Friday,

October 12, 2007

Part III

Department of Energy

10 CFR Part 431

Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule

DEPARTMENT OF ENERGY

10 CFR Part 431

[Docket Number: EE–RM/STD–00–550]

RIN 1904–AB08

Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule

AGENCY: Department of Energy.

ACTION: Final rule.

SUMMARY: The Department of Energy (DOE) has determined that energy conservation standards for liquid-immersed and medium-voltage, dry-type distribution transformers will result in significant conservation of energy, are technologically feasible, and are economically justified. On this basis, DOE is today adopting energy conservation standards for liquid-immersed and medium-voltage, dry-type distribution transformers. Today's rule does not set energy conservation standards for underground mining distribution transformers.

DATES: *Effective Date:* The effective date of this rule is November 13, 2007. Standards for liquid-immersed and medium-voltage, dry-type distribution transformers will be applicable starting January 1, 2010.

ADDRESSES: For access to the docket to read background documents, the technical support document (TSD), transcripts of the public meetings in this proceeding, or comments received, visit the U.S. Department of Energy, Forrestal Building, Room 1J–018 (Resource Room of the Building Technologies Program), 1000 Independence Avenue, SW., Washington, DC, (202) 586–2945, between 9 a.m. and 4 p.m., Monday through Friday, except Federal holidays. Please call Ms. Brenda Edwards-Jones at the above telephone number for additional information regarding visiting the Resource Room. Please note: DOE's Freedom of Information Reading Room (formerly Room 1E–190 at the Forrestal Building) no longer houses rulemaking materials. You may also obtain copies of certain previous rulemaking documents from this proceeding (i.e., Framework Document, advance notice of proposed rulemaking (ANOPR), notice of proposed rulemaking (NOPR or proposed rule)), draft analyses, public meeting materials, and related test procedure documents from the Office of Energy Efficiency and Renewable Energy's Web site at *http://www.eere.energy.gov/buildings/appliance_standards/commercial/distribution_transformers.html.*

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SUPPLEMENTARY INFORMATION:

I. Summary of the Final Rule and Its Benefits

A. The Standard Levels

The Energy Policy and Conservation Act (EPCA), as amended, directs the Department of Energy (DOE) to adopt energy conservation standards for those distribution transformers for which standards would be technologically feasible and economically justified, and would result in significant energy savings. (42 U.S.C. 6317(a)(2)) The standards in today's final rule, which apply to liquid-immersed and medium-voltage, dry-type distribution transformers, satisfy these requirements and will achieve the maximum improvements in energy efficiency that are technologically feasible and economically justified. In the advance notice of proposed rulemaking (ANOPR) in this proceeding, DOE had also addressed standards for low-voltage, dry-type distribution transformers. 69 FR 45376 (July 29, 2004). However, the Energy Policy Act of 2005, Public Law 109–58, (EPACT 2005) amended EPCA to establish energy conservation standards for those transformers. (EPACT 2005, Section 135(c); 42 U.S.C. 6295(y)) Therefore, DOE removed low-voltage, dry-type distribution transformers from the scope of this rulemaking.

The standards established in this final rule are minimum efficiency levels. Tables I.1 and I.2 show the standard levels DOE is adopting today. These standards will apply to liquid-immersed and medium-voltage, dry-type distribution transformers manufactured for sale in the United States, or imported to the United States, on or after January 1, 2010. As discussed in section V.C.2 of this notice, any transformers whose kVA[1] rating falls between the kVA ratings shown in tables I.1 and I.2 shall have its minimum efficiency requirement calculated by a linear interpolation of the minimum efficiency requirements of the kVA ratings immediately above and below that rating.

TABLE I.1.—STANDARD LEVELS FOR LIQUID-IMMERSED DISTRIBUTION TRANSFORMERS, TABULAR FORM

Single-phase		Three-phase	
kVA	Efficiency (%)	kVA	Efficiency (%)
10	98.62	15	98.36
15	98.76	30	98.62
25	98.91	45	98.76
37.5	99.01	75	98.91
50	99.08	112.5	99.01
75	99.17	150	99.08
100	99.23	225	99.17
167	99.25	300	99.23
250	99.32	500	99.25
333	99.36	750	99.32
500	99.42	1000	99.36
667	99.46	1500	99.42
833	99.49	2000	99.46
		2500	99.49

Note: All efficiency values are at 50 percent of nameplate-rated load, determined according to the DOE test procedure. 10 CFR Part 431, Subpart K, Appendix A.

TABLE I.2.—STANDARD LEVELS FOR MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS, TABULAR FORM

Single-phase				Three-phase			
BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)	BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)
15	98.10	97.86	....	15	97.50	97.18	....
25	98.33	98.12	....	30	97.90	97.63	....

[1] kVA is an abbreviation for kilovolt-ampere, which is a capacity metric used by industry to classify transformers. A transformer's kVA rating represents its output power when it is fully loaded (i.e., 100%).

TABLE I.2.—STANDARD LEVELS FOR MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS, TABULAR FORM—Continued

Single-phase				Three-phase			
BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)	BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)
37.5	98.49	98.30		45	98.10	97.86	
50	98.60	98.42		75	98.33	98.12	
75	98.73	98.57	98.53	112.5	98.49	98.30	
100	98.82	98.67	98.63	150	98.60	98.42	
167	98.96	98.83	98.80	225	98.73	98.57	98.53
250	99.07	98.95	98.91	300	98.82	98.67	98.63
333	99.14	99.03	98.99	500	98.96	98.83	98.80
500	99.22	99.12	99.09	750	99.07	98.95	98.91
667	99.27	99.18	99.15	1000	99.14	99.03	98.99
833	99.31	99.23	99.20	1500	99.22	99.12	99.09
				2000	99.27	99.18	99.15
				2500	99.31	99.23	99.20

Note: BIL means basic impulse insulation level.

Note: All efficiency values are at 50 percent of nameplate-rated load, determined according to the DOE test procedure. 10 CFR Part 431, Subpart K, Appendix A.

B. Distribution Transformer Characteristics

The minimum efficiency levels in today's standards can be met by distribution transformer designs that already are available in the market. DOE expects that distribution transformer designs that incorporate different voltages and other design variations will still be able to be manufactured under the new standards, maintaining all the features and utility found in commercially available products today.

In analyzing the benefits and burdens of potential standards, DOE represented the range of possible distribution transformer costs and features by representative engineering design lines. Five design lines (DL1, DL2, DL3, DL4, and DL5) represent the range of features and costs for liquid-immersed transformers, while five design lines (DL9, DL10, DL11, DL12, and DL13) represent medium-voltage, dry-type transformers. Three design lines (DL6, DL7, and DL8) represented low-voltage dry-type transformers and were included in DOE's ANOPR analysis. But as indicated above, DOE subsequently removed these transformers from this rulemaking when the Energy Policy Act of 2005 established minimum efficiency levels for them.

On average, liquid-immersed transformers are already relatively efficient. The annual operating costs for such transformers range from approximately 1/10 to 1/30 of the installed cost. Medium-voltage, dry-type transformers tend to have higher losses, and are subject to higher electricity costs. Their annual operating costs tend to be approximately 1/10 of the installed cost.

C. Benefits to Transformer Consumers

The economic impacts on transformer consumers (i.e., the average life-cycle cost (LCC) savings) are positive for the new energy efficiency levels established by this rule. For liquid-immersed transformers, an increase in first costs of 6–12 percent is accompanied by a decrease in operating costs of 15–23 percent, corresponding to a similar drop in electrical losses. For medium-voltage, dry-type transformers, an increase in first costs of 3–13 percent is accompanied by a decrease in losses and operating costs of 9–26 percent. On average, the new standards provides net life-cycle benefits for all categories of distribution transformers, although some liquid-immersed transformers with smaller loads and relatively low electricity cost are likely to incur a net cost from the new standards. For liquid-immersed transformers, DOE estimates that approximately 25% of the market incurs a net life-cycle cost from the standard while 75% of the market is either not affected or incurs a net benefit. DOE also investigated how these standards might affect municipal utilities and rural electric cooperatives. While the benefits are positive for municipal utilities, a majority of smaller, pole-mounted transformers for rural electric cooperatives will incur a net life-cycle cost. However, because of a relatively large per-transformer reduction in life-cycle cost for some non-evaluating rural electric cooperatives (i.e., those that do not take into consideration the cost of transformer losses when choosing a transformer) rural electric cooperatives as a whole receive an average life-cycle cost benefit.

D. Impact on Manufacturers

Using a real corporate discount rate of 8.9 percent, DOE estimated the industry net present values (INPV) of the liquid-immersed and medium-voltage, dry-type distribution transformer industries to be $609 million and $36 million, respectively, in 2006$. DOE expects the impact of today's standards on the INPV of the liquid-immersed transformer industry to be between an eight percent loss and an eight percent increase (−$47 million to $47 million). DOE expects the impact of today's standards on the INPV of the medium-voltage, dry-type transformer industry to be between a 15 percent loss and a 9 percent loss (−$5.2 million to −$3.2 million). Based on DOE's analysis and interviews with distribution transformer manufacturers, DOE expects minimal plant closings or loss of employment as a result of the standards promulgated today.

E. National Benefits

The standards will provide significant benefits to the Nation. DOE estimates the standards will save approximately 2.74 quads (quadrillion (10^{15}) British thermal units (BTU)) of energy over 29 years (2010–2038). This is equivalent to all the energy consumed by 27 million American households in a single year.

By 2038, DOE expects the energy savings from the standards to eliminate the need for approximately six new 400-megawatt combined-cycle gas turbine power plants. The total energy savings from the standard will result in cumulative greenhouse gas emission reductions of approximately 238 million tons (Mt) of carbon dioxide (CO_2) from a variety of generation sources. This is an amount equal to what would be saved by removing 80 percent of all light vehicles from U.S. roads for one year.

The national net present value (NPV) of the standards is $1.39 billion using a seven percent discount rate and $7.8 billion using a three percent discount rate, cumulative from 2010 to 2073 in 2006$. This is the estimated total value of future energy savings minus the estimated increased equipment costs, discounted to the year 2007. The benefits and costs of the standard can also be expressed in terms of annualized 2006$ values over the forecast period 2010 through 2038.

Using a seven percent discount rate for the annualized cost analysis, the cost of the standard is $463 million per year in increased equipment and installation costs while the annualized benefits are $602 million per year in reduced equipment operating costs. Using a three percent discount rate, the cost of the standard is $460 million per year while the benefits of today's standard are $904 million per year.

F. Conclusion

DOE concludes that the benefits (energy savings, transformer consumer LCC savings, national NPV increases, and emissions reductions) to the Nation of the standards outweigh their costs (loss of manufacturer INPV and transformer consumer LCC increases for some users of distribution transformers). DOE concludes that today's standards for liquid-immersed and medium-voltage, dry-type transformers are technologically feasible and economically justified, and will result in significant energy savings. At present, both liquid-immersed and medium-voltage, dry-type transformers that meet the new standard levels are commercially available.

II. Introduction

A. Authority

Title III of EPCA sets forth a variety of provisions designed to improve energy efficiency. Part B of Title III (42 U.S.C. 6291–6309) provides for the Energy Conservation Program for Consumer Products other than Automobiles. Part C of Title III (42 U.S.C. 6311–6317) establishes a similar program for ''Certain Industrial Equipment,'' and includes distribution transformers, the subject of this rulemaking. DOE publishes today's final rule pursuant to Part C of Title III, which provides for test procedures, labeling, and energy conservation standards for distribution transformers and certain other products, and authorizes DOE to require information and reports from manufacturers. The distribution transformer test procedure appears in Title 10 Code of Federal Regulations (CFR) Part 431, Subpart K, Appendix A.

