$\geq 0.071 * \ln(P_{out}) - 0.0014 * P_{out} + 0.67$	≤ 0.100
> 49 watts to ≤ 250 watts	≥ 0.880	≤ 0.210
> 250 watts	≥ 0.875	≤ 0.500

AC-DC, Low-Voltage External Power Supply

Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
0 to ≤ 1 watt	$\geq 0.517 * P_{out} + 0.087$	≤ 0.100
> 1 to ≤ 49 watts	$\geq 0.0834 * \ln(P_{out}) - 0.0014 * P_{out} + 0.609$	≤ 0.100
> 49 watts to ≤ 250 watts	≥ 0.870	≤ 0.210
> 250 watts	≥ 0.875	≤ 0.500

AC-AC, Basic-Voltage External Power Supply

Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode**
0 to ≤ 1 watt	$\geq 0.5 * P_{out} + 0.16$	≤ 0.210
> 1 to ≤ 49 watts	$\geq 0.071 * \ln(P_{out}) - 0.0014 * P_{out} + 0.67$	≤ 0.210
> 49 watts to ≤ 250 watts	≥ 0.880	≤ 0.210
> 250 watts	≥ 0.875	≤ 0.500

AC-AC, Low-Voltage External Power Supply

Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode**
0 to ≤ 1 watt	$\geq 0.517 * P_{out} + 0.087$	≤ 0.210

> 1 to ≤ 49 watts	≥ 0.0834 * ln(P_{out}) - 0.0014 * P_{out} + 0.609	≤ 0.210
> 49 watts to ≤ 250 watts	≥ 0.870	≤ 0.210
> 250 watts	≥ 0.875	≤ 0.500

Multiple-Voltage External Power Supply		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
0 to ≤ 1 watt	≥ 0.497 * P_{out} + 0.067	≤ 0.300
> 1 to ≤ 49 watts	≥ 0.075 * ln (P_{out}) + 0.561	≤ 0.300
> 49 watts	≥ 0.860	≤ 0.300

(2) The standards described in paragraphs (w)(1)(i) and (iv) of this section shall not constitute an energy conservation standard for the separate end-use product to which the external power supply is connected.

(3) Any external power supply subject to the standards in paragraphs (w)(1)(i) and (iv) of this section shall be clearly and permanently marked in accordance with the External Power Supply International Efficiency Marking Protocol, as referenced in the ''Energy Star Program Requirements for Single Voltage External Ac–Dc and Ac–Ac Power Supplies,'' (incorporated by reference; see § 430.3), published by the Environmental Protection Agency.

(4) Any indirect operation external power supply subject to the standards in paragraph (w)(1)(i) of this section and not labeled with a Roman numeral VI in accordance with the marking protocol referred to in paragraph (w)(3) of this section:

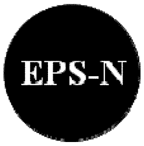
(i) Shall be permanently marked with the capital letter ''N'' as a superscript to the circle that contains the Roman numeral, for example,

and

(ii) If sold separately from the battery charger or end-use consumer product with which it is intended to be used, shall be marked with the manufacturer and model number of that battery charger or end-use consumer product.

(5) Any indirect operation external power supply not subject to the standards in paragraph (w)(1)(i) of this section and not labeled with a Roman numeral VI in accordance with the marking protocol referred to in paragraph (w)(3) of this section:

(i) Shall be permanently marked with the abbreviation ''EPS–N'', for example,



and

(ii) If sold separately from the battery charger or end-use consumer product with which it is intended to be used, shall be marked with the manufacturer and model number of that battery charger or end-use consumer product.