EPCA contains criteria for prescribing new or amended energy conservation standards. DOE must prescribe standards only for those distribution transformers for which DOE: (1) Has determined that standards would be technologically feasible and economically justified and would result in significant energy savings; and (2) has prescribed test procedures. (42 U.S.C. 6317(a)(2)) Moreover, DOE analyzed whether today's standards for distribution transformers will achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (See 42 U.S.C. 6295(o)(2)(A), 6316(a), and 6317(a) and (c)) [2]

In addition, DOE decided whether each of today's standards for distribution transformers is economically justified, after receiving comments on the proposed standards, by determining whether the benefits of each standard exceed its burdens by considering, to the greatest extent practicable, the following seven factors that are set forth in 42 U.S.C. 6295(o)(2)(B)(i):

(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 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 savings likely to result directly from the imposition of the standard;

(4) Any lessening of the utility or the performance of the 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 conservation; and

(7) Other factors the Secretary considers relevant.

In developing today's energy conservation standards, DOE also has applied certain other provisions of 42 U.S.C. 6295. First, DOE would not prescribe a standard for distribution transformers if interested persons established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States of any type (or class) of this equipment with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available at the time of the Secretary's finding. (See 42 U.S.C. 6295(o)(4))

Second, DOE has applied 42 U.S.C. 6295(o)(2)(B)(iii), which 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 * * *.'' The rebuttable presumption test is an alternative path to establishing economic justification.

Third, DOE may specify a different standard level than that which applies generally to a type or class of equipment for any group of products ''which have the same function or intended use, if * * * 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'' than applies or will apply to the other products. (See 42 U.S.C. 6295(q)(1)) Any rule prescribing such a standard includes an explanation of the basis on which DOE establishes such higher or lower level. (See 42 U.S.C. 6295(q)(2))

Federal energy efficiency requirements for equipment covered by 42 U.S.C. 6317 generally supersede State laws or regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297(a)–(c) and 42 U.S.C. 6316(a)) DOE can, however, grant waivers of preemption for particular State laws or regulations,

[2] DOE notes that 42 U.S.C. 6317(c) requires that DOE ''take into consideration'' the criteria contained in section 325(n).'' However, Section 325(n), ''Petition For An Amended Standard,'' does not contain the criteria for establishing new or amended standards, rather as its title states, it contains the criteria DOE must apply for determining whether to grant petitions for amending standards, filed by any person with the Secretary of Energy. Section 325(o) entitled, ''Criteria for Prescribing New or Amended Standards'' contains the appropriate criteria that 42 U.S.C. 6317(c) apparently intends to reference. The reference in section 42 U.S.C. 6317(c) to section 325(n) is an inadvertent error and DOE will apply the criteria in section 325(o) instead.

in accordance with the procedures and other provisions of section 327(d) of the Act. (42 U.S.C. 6297(d) and 42 U.S.C. 6316(a))

B. Background

1. Current Standards

Presently, there are no national energy conservation standards for the liquid-immersed and medium-voltage, dry-type distribution transformers covered by this rulemaking. However, on August 8, 2005, EPACT 2005 amended EPCA to establish energy conservation standards for low-voltage, dry-type distribution transformers.[3] (EPACT 2005, Section 135(c); 42 U.S.C. 6295(y)) The standard levels for low-voltage dry-type transformers appear in Table II.1.

TABLE II.1.—ENERGY CONSERVATION STANDARDS FOR LOW-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS

Single-phase		Three-phase	
kVA	Efficiency (%)	kVA	Efficiency (%)
15	97.7	15	97.0
25	98.0	30	97.5
37.5	98.2	45	97.7
50	98.3	75	98.0
75	98.5	112.5	98.2
100	98.6	150	98.3
167	98.7	225	98.5
250	98.8	300	98.6
333	98.9	500	98.7
		750	98.8
		1000	98.9

Note: All efficiency values are at 35 percent of nameplate-rated load, determined according to the DOE test procedure. 10 CFR Part 431, Subpart K, Appendix A.

DOE incorporated these standards into its regulations, along with the standards for several other types of products and equipment, in a Final Rule published on October 18, 2005. 70 FR 60407, 60416–60417.

2. History of Standards Rulemaking for Distribution Transformers

On October 22, 1997, the Secretary of Energy published a notice stating that DOE ''has determined, based on the best information currently available, that energy conservation standards for electric distribution transformers are technologically feasible, economically justified and would result in significant energy savings.'' 62 FR 54809. The Secretary based this determination, in part, on analyses conducted by DOE's Oak Ridge National Laboratory (ORNL). The two reports containing these analyses—*Determination Analysis of Energy Conservation Standards for Distribution Transformers*, ORNL–6847 (1996) and *Supplement to the ''Determination Analysis*,'' ORNL–6847 (1997)—are available on the DOE Web site at: *http://www.eere.energy.gov/buildings/appliance_standards/commercial/distribution_transformers.html.*

As a result of its positive determination, in 2000 DOE developed the Framework Document for Distribution Transformer Energy Conservation Standards Rulemaking, which described the approaches DOE anticipated using to develop energy conservation standards for distribution transformers. This document is also available on the above-referenced DOE website. On November 1, 2000, DOE held a public meeting to discuss the proposed analytical framework. Manufacturers, trade associations, electric utilities, energy efficiency organizations, regulators, and other interested parties attended this meeting. Stakeholders also submitted written comments on the Framework Document addressing a range of issues.

In the first quarter of 2002, prior to issuing its ANOPR, DOE met with manufacturers of liquid-immersed and dry-type distribution transformers to solicit feedback on a draft engineering analysis report DOE had published containing a proposed analytical structure for the engineering analysis and some initial transformer designs. In addition, DOE also posted draft screening, engineering, and LCC analysis reports on its website, and held a live Webcast on the LCC analysis on October 17, 2002.[4] DOE received comments from stakeholders on the draft reports, and these comments helped improve the quality of the analyses included in the ANOPR for this rulemaking, which was published on July 29, 2004. 69 FR 45376. In preparation for the September 28, 2004, ANOPR public meeting, DOE held a Webcast to acquaint stakeholders with the analytical tools and with other material DOE had published the previous month.

On August 5, 2005, DOE posted its draft NOPR analysis for the liquid-immersed and medium-voltage, dry-type distribution transformers on its Web site for early public review, along with spreadsheets for several of these analyses. This early publication of the draft NOPR analysis included the draft engineering analysis, LCC analysis, national impact analysis, and manufacturer impact analysis (MIA), and the draft TSD chapters associated with each of these analyses. The purpose of publishing these four draft analyses was to give stakeholders an opportunity to review the analyses and prepare recommendations for DOE as to the appropriate standard levels.[5]

On April 27, 2006, DOE published its Final Rule on Test Procedures for

[3] EPACT 2005 established that the efficiency of a low-voltage dry-type distribution transformer manufactured on or after January 1, 2007 shall be the Class I Efficiency Levels for distribution transformers specified in Table 4–2 of the ''Guide for Determining Energy Efficiency for Distribution Transformers'' published by the National Electrical Manufacturers Association (NEMA TP 1–2002).

[4] Copies of all the draft analyses published before the ANOPR are available on DOE's Web site: *http://www.eere.energy.gov/buildings/appliance_standards/commercial/distribution_transformers_draft_analysis.html.*

[5] Copies of the four draft NOPR analyses published in August 2005 are available on DOE's Web site: *http://www.eere.energy.gov/buildings/appliance_standards/commercial/distribution_transformers_draft_analysis_nopr.html.*

Distribution Transformers. In addition to establishing the procedure for sampling and testing distribution transformers so that manufacturers can make representations as to their efficiency as well as establish that they comply with Federal standards, this final rule also contained enforcement provisions, outlining the procedure the Department would follow should it initiate an enforcement action against a manufacturer. 71 FR 24972; 10 CFR 431.198.

On July 25, 2006, DOE published a NOPR proposing compliance certification procedures for a range of consumer products and commercial and industrial equipment, including distribution transformers. This NOPR included both a compliance statement and a certification report for distribution transformer manufacturers. 71 FR 42178. DOE is currently preparing its final rule for that proceeding, which will establish requirements around the compliance statement and certification report for distribution transformers and other products and equipment.

On August 4, 2006, DOE published the distribution transformer energy conservation standards NOPR. 71 FR 44355. In conjunction with the NOPR, DOE also published on its Web site the complete TSD for the proposed rule, which incorporated the final analyses DOE conducted and technical documentation for each analysis. The TSD included the engineering analysis spreadsheets, the LCC spreadsheet, the national impact analysis spreadsheet, and the MIA spreadsheet—all of which are available on DOE's Web site.[6] Table II.2 presents the energy conservation standard levels DOE proposed in the NOPR for liquid-immersed distribution transformers, and Table II.3 presents the energy conservation standard levels DOE proposed for medium-voltage, dry-type distribution transformers.

TABLE II.2.—NOPR PROPOSED ENERGY CONSERVATION STANDARD LEVELS FOR LIQUID-IMMERSED DISTRIBUTION TRANSFORMERS

Single-phase		Three-phase	
kVA	Efficiency (%)	kVA	Efficiency (%)
10	98.40	15	98.36
15	98.56	30	98.62
25	98.73	45	98.76
37.5	98.85	75	98.91
50	98.90	112.5	99.01
75	99.04	150	99.08
100	99.10	225	99.17
167	99.21	300	99.23
250	99.26	500	99.32
333	99.31	750	99.24
500	99.38	1000	99.29
667	99.42	1500	99.36
833	99.45	2000	99.40
		2500	99.44

Note: All efficiency values are at 50 percent of nameplate-rated load, determined according to the DOE test procedure. 10 CFR Part 431, Subpart K, Appendix A.

TABLE II.3.—NOPR PROPOSED ENERGY CONSERVATION STANDARD LEVELS FOR MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS

Single-phase				Three-phase			
BIL kVA	20–45 kV Efficiency (%)	46–95 kV Efficiency (%)	≥96 kV Efficiency (%)	BIL kVA	20–45 kV Efficiency (%)	46–95 kV fficiency (%)	≥96 kV Efficiency (%)
15	98.10	97.86		15	97.50	97.19	
25	98.33	98.12		30	97.90	97.63	
37.5	98.49	98.30		45	98.10	97.86	
50	98.60	98.42		75	98.33	98.12	
75	98.73	98.57	98.53	112.5	98.49	98.30	
100	98.82	98.67	98.63	150	98.60	98.42	
167	98.96	98.83	98.80	225	98.73	98.57	98.53
250	99.07	98.95	98.91	300	98.82	98.67	98.63
333	99.14	99.03	98.99	500	98.96	98.83	98.80
500	99.22	99.12	99.09	750	99.07	98.95	98.91
667	99.27	99.18	99.15	1000	99.14	99.03	98.99
833	99.31	99.23	99.20	1500	99.22	99.12	99.09
				2000	99.27	99.18	99.15
				2500	99.31	99.23	99.20

Note: BIL means basic impulse insulation level.
Note: All efficiency values are at 50 percent of nameplate-rated load, determined according to the DOE test procedure. 10 CFR Part 431, Subpart K, Appendix A.

[6] The Web site address for all the spreadsheets developed for this rulemaking proceeding are available at: *http://www.eere.energy.gov/buildings/appliance_standards/commercial/distribution_transformers_draft_analysis_nopr.html.*

In the NOPR, DOE identified seven issues on which it was particularly interested in receiving comments and views of interested parties. 71 FR 44406.

On February 9, 2007, DOE issued a notice of data availability and request for comments (NODA). 72 FR 6186. DOE published this notice in response to stakeholders who had commented, in response to the NOPR, that DOE's proposed standards might prevent or render impractical the replacement of distribution transformers in certain space-constrained (e.g., vault) installations. In the NODA, DOE sought comment on whether it should include in the LCC analysis potential costs related to size constraints of transformers installed in vaults. In the NODA, DOE outlined different approaches as to how it might account for additional installation costs for these space-constrained applications. In addition, DOE also published the NODA in response to certain stakeholders who commented that DOE should address the consistency issues for liquid-immersed transformers in the table of efficiency standards. DOE also requested comments on linking efficiency levels for three-phase liquid-immersed units with those of single-phase units. Specifically, in the NODA DOE discussed how it was inclined to consider a final standard that is based on efficiency levels that are based on TSL 2 and TSL 3 for three-phase units and TSLs 2, 3 and 4 for single-phase units. 72 FR 6189. Based on comments on the August 2006 proposed rule and the February 2007, NODA, DOE created new TSLs, including TSL B, which is, generally speaking, a combination of TSL 2 for three-phase units and TSL 3 for single-phase units. DOE received more than 20 written comments in response to this NODA on both the space constraint issue and how to set final efficiency ratings, which are discussed in the following sections of this final rule.

In response to the NODA, Cooper Power Systems commented that they were concerned that the NODA did not indicate any specifics regarding the proposed TSL levels for any design lines. Cooper states that DOE needs to publish a new proposed table that represents the mix of efficiency levels being considered in order for interested parties to provide solid feedback on the impact of these proposals. (Cooper, No. 175 at p. 1) [7] ABB provided a similar comment, expressing that they disagree with DOE's action of indicating that it may adopt a new mix of TSLs derived from a combination of TSLs 2, 3 and 4 as the final standard level without specifying exactly which combination is being considered. (ABB, No. 167 at p. 1) DOE appreciates these two comments, but does not agree with the stakeholders criticism of DOE's actions and the rulemaking process for the following reasons. First, the NODA provided notice to stakeholders that DOE would consider a combination of TSLs for liquid-immersed distribution transformers for the final rule. Accordingly, stakeholders have been given an opportunity to review the existing proposed standard levels and published NOPR analysis, and provide comments to DOE as to the combination of efficiency values they believe are the most justified, and why. Second, DOE did not consider simply one new TSL in today's final rule, but instead created four new TSLs (TSL A, B, C, and D) based on combinations of efficiency values from previously proposed TSL 2, 3 and 4. These four combinations of TSLs enabled DOE to consider several different efficiency values for liquid-immersed transformers for the final rule, decreasing the burdens associated with inconsistencies between three-phase and single-phase units and eliminating the discontinuities of efficiency values between design lines. In addition, the four combinations of TSLs attempt to maximize national and consumer benefits and select appropriate, cost-justified, efficiency levels across all the design lines. Third, all of the actual efficiency ratings considered in the four new TSL combinations developed for today's final rule were previously published in DOE's August 2006 NOPR. For all of these reasons, DOE believes the NODA provides stakeholders sufficient notice and opportunity for comment concerning the standard level adopted by today's final rule.

III. General Discussion

A. Test Procedures

Section 7(c) of the Process Rule (*Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products,* Title 10 CFR part 430, Subpart C, Appendix A; 61 FR 36974) [8] indicates that DOE will issue a final test procedure, if one is needed, prior to issuing a proposed rule for energy conservation standards. DOE published its test procedure for distribution transformers as a final rule on April 27, 2006. 71 FR 24972.

B. Technological Feasibility

1. General

There are distribution transformers in the market at all of the efficiency levels prescribed in today's final rule. Therefore, DOE believes all of the efficiency levels adopted by today's final rule are technologically feasible.

2. Maximum Technologically Feasible Levels

Applying the requirements of 42 U.S.C. 6295(p)(2), and as discussed in the proposed rule, DOE determined ''the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible.'' 71 FR 44362. DOE determined the ''max-tech'' efficiency levels in the engineering analysis (see Chapter 5 in the TSD) and then used these highest efficiency designs to establish the max-tech levels for the LCC analysis (see Chapter 8 in the TSD). DOE then scaled these max-tech efficiencies to the other kVA ratings within a given design line, establishing max-tech efficiencies for all the distribution transformer kVA ratings.

C. Energy Savings

DOE forecasted energy savings in its national energy savings (NES) analysis, through the use of an NES spreadsheet tool, as discussed in the proposed rule. 71 FR 44361, 44363, 44380–44381, 44384, 44393, 44401.

One of the criteria that govern DOE's adoption of standards for distribution transformers is that the standard must result in ''significant'' energy savings. (42 U.S.C. 6317(a)) While EPCA does not define the term ''significant,'' a 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 section 325 of EPCA to be savings that were not ''genuinely trivial.'' The energy savings for the standard levels DOE is adopting today are nontrivial, and therefore DOE considers them ''significant'' as required by 42 U.S.C. 6317(a).

D. Economic Justification

As noted earlier, EPCA provides seven factors for DOE to evaluate in determining whether an energy conservation standard for distribution transformers is economically justified. The following discussion explains how DOE has addressed each of these seven

[7] A notation in the form ''Cooper, No. 175 at p. 1'' identifies a written comment DOE received and included in the docket for this rulemaking. This particular notation refers to a comment (a) by Cooper Power Systems (Cooper), (b) in document number 175 in the docket of this rulemaking (maintained in the Resource Room of the Building Technologies Program), and (c) appearing on page 1 of document number 175.

[8] The Process Rule provides guidance on how DOE conducts its energy conservation standards rulemakings, including the analytical steps and sequencing of rulemaking stages (such as test procedures and energy conservation standards).

factors in this rulemaking. (42 U.S.C. 6295(o)(2)(B)(i))

1. Economic Impact on Commercial Consumers and Manufacturers

DOE considered the economic impact of the standard on commercial consumers and manufacturers, as discussed in the proposed rule. 71 FR 44361, 44363–44364, 44367, 44376–44277, 44379, 44381–44384, 44385–44389, 44390–44393, 44394, 44396–44400, 44401–44404. DOE updated the analyses to incorporate more recent material price information. One significant change to the MIA was the inclusion of lower conversion-capital expenditure estimates for those trial standard levels (TSLs) which require or otherwise trigger manufacturers to switch to amorphous core technology. DOE based the revised estimates on information provided by industry experts (see Section V.A.3 below).

2. Life-Cycle Costs

DOE considered life-cycle costs of distribution transformers, as discussed in the proposed rule. 71 FR 44362–44363, 44371–44376, 44378–44379, 44385–44390, 44395–44396. It calculated the sum of the purchase price and the operating expense—discounted over the lifetime of the equipment—to estimate the range in LCC benefits that commercial consumers would expect to achieve due to the new standards. DOE also examined the economic justification for its proposed standards for distribution transformers by applying section 325(o)(2)(B)(iii) of EPCA (42 U.S.C. 6295(o)(2)(B)(iii)), which provides that there is a rebuttable presumption that an energy conservation standard is economically justified if the increased installed cost for a product that meets the standard is less than three times the value of the first-year energy savings resulting from the standard, as calculated under the applicable DOE test procedure. 71 FR 44388–44389. Some of the standard levels DOE is adopting today satisfy the rebuttable presumption test but others do not. However, DOE determined all of them to be economically justified based on the above-described analyses.

3. Energy Savings

While significant conservation of energy is a separate statutory requirement for imposing an energy conservation standard, in determining the economic justification of a standard, DOE considers the total projected energy savings that are expected to result directly from the standard. (See 42 U.S.C. 6295(o)(2)(B)(i)(III)) DOE used the NES spreadsheet results in its consideration of total projected savings. 71 FR 44361, 44363, 44380–44381, 44384, 44393, 44401.

4. Lessening of Utility or Performance of Equipment

In selecting today's standard levels, DOE avoided new standards for distribution transformers that lessen the utility or performance of the equipment under consideration in this rulemaking. (See 42 U.S.C. 6295(o)(2)(B)(i)(IV)) DOE sought to capture in the economic analysis the impact of any increase in transformer size or weight associated with efficiency improvements. Specifically when selecting the new standards, DOE considered the installation costs for pole-mounted transformers and vault transformers that may be incurred with larger, heavier, more efficient transformers. 71 FR 44363, 44394. In addition, DOE recognizes that underground mining transformers are subject to unique and extreme dimensional constraints which impact the efficiency and performance of these distribution transformers. Therefore, DOE is establishing a separate product class for underground mining transformers. In the future, DOE may consider establishing energy conservation standards for underground mining transformers. DOE is not setting a standard for underground mining transformers in today's final rule, rather it is reserving a section and intends to develop analysis that would establish an appropriate energy conservation standard for underground mining transformers in the future. Finally, when selecting today's standard, DOE carefully reviewed the results of an engineering sensitivity analysis on primary winding voltages. This sensitivity analysis considers higher primary voltages than those used in the representative units studied in the engineering analysis. This sensitivity analysis enables DOE to evaluate the impact on cost and efficiency associated with the final rule TSLs. (see Section V.A.1.a in this notice, and TSD Appendix 5D) Thus, the analysis in today's final rule takes into consideration the additional costs associated with space-constrained pole-mounted and vault transformers, and ensures that higher primary voltages are not eliminated from the market. Based on DOE's engineering analysis, DOE concludes that more efficient pole-mounted and vault transformers are technologically feasible. However, in some instances, DOE believes that transformer poles and vaults may need to be replaced to accommodate the more efficient transformers as a result of today's final rule. DOE included increased installation costs of such pole-mounted and vault transformer in its analysis. In this way, DOE has captured the costs and benefits of replacement pole-mounted and vault transformers. Details of pole and vault replacement cost estimation methods are provided in sections 7.3.1 and 7.3.5 of TSD Chapter 7.

5. Impact of Any Lessening of Competition

DOE considers any lessening of competition that is likely to result from standards. Accordingly, as discussed in the proposed rule, 71 FR 44363–44364, 44394, at DOE's request, the Department of Justice (DOJ) reviewed the proposed standard level (i.e., the NOPR) and transmitted to the Secretary a written determination of the impact of any lessening of competition likely to result, together with an analysis of the nature and extent of such impact. (See 42 U.S.C. 6295(o)(2)(B)(i)(V) and (B)(ii)) DOE addressed the issues raised in the Attorney General's response to the NOPR, as discussed in section VI.C.5 of today's final rule. The letter DOJ submitted to DOE in response to the NOPR appears at the end of this notice of final rulemaking.

Today's final rule, which follows publication of the NODA, adopts a standard level that is higher than the standard proposed in the NOPR for certain liquid-immersed distribution transformers. DOJ was provided draft copies of the notice of final rulemaking and the final rule TSD for review. The Attorney General did not express any concerns about impacts associated with today's final rule. A copy of Attorney General's letter to DOE in response to the final rule also appears at the end of this notice of final rulemaking.

6. Need of the Nation To Conserve Energy

The Secretary recognizes that energy conservation benefits the Nation in several important ways. The non-monetary benefits of a standard are likely to be reflected in improvements to the security of the Nation's energy system. In addition, reductions in the overall demand for energy will result in reduced costs for maintaining reliability of the Nation's electricity system. Finally, today's standards will likely result in reductions in greenhouse gas emissions. As discussed in the proposed rule, DOE has considered these factors in adopting today's standards. 71 FR 44364, 44384, 44394–44395, 44398–44400. (See 42 U.S.C. 6295(o)(2)(B)(i)(VI))

7. Other Factors

The Secretary of Energy, in determining whether a standard is economically justified, considers any other factors the Secretary deems to be relevant. (See 42 U.S.C. 6295(o)(2)(B)(i)(VII)) The results of the utility impact analysis, and the analysis of national employment impacts are ''other factors'' that the Secretary took into consideration. In addition, for this rulemaking, the Secretary also took into consideration stakeholder concerns about the increasing cost of raw materials for building transformers, the volatility of material prices, and the cumulative effect of material price increases on the transformer industry, as discussed in the proposed rule. 71 FR 44364, 44395. Since issuance of the NOPR, DOE conducted two engineering sensitivity evaluations—one considering current (2006) material prices and a second considering transformers with alternative primary voltages that have higher insulation requirements (and are therefore more expensive and less efficient to manufacture). Also, as it had done in the proposed rule, DOE conducted LCC sensitivities, evaluating engineering analysis cost-efficiency curves generated using a high material price scenario [9] and a low material price scenario,[10] and other variable inputs in the LCC analysis. In selecting today's standards, DOE also took into consideration the need to have consistency in the efficiency requirements between single-phase and three-phase liquid-immersed transformers. See section V.C.1 for discussion on development of the final rule TSLs, including how single-phase and three-phase consistency was maintained between the liquid-immersed product classes.

IV. Methodology and Discussion of Comments on Methodology

DOE used a number of analytical tools that it previously developed and adapted for use in this rulemaking. The first tool is a spreadsheet that calculates LCC and payback period (PBP). The second tool calculates NES and national NPV. DOE also used the Government Regulatory Impact Model (GRIM), among other methods, in its MIA. Finally, DOE developed an approach using the National Energy Modeling System (NEMS) to estimate impacts of distribution transformer energy conservation standards on electric utilities and the environment.