* * * * *

(y) *Battery Chargers.* (1) Battery chargers manufactured on or after July 1, 2013, shall have a unit energy consumption (UEC) less than or equal to the standard calculated using the equations for the appropriate product class and corresponding measured battery energy as shown below:

Product Class #	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	$= 0.2095(E_{batt}{**}) + 5.87$
3			4 – 10 V	For $E_{batt} < 9.74$ Wh, = 4.68 For $E_{batt} \geq 9.74$ Wh, $= 0.0933(E_{batt}) + 3.77$
4			> 10 V	For $E_{batt} < 9.71$ Wh, = 9.03 For $E_{batt} \geq 9.71$ Wh, $= 0.2411(E_{batt}) + 6.69$
5		100–3000	< 20 V	For $E_{batt} < 355.18$ Wh, = 20.06 For $E_{batt} \geq 355.18$ Wh, $= 0.0219(E_{batt}) + 12.28$
6			≥ 20 V	For $E_{batt} < 239.48$ Wh = 30.37 For $E_{batt} \geq 239.48$ Wh $= 0.0495(E_{batt}) + 18.51$
7		> 3000	-	$= 0.502(E_{batt}) + 4.53$
8	DC In, DC Out	-	< 9 V Input	0.66
9		-	≥ 9 V Input	No Standard
10a	AC In, AC Out	-	Basic (i.e. no Automatic Voltage Regulation)	For $E_{batt} < 37.2$ Wh, = 2.54 For $E_{batt} \geq 37.2$ Wh, $= 0.0733(E_{batt}) - 0.18$
10b		-	Contains Automatic Voltage Regulation	For $E_{batt} < 37.2$ Wh, = 6.18 For $E_{batt} \geq 37.2$ Wh, $= 0.0733(E_{batt}) + 3.45$
11	AC In, DC Out	< 100 Wh	Wireless Charging Capability (for dry environments)	Reserved

* 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 Part 430.

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(2) Unit energy consumption shall be calculated for a device seeking certification using one of the two equations 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 Part 430 minus 5 hours exceeds the threshold charge time listed in the table below, the equation in paragraph (y)(2)(ii) of this section shall be used to calculate UEC; otherwise a device's UEC shall be calculated using the equation in paragraph (y)(2)(i).

(i)

$$UEC = 365\left(n(E24_{\square} - 5P_m - E_{batt})\frac{24}{t_{cd}} + (P_m(t_{a\&m} - (t_{cd} - 5)n)) + (P_{sb}t_{sb}) + (P_{off}t_{off})\right)$$

or,

(ii)

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

Where:

E_{24} = 24-hour energy as determined in section 5.10 of Appendix Y to Subpart B of Part 430,

E_{batt} = Measured battery energy as determined in section 5.6 of Appendix Y to Subpart B of Part 430,

P_m = Maintenance mode power as determined in section 5.9 of Appendix Y to Subpart B of Part 430,

P_{sb} = Standby mode power as determined in section 5.11 of Appendix Y to Subpart B of Part 430,

P_{off} = Off mode power as determined in section 5.12 of Appendix Y to Subpart B of Part 430,

t_{cd} = Charge test duration as determined in section 5.2 of Appendix Y to Subpart B of Part 430,

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	8.82	4.56	0.00	0.54	19.00
3	6.85	0.29	0.00	0.10	67.21
4	16.35	0.95	0.00	0.49	33.04
5	6.29	1.07	0.00	0.11	56.83
6	17.17	6.83	0.00	0.34	50.89
7	8.14	7.30	0.00	0.32	25.15
8	6.34	6.93	0.00	0.54	19.00
10	24.00	0.00	0.00	0.00	N/A***

*If the duration of the charge test (minus 5 hours) as determined in section 5.2 of Appendix Y to Subpart B of Part 430 exceeds the threshold charge time, use equation (ii) to calculate UEC otherwise use equation (ii).

**If the total time does not sum to 24 hour 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.

***Because n = 0 for PC 10, UEC should always be calculated using equation (i).

(3) Any battery charger subject to the standards in paragraph (y)(1) of this section shall be clearly and permanently marked on the outside of its housing with the encircled upper case letters "BC" coupled with the Roman numeral "III" or a Roman numeral having a greater value, for example,

BC-III

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