Regarding the analytical methodology, DOE has continued to use the spreadsheets and approaches explained in the proposed rule. 71 FR 44364–44384. It revised them, and applied them again to develop the analysis for this final rule. The tables below summarize all the major NOPR inputs to the LCC and PBP analysis, the Shipments Analysis and the National Impact Analysis, and whether those inputs were revised for the final rule. In addition to these updates, DOE also updated the material prices it used for the engineering analysis, as discussed in TSD Chapter 5.

TABLE IV.1.—FINAL RULE INPUTS FOR THE LCC AND PBP ANALYSES

Inputs	NOPR description	Changes for final rule
Affecting Installed Costs		
Equipment price	Derived by multiplying manufacturer selling price (from the engineering analysis) by distributor markup and contractor markup plus sales tax for dry-type transformers. For liquid-immersed transformers, DOE used manufacturer selling price plus small distributor markup plus sales tax. Shipping costs were included for both types of transformers.	No change.
Installation cost	Includes a weight-specific component, derived from *RS Means Electrical Cost Data 2002* and a markup to cover installation labor, pole replacement costs for design line 2 and equipment wear and tear.	Added a case with vault replacement costs as a subgroup analysis.
Baseline and standard design selection.	The selection of baseline and standard-compliant transformers depended on customer behavior. For liquid-immersed transformers, the fraction of purchases evaluated was 75%, while for dry-type transformers, the fraction of evaluated purchases was 50% for small capacity medium voltage and 80% for large-capacity medium voltage.	No change in percent of evaluators. Different values of customer choice B parameter was estimated for small versus large liquid-immersed transformers.*
Affecting Operating Costs		
Transformer loading	Loading depended on customer and transformer characteristics	Technical improvement was made for liquid-immersed statistical load model where the 1995 *Commercial Building Energy Consumption Survey* data was used for load factor estimates.
Load growth	1% per year for liquid-immersed and 0% per year for dry-type transformers.	Adjusted to 0% per year for both liquid-immersed and dry-type.
Power factor	Assumed to be unity	No change.

[9] The high material price scenario is based on using the year with the highest material prices in the five-year sample (i.e., 2002 to 2006) of material prices updated for the final rule. In this sample, the year with the highest overall material prices was 2006. See TSD Chapter 5 for a discussion on material prices.

[10] The low material price scenario is based on selecting the year with the lowest M6 material price in the five-year sample (*i.e.*, 2002), and then applying a uniform 15 percent discount to all the material prices from that year. See TSD Chapter 5 for a discussion on material prices.

TABLE IV.1.—FINAL RULE INPUTS FOR THE LCC AND PBP ANALYSES—Continued

Inputs	NOPR description	Changes for final rule
Annual energy use and demand	Derived from a statistical hourly load simulation for liquid-immersed transformers, and estimated from the 1995 *Commercial Building Energy Consumption Survey* data for dry-type transformers using factors derived from hourly load data. Load losses varied as the square of the load and were equal to rated load losses at 100% loading.	No change.
Electricity costs	Derived from tariff-based and hourly based electricity prices. Capacity costs provided extra value for reducing losses at peak.	Adjusted electricity prices for inflation.
Electricity price trend	Obtained from *Annual Energy Outlook 2005 (AEO2005)*	Updated to *AEO2007*.
Maintenance cost	Annual maintenance cost did not vary as a function of efficiency	No change.
Affecting Present Value of Annual Operating Cost Savings		
Effective date	Assumed to be 2010	No change.
Discount rates	Mean real discount rates ranged from 4.2% for owners of pole-mounted, liquid-immersed transformers to 6.6% for dry-type transformer owners.	Discount rate sensitivity added to spreadsheet tool.
Lifetime	Distribution of lifetimes, with mean lifetime for both liquid and dry-type transformers assumed to be 32 years.	No change.
Candidate Standard Levels		
Trial standard levels	Six efficiency levels with the minimum equal to TP 1 and the maximum from the most efficient designs from the engineering analysis. Intermediate efficiency levels for each design line selected using a redefined set of LCC criteria..	For liquid-immersed transformers a set of four recombinations of the NOPR standard levels were formulated that have consistency between single-phase and three-phase efficiency levels

*The concept of using A and B loss evaluation combinations is discussed in TSD chapter 3, Total Owning Cost Evaluation. Within the context of the LCC analysis, the A factor measures the value to a transformer purchaser, in $/watt, of reducing no-load losses while the B factor measures the value, in $/watt, of reducing load losses. The purchase decision model developed by the Department mimics the likely choices that consumers make given the A and B values they assign to the transformer losses.

TABLE IV.2.—FINAL RULE INPUTS FOR THE SHIPMENTS ANALYSIS

Input	NOPR description	Changes for final rule
Shipments data	Third-party expert (HVOLT) for the year 2001	No change.
Shipments backcast	For years 1977–2003, used Bureau of Economic Analysis' (BEA) manufacturing data for distribution transformers. Source: *http://www.bea.doc.gov/bea/pn/ndn0304.zip.* For years 1950–1976, used EIA's electricity sales data. Source: *http://www.eia.doe.gov/emeu/aer/txt/stb0805.xls*.	No change.
Shipments forecast	Years 2002–2035: Based on *AEO2005*	Years 2010–2038: Based on *AEO2007.*
Dry-type/liquid-immersed market shares.	Based on EIA's electricity sales data and *AEO2005*	Based on EIA's electricity sales data and *AEO2007.*
Regular replacement market	Based on a survival function constructed from a Weibull distribution function normalized to produce a 32-year mean lifetime. Source: ORNL 6804/R1, *The Feasibility of Replacing or Upgrading Utility Distribution Transformers During Routine Maintenance,* page D–1.	No change.
Elasticities, liquid-immersed	For liquid-immersed transformers • Low: 0.00 • Medium: −0.04 • High: −0.20	No change.
Elasticities, dry-type	For dry-type transformers • Low: 0.00 • Medium: −0.02 • High: −0.20	No change.

TABLE IV.3.—FINAL RULE INPUTS FOR THE NATIONAL IMPACT ANALYSIS

Input	NOPR description	Changes for final rule
Shipments	Annual shipments from shipments model	No change.
Implementation date of standard	Assumed to be 2010	No change.
Base case efficiencies	Constant efficiency through 2035. Equal to weighted-average efficiency in 2010.	No change.
Standards case efficiencies	Constant efficiency at the specified standard level from 2007 to 2038	No change.

TABLE IV.3.—FINAL RULE INPUTS FOR THE NATIONAL IMPACT ANALYSIS—Continued

Input	NOPR description	Changes for final rule
Annual energy consumption per unit.	Average rated transformer losses are obtained from the LCC analysis, and are then scaled for different size categories, weighted by size market share, and adjusted for transformer loading (also obtained from the LCC analysis).	No change.
Total installed cost per unit	Weighted-average values as a function of efficiency level (from LCC analysis).	No change.
Electricity expense per unit	Energy and capacity savings for the two types of transformer losses are each multiplied by the corresponding average marginal costs for capacity and energy, respectively, for the two types of losses (marginal costs are from the LCC analysis).	No change.
Escalation of electricity prices	*AEO2005* forecasts (to 2025) and extrapolation for 2038 and beyond	Used *AEO2007* forecasts (to 2025) and extrapolation for 2038 and beyond.
Electricity site-to-source conversion	A time series conversion factor; includes electric generation, transmission, and distribution losses. Conversion varies yearly and is generated by DOE/EIA's National Energy Modeling System (NEMS) program.	Updated conversion factors from NEMS.
Discount rates	3% and 7% real	Results for 4.2% reported in TSD.
Analysis year	Equipment and operating costs are discounted to the year of equipment price data, 2004.	Equipment and operating costs are discounted to year 2006.

A. Market and Technology Assessment

1. General

The methodology DOE followed in the market and technology assessment was described in previous notices and is discussed in TSD Chapter 3. This is the section of the analysis where DOE typically discusses issues on the scope of coverage. DOE received a few comments on this topic, including comments regarding mining transformers, less-flammable liquid-immersed transformers, refurbished transformers, and the waiver process. These comments are discussed in the following sub-sections.

2. Mining Transformers

The definition of a distribution transformer and thereby the scope of coverage of this rulemaking was finalized in the test procedure final rule, published on April 27, 2006. 71 FR 24975–24982, 24995–24997. In that notice, DOE indicated that comments supporting an exclusion for mining transformers did not provide sufficient data and information on mining transformers to warrant an exclusion or separate treatment. 71 FR 24980–24981. In the August 2006 NOPR, DOE addressed the issue of mining transformers in the preamble. DOE decided not to exempt mining transformers under 42 U.S.C. 6291(35)(B)(iii)(I), noting that DOE lacked specific information and data on whether these transformers were likely to be used in general purpose applications or whether significant energy savings would result from applying standards to them. 71 FR 44365–44366.

a. Comments Requesting Exemption

DOE received several comments calling for mining transformers to be exempt from any national efficiency standard. The Alaska Miners Association (AMA), Arch Coal, Brooks Run Mining (BRM), Control Transformer, Federal Pacific Transformer (FPT), HVOLT, NEMA, the National Mining Association (NMA), the Ohio Valley Coal Company (OVCC), Peabody Energy Corporation (PEC), PEMCO Corporation (PEMCO), and SMC Electrical Products (SMC), all called for mining transformers to be exempt from the national efficiency standard. These stakeholders identified a number of reasons for this request, including safety, minimal impact on energy savings, appropriateness of the representative efficiency rating loading point, and lack of guidance in the test procedure for measuring the efficiency of mining transformers that have more than one secondary output connection. (AMA, No. 118 at p. 1; Arch Coal, No. 115 at p. 1; BRM, No. 112 at p. 1; Control Transformer, No. 142 at p. 1; FPT, No. 102 at pp. 1–3; Public Meeting Transcript, No. 108.6 at p. 131; HVOLT, No. 141 at p. 5; NEMA, No. 125 at p. 3; NMA, No. 116 at pp. 1–2; OVCC, No. 151 at p. 1; PEC, No. 146 at p. 1; PEMCO, No. 130 at p. 2; SMC, No. 124 at pp. 1–2) FPT also submitted several mining transformer designs they prepared to support its request to exempt mining transformers from the standard. (FPT, No. 114 at pp. 1–33) Howard Industries indicated that it would agree that mining transformers should be exempted if such transformers are ''exactly defined.'' (Howard, No. 143 at p. 5)

NMA and the Ohio Valley Coal Company (OVCC) commented that safety was a concern and a reason for exempting mining transformers from Federal efficiency standards. NMA commented that size constraints and the need to move the transformers as the mining process advances necessitate special designs. NMA also stated that DOE needs to consider safety issues raised by the need to move transformers in mining operations. (NMA, No. 116 at pp. 1–2) OVCC also noted the importance of mining transformers being as small as possible, in part to prevent safety problems as these transformers have to be moved frequently. (OVCC, No. 151 at p. 1)

Stakeholders also commented on the fact that they did not believe significant energy savings would result from DOE covering and regulating mining transformers. (Arch Coal, No. 115 at p. 1) AMA commented that mining transformers should be excluded based on the very large impact on the cost of equipment that will be incurred under standards and that this exclusion of mining transformers would have a minimal impact on energy savings. (AMA, No. 118 at pp. 1–2) NEMA commented that mining transformers account for considerably less than one percent of all distribution transformers, and that they are part of the medium-voltage, dry-type group of distribution transformers which has far less significant energy savings opportunities than liquid-immersed transformers. (NEMA, No. 125 at p. 3) Federal Pacific estimated that, annually, the total market of mining transformers is approximately 969.1 megavolt-amperes (MVA), or about 1.15 percent of total distribution transformer capacity. (FPT, No. 102 at p. 2) DOE notes that 969.1 MVA of shipped capacity represents approximately 20 percent of the medium-voltage, dry-type distribution transformer market, of which mining transformers are a subset.

Arch Coal commented that mining transformers have large cores, and thus higher core losses when compared to general purpose distribution transformers. This puts mining transformers at a disadvantage for achieving efficiency levels measured at 35 percent and 50 percent of rated nameplate capacity. (Arch Coal, No. 115 at p. 1) SMC Electrical Products commented that the smaller heights and lower-than-typical impedance of mining transformers mean they contain more core steel and have increased losses when measured at 50 percent of nameplate load. (SMC, No. 124 at pp. 1–2) Control Transformer commented that mining transformers are usually size constrained (normally in the height), and therefore they have higher core losses than taller (standard) transformers. The core loss constitutes a critical portion of the efficiency rating, and may make the customer's dimensional constraints difficult, if not impossible, to achieve. Control Transformer also commented that very often impedance requirements are placed on these transformers, which adds another constraint to the design. (Control Transformer, No. 142 at p. 1) However, FPT commented at the workshop that it is possible to make mining transformers more efficient without sacrificing size. FPT notes that problems occur when the standard levels become really high, but they believe there might be some standard level that would be appropriate for mining transformers. (Public Meeting Transcript, No. 108.6 at p. 253) FPT also commented that mining transformers have different loading requirements than typical distribution transformers, and their loading requirements are dependent on the application. (Public Meeting Transcript, No. 108.6 at pp. 245 and 255) HVOLT commented that mining transformers are used at full load, and therefore may not be able to meet certain efficiency levels, when measured at lower loading points. (Public Meeting Transcript, No. 108.6 at p. 255) PEMCO Corporation estimates that mining transformers have loading of 100 percent or better. (Public Meeting Transcript, No. 108.6 at p. 255) However, one mining company, OVCC, commented that its transformers are lightly loaded. It noted that one of its mines has 30 mega-volt amperes (MVA) of dry-type transformer capacity installed, but only has an electrical demand of 7 MVA—meaning its transformers are lightly loaded and therefore would receive less benefit from mandatory energy efficiency standards. (OVCC, No. 151 at p. 1)

Finally, the Department of Justice (DOJ), commented that it was concerned that the proposed standard level may adversely affect competition with respect to distribution transformers used in industries, such as underground coal mining. Consistent with stakeholders commenting on the proposed rule, DOJ highlighted the dimensional constraints imposed on mining transformers due to the operating environments into which they are installed. DOJ is concerned that these constraints contribute to higher costs than would otherwise be associated with transformers not subject to the same dimensional constraints. DOJ urged DOE to create an exception for distribution transformers used in industries with space constraints. (DOJ, No. 157 at p. 2)

In comments requesting that DOE provide an exemption for mining transformers, some comments referred simply to 'mining transformers', while other comments referred more specifically to 'underground mining transformers.' Considering the operating environments of these two types of distribution transformers, DOE does not believe that those transformers used in above-ground or open-pit mining operations are subject to the same physical constraints as those transformers installed in underground mining operations. DOE understands that both underground and above-ground mining transformers are distribution transformers,[11] which serve a distribution function in the electrical systems of the mines in which they operate. The critical difference between these two types of transformers is that underground mining transformers must be able to fit into a tight (i.e., dimensionally constrained) space while above-ground mining transformers are designed to operate on the surface, and thus are not required to be manufactured to fit into a tunnel, shaft or other dimensionally constrained space. Mining transformers used in above-ground mining operations have considerably greater dimensional flexibility than transformers installed in underground mining operations. Therefore, DOE considers medium-voltage dry-type distribution transformers that are used in above-ground mining operations to be medium-voltage dry-type distribution transformers subject to the standards adopted by today's rule.

In the analysis for the proposed rule, DOE did not consider underground mining transformers as a separate product class. Rather, they were considered with all other medium-voltage dry-type transformers. However, based on comments received, DOE recognizes that underground mining transformers must comply with dimensional constraints, design requirements, and safety considerations that are different from those faced by other distribution transformers. DOE concludes that underground mining transformers have a distinct utility which limits the energy efficiency improvement potential possible for such distribution transformers. While more efficient underground mining transformers are technologically feasible, DOE does not have the data needed to estimate either the energy efficiency improvement potential or the cost of more efficient designs of underground mining transformers. DOE reviewed the underground mining transformer designs submitted (Federal Pacific, No. 114 at pp. 1–33) and the comments of a mining transformer design engineer at the public meeting (Public Meeting Transcript, No. 108.6 at p. 253), and believes that more efficient underground mining transformer designs are technologically feasible, but these comments didn't provide information on the extent of improvement possible. Furthermore, none of the comments requesting DOE exempt mining transformers provided an economic analysis demonstrating that efficiency standards for such transformers would not be cost-justified. Without engineering cost and efficiency data, DOE was not able to perform an analysis of the impacts of standards on underground mining transformers. Thus, DOE is not able to determine whether energy conservation standards for underground mining transformers are economically justified and would result in significant energy savings. Based on the above, DOE concludes that underground mining transformers are a class of medium-voltage dry-type distribution standards, and since DOE cannot determine whether standards would meet EPCA's statutory criteria, DOE is not setting standards for underground mining transformers at this time.

In order that stakeholders understand which mining transformers are subject to standards being promulgated today and which mining transformers would

[11] The definition of the term 'distribution transformer' is discussed in TSD Chapter 3, section 3.2. The definition in the Code of Federal Regulations (10 CFR section 431.192) is based on EPCA (42 U.S.C. 6291(35)(A)).

be subject to energy efficiency standards at some future date, DOE incorporated into today's rule a definition for underground mining distribution transformers. DOE received one comment from FPT with a draft, proposed definition which read: ''Mining transformers shall be considered to be installed underground in a mine, inside equipment for use in mines or as a component of equipment used for underground digging, tunneling or dredging operations. The nameplate shall identify transformer for such use only.'' (FPT, No. 102 at p. 3) DOE considered this definition, and researched technical sources for alternative definitions, including IEEE and the Mine Safety and Health Administration (MSHA), a division of the Department of Labor. Neither the IEEE nor MSHA have a definition for an underground mining distribution transformer. Based on consideration of the above comment, DOE adopts the following definition for an underground mining distribution transformer:

Underground mining distribution transformer means a medium-voltage dry-type distribution transformer that is built only for installation in an underground mine or inside equipment for use in an underground mine, and that has a nameplate which identifies the transformer as being for this use only.

DOE recognizes that this definition for underground mining distribution transformers could be refined if DOE initiates a rulemaking proceeding that evaluates energy conservation standards for underground mining distribution transformers.

b. Mining Transformer Test Procedure Comments

Arch Coal commented that mining transformers often have more than one secondary connection, and multiple options for secondary connections, making it impossible to test using DOE's test procedure, which provides no guidance for testing of multiple secondary transformers. (Arch Coal, No. 115 at p. 1) SMC noted that DOE's test procedure does not indicate how multiple winding transformers should be loaded for the test. (SMC, No. 124 at pp. 1–2) FPT also noted that mining transformers are normally designed with multiple secondary windings at different kVA ratings. FPT indicated that DOE would need to provide clarification in the test procedure on the appropriate overall kVA rating and efficiency standard that would apply to these transformers with multiple secondary windings. (FPT, No. 102 at pp. 1–2)

DOE appreciates these comments and notes that while DOE's test procedure contains a test method that can be used for transformers with multiple secondary connections, it doesn't set the conditions for testing such units. Based on comments received, DOE understands that transformers with multiple secondary connections are used solely in underground mining operations. Since underground mining transformers are not subject to the standards adopted in today's final rule, DOE doesn't need to amend its test procedures to address this issue at this time. Before DOE establishes standards for underground mining transformers, DOE will amend the test procedures to specify the testing conditions for these units. DOE understands that the energy efficiency of distribution transformers is generally related to kVA, and that larger kVA units generally have a higher efficiency. DOE could, for example, require that underground mining transformers be tested at the secondary connection that yields the highest kVA value.

3. Less-Flammable, Liquid-Immersed Transformers

In the NOPR, DOE solicited comment on the issue of whether it should include liquid-immersed distribution transformers that are less flammable than most liquid-immersed models in the same product classes as medium-voltage, dry-type transformers. In developing and presenting the NOPR, DOE placed these less flammable liquid-immersed transformers in product classes with other liquid-immersed models, separate from the product classes for dry-type units (see TSD Chapter 3 for discussion on product classes).

Cooper Power Systems commented that the less-flammable, liquid-immersed transformers are used in the same applications as medium-voltage, dry-type transformers and therefore should be held to the same efficiency standards. (Public Meeting Transcript, No. 108.6 at p. 91; Cooper, No. 154 at p. 2) Howard Industries commented that less-flammable, liquid-immersed transformers should not be in the same product class as medium-voltage, dry-type transformers. Howard agrees that some less-flammable liquid-immersed transformers are used in some of the same applications as medium-voltage dry-type transformers, but many are used in applications that are not suitable for dry-type transformers and therefore would not be competing against a less efficient product. (Howard, No. 143 at p. 2)

DOE believes that the issue raised by Cooper and Howard is essentially whether less-flammable, liquid-immersed transformers should be treated as a separate class of liquid-immersed transformers and held to the same standard as medium voltage dry-type transformers.

EPCA provides DOE direction for establishing product classes. (42 U.S.C. 6295(q)(1)) In general, when evaluating and establishing energy efficiency standards, DOE classifies covered products into classes by: (a) The type of energy used; or (b) the capacity or other performance-related features that affect consumer utility or efficiency. In the July 2004 ANOPR, DOE concluded that the design of the transformer (i.e., dry-type or liquid-immersed) was a performance-related feature which affects the energy efficiency of the equipment. 69 FR 45385. Accordingly, DOE concludes that dry-type and liquid-immersed are separate classes of transformers. *Id.* Furthermore, while less-flammable, liquid-immersed transformers may have distinct applications apart from other liquid-immersed transformers, DOE does not believe the less-flammable cooling fluid affects the energy efficiency potential of such transformers compared to liquid-immersed transformers using mineral oil.[12] DOE understands that, depending on the cooling fluid used, less-flammable, liquid-immersed transformers can have the same energy efficiency potential as mineral oil cooled liquid-immersed transformers. (See TSD Section 5.3) Furthermore, DOE believes that all less-flammable, liquid-immersed transformers can meet the standards adopted today with any of the less-flammable cooling fluids currently used. Thus, considering the above, DOE concludes that less-flammable, liquid-immersed transformers have efficiency characteristics that are similar to other liquid-immersed transformers and, therefore, is not setting separate classes for less-flammable liquid-immersed transformers. As a result, less-flammable, liquid-immersed transformers must meet the same energy efficiency requirements as other liquid-immersed transformers.

4. Rebuilt or Refurbished Distribution Transformers

In the August 2006 NOPR, DOE requested comment on its treatment of rebuilt or refurbished transformers and the potential impact on consumers, manufacturers, and national energy use

[12] Currently, mineral oil is the standard cooling fluid used in liquid-immersed distribution transformers.

if these transformers were not covered by the standard. In the NOPR, DOE expressed doubt that its authority under EPCA extends to rebuilt or refurbished products or equipment. 71 FR 44366–44367. It also noted that throughout the program's history, DOE has not sought to regulate ''used'' products that had been reconditioned or undergone major repairs. 71 FR 44367. However, DOE acknowledged that it could be argued that rebuilt transformers are ''manufactured'' again when they are rebuilt, and, therefore, under this argument, they could be classified as new distribution transformers subject to standards.

DOE received numerous comments on the topic of rebuilt and refurbished transformers, reflecting a diverse range of views on this issue. The American Council for an Energy-Efficient Economy (ACEEE), BBF & Associates (BBF), and the Copper Development Association (CDA) all recommended that DOE cover and regulate rebuilt transformers. (ACEEE, No. 127 at p. 10; BBF, No. 122 at p. 2; CDA, No. 111 at p. 2) ERMCO, FPT, Howard Industries, HVOLT, NEMA, and NRDC all recommended that DOE cover and regulate both rebuilt and refurbished transformers. (ERMCO, No. 96 at p. 2; FPT, No. 102 at p. 3; Public Meeting Transcript, No. 108.6 at p. 90; Public Meeting Transcript, No. 108.6 at p. 82; Howard, No. 143 at p. 2; Public Meeting Transcript, No. 108.6 at pp. 47, 80, and 87; HVOLT, No. 144 at p. 4; NEMA, No. 125 at p. 3; Public Meeting Transcript, No. 108.6 at p. 81; NRDC, No. 117 at p. 12)

ACEEE suggested regulating rebuilt transformers through a phased-in approach where rebuilt transformers become covered and regulated at a later time. (ACEEE, No. 127 at p. 10) NRDC commented that if DOE determines it does not have the authority under the current rule to regulate remanufactured transformers, then it should establish a new product class (remanufactured transformers) to regulate. NRDC encouraged DOE to regulate refurbished transformers, perhaps on the basis of organizing an informal, inclusive, consensus-seeking process. (Public Meeting Transcript, No. 108.6 at p. 81; NRDC, No. 117 at p. 12)

NEMA commented that it believes DOE should establish, in its final rule, a mechanism to monitor whether rebuilt or refurbished transformers are being used as a means to circumvent the efficiency standard, and stated that DOE should consider covering and regulating such units, if necessary. (NEMA, No. 125 at p. 3) The California Energy Commission (CEC) commented that it believes if a transformer is resold into the marketplace, then it can be regulated. However, if it is remanufactured internally, the standard would not apply. (Public Meeting Transcript, No. 108.6 at p. 82)

The Edison Electric Institute (EEI) supported DOE's proposal not to include used or refurbished transformers as part of the standard. EEI stated that EPCA does not include products that are used, refurbished, or rebuilt. It commented that any concern that customers will repair a product instead of buying a new, standards-compliant product applies to all regulated products, not just transformers. Furthermore, EEI noted that rebuilt transformers are only a small part of the market. (Public Meeting Transcript, No. 108.6 at p. 79) National Grid commented that it believes national standards should not apply to refurbished or rebuilt transformers. (NGrid, No. 138 at p. 2) Southern Company commented that it agrees DOE does not have the authority to regulate refurbished transformers. (Public Meeting Transcript, No. 108.6 at p. 64)

DOE has carefully considered its authority to establish energy conservation standards for rebuilt and refurbished distribution transformers in light of these comments, and, as discussed below, concludes that its authority does not extend to rebuilt and refurbished products. The relevant statutory provisions are discussed below, as well as the agency's rationale in reaching this conclusion.

Section 332 of EPCA provides that it shall be unlawful for any manufacturer or private labeler to distribute in commerce any *new* covered product which is not in conformity with an applicable energy conservation standard. (42 U.S.C. 6302(a)(5) (emphasis added)) [13] Congress made section 332 applicable to distribution transformers in section 346(f)(1) of EPCA. (42 U.S.C. 6317(f)(1)) Section 332(b) defines ''new covered product'' to mean ''a covered product the title of which has not passed to a purchaser who buys such product for purposes other than (1) reselling such product, or (2) leasing such product for a period in excess of one year.'' (42 U.S.C. 6302(b)) That is, a new covered product is one for which the title has not passed to a consumer.[14]

DOE believes that the definition of ''new covered product'' in section 332 is ambiguous on the question of whether a rebuilt or refurbished distribution transformer is subject to DOE's authority to set energy conservation standards. On this point, DOE notes that section 332 does not expressly provide that ''new covered product'' means a new product the title of which is transferred by the *original* manufacturer to an *original* owner. Conversely, the definition of ''new covered product'' does not expressly exclude substantially remanufactured products that are subsequently resold (i.e., a product sold or disposed of by the *original* owner that is rebuilt or refurbished by an entity which resells it to another person). In order to resolve this ambiguity regarding DOE's authority to regulate rebuilt and refurbished distribution transformers, DOE considered both congressional intent and the nature of the existing distribution transformer market.

There is no legislative history that reflects Congress's intent. However, DOE views the way Congress chose to define ''new covered product'' in EPCA as the strongest indicator that the term was not intended to apply to rebuilt or refurbished products. Specifically, it is unlikely that Congress would have made transfer of ''title'' the test of whether a product was ''new'' if it intended to cover rebuilt or refurbished products. The most reasonable interpretation of the statutory definition is that Congress intended that this provision apply to newly manufactured products the title of which has not passed for the first time to a consumer of the product. Such interpretation provides certainty and clarity for the regulated entities subject to these statutory provisions.

In addition, if DOE were to interpret ''new covered product'' as applying to other than *newly* manufactured products EPCA's testing and labeling provisions would be much harder to implement and enforce. Identifying ''manufacturers'' under such an interpretation likely would be difficult [15] and it also likely would be

[13] DOE only regulates equipment that is either specifically enumerated as ''covered equipment'' or is equipment for which DOE has been granted authority to regulate in another statutory provision. Section 346 of EPCA (42 U.S.C. 6317) grants DOE authority to regulate distribution transformers, without including the specific language designating them as ''covered equipment.'' The failure to include the words ''covered equipment'' in Section 346 of EPCA or to include distribution transformers in Section 340 of EPCA, which lists the covered equipment in Part C, does not mean that distribution transformers will not be treated as ''covered equipment'' for purposes of DOE exercising its regulatory authority.

[14] In the context of this discussion, the term ''consumer'' is used to identify a product's end user; e.g., ''consumer'' does not include a party that takes title of a product solely for the purpose of resale or for leasing the product for less than a year.

[15] For example, a business that rebuilds or remanufactures products, instead of reselling them

Continued

difficult for DOE to distinguish between rebuilt products that are not covered and those products that were so extensively rebuilt as to be considered ''new'', and therefore subject to these provisions.

In terms of the existing distribution transformer market, DOE understands that rebuilt and refurbished transformers typically are either: (1) A product sold by the *original* manufacturer or private labeler, which after purchase by a consumer, is then modified and resold by another party; or (2) a product that following purchase by a consumer is modified and retained by that consumer. For the above-stated reasons, DOE concludes that rebuilt and refurbished distribution transformers are not ''new covered products'' under EPCA, and therefore, are not subject to DOE's energy conservation standards or test procedures.[16] With respect to the first scenario, upon transfer of the title of the distribution transformer to the consumer, the distribution transformer is no longer a new covered product, therefore, not subject to DOE regulations even if it is subsequently re-sold. Similarly, with respect to distribution transformers that are refurbished or rebuilt for or by the consumer (i.e., they are not re-sold), DOE lacks authority over those transformers because they are neither ''new'' covered products nor distributed in commerce. Furthermore, if refurbished or rebuilt transformers that are sold to another party were covered but not those that are refurbished or rebuilt for the consumer, DOE believes this would likely create an inequity that Congress would not have intended since a purpose of EPCA was to establish a *single* national standard, not multiple standards for the same product.

As discussed above, for distribution transformers in particular, DOE understands that at present, rebuilt transformers are only a small part of today's market. If conditions change—for example, if rebuilt transformers become a larger share of the transformer market in response to the energy conservation standards adopted today (e.g., there is a significant increase in the purchase of rebuilt or refurbished transformers), DOE would consider appropriate action at that time.

and transferring title, could operate as a repair facility for consumers who already own the used products. The business would simply rebuild the product for a fee and return it to the owner; there would be no transfer of title.

[16] DOE notes that *de minimis* use of used or recycled parts would not make a ''new product'' into a used product.

5. Uninterruptible Power System Transformers

The Energy Policy Act of 2005 (EPACT 2005) exempted ''Uninterruptible Power System transformer'' from the definition of ''distribution transformer.'' (42 U.S.C. 6291(35)(B)(ii)) DOE indicated when it adopted the EPACT 2005 efficiency requirements for low-voltage dry-type distribution transformers that it believed the name of this exemption contained a clerical error. 70 FR 60408 (October 18, 2005). DOE stated in the October 2005 final rule notice that it intended to make corrections where necessary to the statutory language, and gave the following example: ''the definition of ''distribution transformer'' in section 135(a)(2)(B) of EPACT 2005 uses the term ''Uninterruptible Power System transformer'' instead of ''Uninterruptible Power Supply transformer.'' DOE later codified the name change of UPS from ''System'' to ''Supply'' in the distribution transformer test procedure final rule, and it noted ''DOE is amending its definition of distribution transformer to correct use of * * * UPS transformers [which] are commonly referred to as ''Uninterruptible Power Supply transformers,'' not ''Uninterruptible Power System transformers.'' 71 FR 24977 (April 27, 2006).

In the April 2006 final rule notice, DOE also adopted the following definition of an ''uninterruptible power supply transformer'': ''*Uninterruptible Power Supply transformer* means a transformer that supplies power to an uninterruptible power system, which in turn supplies power to loads that are sensitive to power failure, power sags, over voltage, switching transients, line noise, and other power quality factors.'' 71 FR 24997; 10 CFR section 431.192. This definition, matches the definition of ''Uninterruptible Power Supply transformer'' as published in NEMA TP 2–2005 ''Standard Test Method for Measuring the Energy Consumption of Distribution Transformers.''

In a comment submitted to DOE in this rulemaking, NEMA expressed its concern that DOE's revision of the term used for this exemption and the definition of the term, had introduced some confusion as to the applicability of this exemption. (NEMA, No. 174 at p. 2) NEMA requests that DOE change the name of this exemption from ''Uninterruptible Power Supply transformer'' back to the original name, as it appeared in EPACT 2005—''Uninterruptible Power System transformer.'' (NEMA, No. 174 at p. 2) NEMA also asked that DOE revise the definition associated with uninterruptible power system transformers, to clarify that the exemption applies to transformers incorporated into uninterruptible power systems rather than supplying power to them. (NEMA, No. 174 at p. 2)

In the rulemaking in which it codified the exclusion of ''Uninterruptible Power Supply transformer'' from the definition of ''distribution transformer,'' DOE received no comments about either the exclusion or use of this term or DOE's definition of the term. In the supplemental notice of proposed rulemaking (SNOPR) in which it had proposed the exclusion, DOE stated that ''an uninterruptible power supply transformer is not a distribution transformer'' and that ''[i]t is used as part of the electric supply system for sensitive equipment that cannot tolerate system interruptions or distortions, and counteracts such irregularities.'' 69 FR 45505, 45512 (July 29, 2004). DOE sees no reason to modify the term ''Uninterruptible Power Supply transformer'' in its regulations, or to completely revise its definition of this term. Nonetheless, DOE recognizes that, in characterizing an uninterruptible power supply transformer as one that ''supplies power to'' an uninterruptible power system, 10 CFR 431.192, DOE's definition may be confusing and slightly inconsistent with its description in the SNOPR of this type of transformer. Therefore, to make the definition consistent with its expressed intent in the SNOPR, to which there was no objection, in today's rule DOE is clarifying its definition of ''Uninterruptible Power Supply transformer'' by replacing the phrase ''supplies power to'' with ''is used within.'' This modification does not expand or reduce the intended group of Uninterruptible Power Supply transformers that DOE wishes to exempt from its standard. Rather, this change provides greater clarity of the scope of this exemption.

B. Engineering Analysis

For the engineering analysis, which established the relationship between cost and efficiency for certain distribution transformer kVA ratings considered in this rulemaking, DOE continued to use transformer design software developed for the rulemaking by Optimized Program Service (OPS). DOE verified the findings of this software by comparing designs during manufacturer interviews, and through a testing and teardown analysis of six transformers. Chapter 5 of the TSD contains detailed discussion on the methodology followed for the engineering analysis.

C. Life-Cycle Cost and Payback Period Analysis

The LCC is the total customer cost over the life of the equipment, including purchase expense and operating costs (including energy expenditures and maintenance). To compute the LCC, DOE summed the installed price of a transformer and the discounted annual future operating costs over the lifetime of the equipment. The PBP is the change in purchase expense due to an increased efficiency standard divided by the change in first-year operating cost that results from the standard. DOE expresses PBP in years. The data inputs to the PBP calculation are the purchase expense (otherwise known as the total installed consumer cost or first cost) and the annual operating costs for each selected design. The inputs to the transformer purchase expense are the equipment price and the installation cost, with appropriate markups to reflect price increases as the transformer passes through the distribution channel. The inputs to the operating costs are the annual energy consumption and the electricity price. The PBP calculation uses the same inputs as the LCC analysis but, since it is a simple payback, the operating cost is for the year the standard takes effect, assumed to be 2010.

For each efficiency level DOE analyzed, the LCC analysis required input data for the total installed cost of the equipment, the operating cost, and the discount rate. Equipment price, installation cost, and baseline and standard design selection affect the installed cost of the equipment. Transformer loading, load growth, power factor, annual energy use and demand, electricity costs, electricity price trends, and maintenance costs affect the operating cost. The effective date of the standard, the discount rate, and the lifetime of equipment affect the calculation of the present value of annual operating cost savings from a proposed standard.

The following sections contain brief discussions of comments on the inputs and key assumptions of DOE's LCC analysis and explain how DOE took these comments into consideration.

1. Inputs Affecting Installed Cost

a. Installation Costs

Higher efficiency distribution transformers tend to be larger and heavier than less efficient designs. DOE therefore included the increased cost of installing larger, heavier transformers as a component of the first cost of more efficient transformers. In the NOPR, DOE presented the installation cost model and solicited comment from stakeholders. For details of the installation cost calculations, see TSD section 7.3.1.

In response to both the NOPR and the NODA, many stakeholders commented that it is important for DOE to take into consideration the costs and reliability impacts of installing transformers in space-constrained situations. ACEEE recommended that DOE factor into its calculations space-constraint costs, based on the percentage of transformers that will necessitate modification of the vaults in which they are installed and the average cost for such modifications. (Public Meeting Transcript, No. 108.6 at pp. 130–131) EEI noted that DOE's analysis should include a space occupancy factor, although it might be hard to estimate. (Public Meeting Transcript, No. 108.6 at p. 129) In addition, EEI expressed concern regarding size and weight implications for the reliability and cost of the transformer, especially for TSL4, noting that, for pole-mounted transformers, more weight will increase the stress on poles and noting that manufacturers doubt that they can produce all equipment needed at TSL4. (Public Meeting Transcript, No. 108.6 at p. 31) HVOLT recommended that the analysis account for volume and weight in a mathematical equation to account for space occupancy costs. (Public Meeting Transcript, No. 108.6 at p. 129) NEMA commented that, with higher standards, manufacturers may use lower quality steel and switch from copper to aluminum, and that this may increase the weight and/or size of transformers. (Public Meeting Transcript, No. 108.6 at p. 132) Metglas commented that transformers are smaller and lighter than those made 30–40 years ago, and stated that there will not be an issue with size and weight of amorphous core transformers. (Metglas, No. 144 at p. 3)

DOE responded to the comments raised regarding space-constraint implications for installation costs by formulating a method and a cost equation for estimating the economic impacts of space constraints and issuing a NODA that solicited comments on the method and equations proposed for evaluating such costs. 72 FR 6186–6190. DOE then performed a subgroup analysis of space-constrained vault transformers, for which DOE modeled potential standards-induced vault modification costs with an appropriate equation that included both fixed and volume-dependent variable components. The results of this analysis are detailed in Chapter 11 of the TSD, and DOE took these costs into consideration in the selection of the standard level for this rule.

b. Baseline and Standard Design Selection

A major factor in estimating the economic impact of a proposed standard is the selection of transformer designs in the base case and standards case scenarios. A key issue in the selection process is the degree to which transformer purchasers take into consideration the cost of transformer losses (A and B factors) when choosing a transformer (i.e., whether they "evaluate"), both before and after the implementation of a standard. The purchase-decision model in the LCC spreadsheet selects which of the hundreds of designs in the engineering database are likely to be selected by transformer purchasers. The LCC transformer selection process is discussed in detail in TSD Chapter 8, section 8.2.

DOE received several comments regarding the fraction of transformer purchasers that evaluate distribution transformer electrical losses before purchase and how transformer purchasers evaluate these losses. HVOLT estimates that 20 percent of the market for medium-voltage, dry-type transformers evaluates and places a value of $3.00/watt on loss evaluation, while the market share of transformers meeting TP 1 levels for liquid-immersed transformers is 75 to 80 percent. (Public Meeting Transcript, No. 108.6 at p. 216) NEMA commented that 10 years ago there was a trend where customers bought cheaper and less efficient transformers every year due to less loss evaluation, but that the market has turned around and now an increasing percentage of customers are buying the more efficient TP 1 transformers. NEMA also noted that the shipments data it has submitted over the years to DOE have shown this changing trend. (Public Meeting Transcript, No. 108.6 at p. 220; NEMA, No. 125 at p. 3)

In response to these comments, DOE developed its baseline market model using the most detailed and reliable data available. This included data that NEMA supplied providing TP 1 transformer market shares, in addition to publicly available data regarding evaluation parameters used by distribution transformer purchasers. For the final rule, DOE set average A and B values of 3.85 and 1.16 $/watt respectively for design lines 1, 2 and 4, and average A and B values of 3.85 and 1.93 $/watt for design lines 3 and 5. These slight adjustments to the evaluation parameters for the small transformers (i.e., design lines 1, 2, and 4) versus the large transformers (i.e., design lines 3 and 5) were made because these two types of transformers have different load profiles, which necessitate different loss valuations. DOE determined the loss valuation variation for small versus large transformers through its analysis of publicly available data on loss valuations which indicated differences as a function of transformer capacity. Estimation of the A and B values is discussed in detail in TSD Chapter 8, section 8.3.1.

2. Inputs Affecting Operating Costs

a. Transformer Loading

Transformer loading is an important factor in determining which types of transformer designs will deliver a specified efficiency, and for calculating transformer losses. Transformer losses have two components: no-load losses and load losses. No-load losses are independent of the load on the transformer, while load losses depend approximately on the square of the transformer loading. Because load losses increase with the square of the loading, there is a particular concern that, during times of peak system load, load losses can impact system capacity costs and reliability. For the final rule, DOE made a slight technical adjustment to the loading model for liquid-immersed transformers by relying on the more comprehensive 1995 Commercial Building Energy Consumption Survey data for the relationship between peak and average loads as a function of transformer size rather than the older, regionally specific End-Use Load and Consumer Assessment Program data used in the NOPR analysis. TSD Chapter 6 provides details of DOE's transformer loading models.

Stakeholders appeared to generally agree with DOE's technical approach to evaluating loading, although HVOLT commented that DOE should mathematically evaluate the loading of single-phase and three-phase transformers the same way. (Public Meeting Transcript, No. 108.6 at p. 151)

Because of greater load diversity and based on an analysis of building load data described in Chapter 6 of the TSD, DOE generally estimated the loading on larger transformers as greater than the loading for smaller transformers, although DOE did in this rule set efficiency levels for single-phase and three-phase transformers as equal when the capacity per phase for the two different types of transformers is equal.

b. Load Growth

The LCC takes into account the projected operating costs for distribution transformers many years into the future. This projection requires an estimate of how, if at all, the electrical load on transformers will change over time (i.e., load growth). In the NOPR analysis, for dry-type transformers, DOE assumed no load growth, while for liquid-immersed transformers, DOE used as the default scenario a one-percent-per-year load growth. It applied the load growth factor to each transformer beginning in 2010, the expected effective date of the standard. To explore the LCC sensitivity to variations in load growth, DOE included in the model the ability to examine scenarios with zero percent, one percent, and two percent load growth. Load growth is discussed in detail in TSD Chapter 8, section 8.3.6.

DOE received substantial comment regarding its load growth assumptions. CDA commented that it is entirely reasonable to deduce that peak power per dwelling increases, and thus transformer loading also increases over time, as people add home theaters, home offices, appliances, and air conditioning to existing dwellings. (CDA, No. 111 at p. 2) EEI commented that load growth on transformers may be from zero to half of a percent per year. (Public Meeting Transcript, No. 108.6 at pp. 147–148) HVOLT commented that after transformers are installed in a residential area with a complement of houses, the load basically stagnates. (Public Meeting Transcript, No. 108.6 at p. 145) Pacific Gas and Electric (PG&E) commented that it assumes three percent growth over the total 30 year life of a transformer corresponding to a growth rate of one tenth of one percent per year. (Public Meeting Transcript, No. 108.6 at pp. 149–150) Southern Company commented that, for the transformer installed in the field, it sees no significant growth once a transformer is installed. (Public Meeting Transcript, No. 108.6 at p. 144)

For the final rule, DOE responded to comments by examining more recent data relevant to customer load growth. Since AEO forecasts indicate that energy use per capita will be approximately constant over time due to trends of increasing end-use efficiency, DOE set the load growth parameter for the main analysis scenario as zero percent per year for both dry-type and liquid-immersed transformers. However, DOE retained the one-percent-per-year load growth scenario as a sensitivity analysis.

c. Electricity Costs

DOE needed estimates of electricity prices and costs to place a value on transformer losses for the LCC calculation. DOE created two sets of electricity prices to estimate annual energy expenses for its analysis: an hourly-based estimate of wholesale electricity costs for the liquid-immersed transformer market, and a tariff-based estimate for the dry-type transformer market (see TSD Chapter 8).

DOE received a few comments regarding electricity cost estimation. HVOLT estimated that generation costs of electricity have been in the four to six cents per kilowatt-hour (kWh) range. (Public Meeting Transcript, No. 108.6 at p. 197) ACEEE commented that roughly half the cost of electricity is due to generation, while the other half is transmission and distribution and other expenses. (Public Meeting Transcript, No. 108.6 at p. 204) Southern Company commented that DOE's hourly marginal electricity price model looks conceptually correct, but that there are many variables and it is possible to argue about every one of them (Public Meeting Transcript, No. 108.6 at pp. 205–206).

DOE compared these comments with the estimates of its electricity cost model and determined that these comments and suggestions were consistent with the electricity cost model and estimates in the NOPR analysis. DOE therefore used the same cost model for the final rule with minor adjustments to take into account inflation and more recent data. Electricity cost estimates are discussed in detail in TSD Chapter 8, section 8.3.5.

d. Electricity Price Trends

For the relative change in electricity prices in future years, DOE relied on price forecasts from the Energy Information Administration (EIA) *Annual Energy Outlook (AEO)*. For the NOPR, DOE used price forecasts from the *AEO2005*. The application of electricity price trends in the final rule analysis is discussed in detail in TSD Chapter 8, section 8.3.7.

In response to the NOPR, DOE received a large number of comments regarding electricity price forecasts. ACEEE recommended that DOE look at a range of forecasts, since EIA seems to be at the low end of the range. (Public Meeting Transcript, No. 108.6 at p. 203) In its written comments, ACEEE asked that, at a minimum, DOE use projections from *AEO 2007*, and suggested that DOE use the average of a basket of forecasts. (ACEEE, No. 127 at p. 3) EMS Consulting, the Northwest Power and

Conservation Council (NPCC), and NRDC also recommended that DOE use a wider range of price forecasts. (Public Meeting Transcript, No. 108.6 at pp. 199–210) CDA commented that electricity prices will not be declining in future years since shortcomings in the generation and transmission systems will become apparent. (CDA, No. 111 at p. 2) EEI commented that DOE did a reasonable job, based on the information in its NOPR TSD, and that in some years electricity prices actually go down in real terms. (Public Meeting Transcript, No. 108.6 at pp. 201 and 211) HVOLT commented that it expects prices to increase at a stable, even keel over the next 20 years. (Public Meeting Transcript, No. 108.6 at p. 210)

For the final rule, DOE updated the price forecast to AEO2007 and examined in increased detail the sensitivity of analysis results to changes in electricity price trends and other parameters. Appendix 8D of the TSD provides an expanded sensitivity analysis for all five liquid-immersed transformer design lines and the medium-voltage dry-type with the largest volume of transformer capacity shipments in the market, DL12. This analysis shows that the effect of changes in electricity price trends, compared to changes in other analysis inputs, is relatively small. DOE evaluated a variety of potential sensitivities, and the robustness of analysis results with respect to the full range of sensitivities, in weighing the potential benefits and burdens of the final rule.

e. Natural Gas Price Impacts

Even though distribution transformers use electricity rather than natural gas for their energy supply, several comments expressed concerns that DOE's NOPR analyses might be neglecting indirect energy impacts of standards on natural gas demand and prices. The Alliance to Save Energy (ASE) commented that the natural gas market is extremely tight primarily due to increased use of natural gas to produce electricity, and this has led to incredible volatility in prices. (Public Meeting Transcript, No. 108.6 at p. 59) The American Chemistry Council (ACC) asked DOE to consider the impacts on the natural gas market in selecting the final standard. (ACC, No. 132 at p. 2) Dow Chemical Company commented that, if DOE considers the impact of standards on the U.S. natural gas market and prices, then higher levels can be further substantiated. (Dow Chemical, No. 129 at pp. 1–2) NRDC commented that energy efficiency in transformers can bring down natural gas prices by reducing the demand on gas as a generation fuel. It further commented that this can have a major benefit in reducing natural gas prices to all users, not merely users of transformers. (Public Meeting Transcript, No. 108.6 at p. 57; NRDC, No. 117 at p. 7)

DOE examined the potential size of the impact of distribution transformer standards on natural gas demand in its updated utility impact analysis, and reported the impact of the standard by generation type in Chapter 13 of the TSD. DOE performed the updated analysis based on *AEO2006*,[17] which includes a forecast of relatively high natural gas prices compared to earlier DOE forecasts. (See TSD Chapter 13) In this utility impact forecast with high natural gas prices, most of the electricity saved from the standard comes from coal-generated electricity. In addition, DOE's hourly marginal price analysis already incorporates the impact of volatile and high marginal natural gas prices in the marginal price of electricity that DOE uses in its analysis. One way that changes in demand can impact average prices in a market as a whole is when the marginal demand of a commodity does not pay the full marginal cost of supply; then prices in the market as a whole must rise to balance costs in the market as a whole. In DOE's analysis of electricity prices for distribution transformers, DOE attempted to include the full marginal cost of supply for electricity including the effect of high, volatile natural gas prices by using volatile real-time electricity prices. Real-time electricity prices are strongly influenced by the real-time marginal cost of natural gas when gas turbines are supplying electricity to the market. Since DOE already includes the effect of volatile marginal natural gas prices in its electricity price analysis through real-time electricity prices, and since a relatively small fraction of the electricity saved over the long term is forecast from natural gas generation, DOE did not give additional consideration to the impact on natural gas prices in this rulemaking.

[17] While the AEO2007 electricity price forecast data was available in time for preparation of this final rule, the full AEO2007 forecast was not available at the time DOE performed the utility and environmental impact analysis. DOE therefore used AEO2006 for the utility and environmental analysis. Following completion of the utility and environmental analysis and after the full AEO 2007 became available, DOE compared the AEO2006 and AEO2007 and found the forecasts of electricity prices, the marginal generation mix and emissions factors in the AEO2007 and AEO2006 forecasts were very similar. The two forecasts provide the same marginal fractions of coal and natural gas generation (within 3.5%), and have marginal CO_2 emission factors that differ by less than 2%.

3. Inputs Affecting Present Value of Annual Operating Cost Savings

a. Standards Implementation Date

In the August 2006 NOPR, DOE proposed that the standards for distribution transformers apply to all units manufactured on or after January 1, 2010. 71 FR 44407. DOE calculated the LCC for customers as if each new distribution transformer purchase occurs in the year manufacturers must comply with the standard.

Some stakeholders suggested that DOE could implement a two-tier standard with two effective dates. In response to the NODA, a group of stakeholders consolidated their comments by creating a joint proposal in this regard. ACEEE, NRDC, EEI, ASE, the American Public Power Association (APPA), the Appliance Standards Awareness Project (ASAP), and the Northeast Energy Efficiency Partnerships (NEEP) recommended in their joint proposal that DOE adopt TSL2 in 2009 and TSL4 in 2013. (Joint Comment) They recommended the delay in implementation of TSL4 so that technical manufacturing problems could be addressed. (Joint Comment, No. 158 at p. 2) On July 30, 2007, DOE received a letter from two Senators urging DOE to adopt the Joint Comment.[18] (Bingaman and Domenici, No. 191 at p. 1) Howard commented that it is strongly opposed to moving the effective date of the standard to January 1, 2009, because it will need to perform an enormous amount of engineering and design work to meet the new levels. (Howard, No. 180 at p. 4) NEMA commented that it does not believe the proposed compliance date of January 1, 2009 for TSL2 is achievable because transformer designs are already in development now for delivery after January 1, 2009. NEMA requests that the compliance date be moved to January 1, 2010. (NEMA, No. 174 at p. 2) Southern Company commented that it supports a two-tiered standard of TSL2 in 2009 and TSL4 in 2013 with a technical conference in 2010 to make any necessary adjustments to the year 2013 level. (Southern, No. 178 at p. 1, 9)

DOE rejects the two-tiered approach with TSL4 as the level of the second tier for two reasons: DOE found that TSL4 is not economically justified as described in section VI.1.d of this notice, and therefore rejected TSL4. Second, DOE does not have the authority to amend standards outside a

[18] Letter from Senator Jeff Bingaman and Senator Pete Domenici, to Samuel Bodman, Secretary of Energy (July 30, 2007).

rulemaking proceeding.[19] If DOE were to set a two-tier standard, with one tier at TSL4, DOE would not be able to roll it back at a later date because of the anti-backsliding provision of EPCA. DOE is expressly prohibited from lowering standards once they have been established. (42 U.S.C. 6295 (o)(1), *Natural Resources Defense Council* v. *Abraham*, 355 F. 3d 179, 195–197 (2nd Cir. 2004)) Accordingly, DOE rejects the proposal to adopt a two-tiered approach with potential to amend the standard during a technical conference and, instead is adopting a set of energy conservation standards with an implementation date of January 1, 2010, in today's final rule.

b. Discount Rate

The discount rate is the rate at which future expenditures are discounted to estimate their present value. It is the factor that determines the relative weight of first costs and operating costs in the LCC calculation. Consumers experience discount rates in their day-to-day lives either as interest rates on loans or as rates of return on investments. Another characterization of the discount rate is the 'time value of money.' The value of a dollar today is one plus the discount rate times the value of a dollar a year from now. DOE estimated a statistical distribution of commercial consumer discount rates that varied by transformer type by calculating the cost of capital for the different types of transformer owners (see TSD Chapter 8).

In response to the NOPR, DOE received specific comments regarding its methods for calculating discount rates. EEI commented that some utility companies may have lower credit ratings due to rate decisions that can increase the cost of capital to between 7 and 12 percent real. (Public Meeting Transcript, 108.6 at pp. 123–124) NRDC made a number of specific comments regarding the parameters DOE used in its equation to estimate the cost of capital, suggesting that DOE erred in estimating the reference risk-free discount rate, and in estimating average values of inflation and cost of equity capital. (NRDC, No. 117 at pp. 8–9)

DOE has a two-step approach in calculating discount rates for analyzing consumer economic impacts. The first step is to assume that the actual consumer cost of capital approximates the appropriate consumer discount rate. The second step is to use the use the capital asset pricing model (CAPM) to calculate the equity capital component of the consumer discount rate. Neither stakeholder disagreed with DOE's general approach of estimating consumer discount rates from the cost of capital. NRDC asserted that DOE was using incorrect parameters when it calculated the consumer cost of equity capital with the CAPM. DOE uses information from the Federal Reserve when it determines which parameters are correct for use in the CAPM. The Federal Reserve solicited input in 2005 from a range of stakeholders specifically on how to perform CAPM cost of capital calculations and considered input from a range of stakeholders in determining the best parameter values to use in the CAPM. 70 FR 29512–29526 (May 23, 2005). Specifically, DOE rejects NRDC's assertion that the long-term average of the rate of return on short-term Treasury notes is the only correct way to calculate the risk free interest rate because this is not consistent with the information from the Federal Reserve which accepts long term averages of both short-term and long-term Treasury note rates for use in the CAPM. DOE added a discount rate sensitivity feature to its consumer economic impact analysis tools to examine the sensitivity of the analysis results to the details of DOE's capital cost estimates. More detail regarding DOE's estimates of commercial consumer discount rates is provided in section 8.3.8 of the TSD.

c. Temperature Rise, Reliability, and Lifetime

In response to the NOPR, DOE received many comments regarding whether or not more efficient distribution transformers would have longer lifetimes and whether this would be both a reliability and an economic benefit that could accrue from standards.

ACC, ASAP, CEC, Dow Chemical Company, the North American Electric Reliability Corporation (NERC), 23 members of the U.S. House of Representatives, and two members of the U.S. Senate urged DOE to take into consideration transformer operating temperatures and the impact that this may have on transformer lifetime and reliability. (ACC, No. 132 at p. 2; Public Meeting Transcript, No. 108.6 at p. 175; Public Meeting Transcript, No. 108.6 at p. 60; Dow, No. 129 at p. 2; NERC, No. 133 at p. 1; U.S. Congress, No. 125 at p. 1; U.S. Senate, No. 120 at p. 1) Several stakeholders, including EMS Consulting and Metglas, asserted that lower operating temperatures may double or quadruple the life of transformers. (Public Meeting Transcript, No. 108.6 at pp. 172 and 186; Metglas, No. 144 at p. 6) Others, including Central Moloney, Inc., PG&E, HVOLT, and Southern Company, commented that they expected lower operating temperatures to have potentially little or no impact on transformer lifetimes in practice because designs and loading practices would adjust to maintain current operating temperatures and lifetimes. (Public Meeting Transcript, No. 108.6 at pp. 187, 174, 168, and 171) ACEEE, ASAP, and an individual stakeholder all commented that DOE can and should calculate the impacts of a higher efficiency standard on transformer lifetimes and should include these impacts in its consumer benefit calculations. (Public Meeting Transcript, No. 108.6 at pp. 40–41; ASAP, No. 104 at p. 1; Zahn, No. 119 at p. 7)

DOE evaluated the possibility of estimating the effects of efficiency on transformer lifetime and reliability, and the likely accuracy of such estimates. DOE first calculated the average temperature rise and operating temperature of the transformer designs at each of the TSLs considered in today's final rule. These average temperature rises are presented in TSD Appendix 8G.

From its review of transformer engineering references, DOE agrees that if the only difference between more and less efficient transformers is that more efficient transformers have lower operating temperatures, then the lifetime of more efficient transformers may increase because the electrical insulation within the transformer may last longer. But given the full range of factors that can affect transformer life and reliability, DOE cannot determine at this time that decreasing temperature due to efficiency improvements will cause high efficiency transformers to have increased transformer lifetimes on average compared to lower efficiency transformers. There are many differences between more and less efficient transformers in addition to temperature rise, and there are many failure modes for a transformer in addition to insulation degradation. More efficient transformers tend to be larger and heavier, and for pole-mounted transformers this may increase the likelihood of weather-related and support-structure failures. Thus, higher efficiency transformers may at times have lower lifetimes than lower efficiency transformers. Many transformers fail due to corrosion, lightning, and animal-related short circuits. In addition, many transformers are replaced during distribution system upgrades or after a certain age, not due

[19] DOE's authority to set standards for distribution transformers, by rulemaking, is set forth in 42 U.S.C. 6317(a)(2). DOE is required to follow the procedures in 42 U.S.C. 6295(p) for this rulemaking proceeding. (42 U.S.C. 6316(a))

to insulation degradation failure. Therefore, the fraction of transformers that have longer service lifetimes when insulation degradation rates are slow may be small. Furthermore, the most significant decrease in transformer temperatures occurs with amorphous core designs, with the potential lifetime extension benefits likely to be seen after 25–35 years of service. DOE does not have at its disposal or know of the existence of data that demonstrate an actual increase in the lifetime of amorphous core transformers in this age range.

DOE already includes in its analysis the economic benefits of reliability from more efficient transformers due to decreased peak loading. It includes a reliability margin cost in generation, transmission and distribution capacity costs that are included in the marginal capacity cost estimates for both the LCC analysis and the national impact analysis (NIA). As such, DOE fully includes the decreased reliability capacity costs resulting from standards in its benefits calculations. Electricity cost estimates, which include capacity and reliability costs, are discussed in detail in TSD Chapter 8, section 8.3.5.

D. National Impact Analysis—National Energy Savings and Net Present Value Analysis

The NIA evaluates the impact of a proposed standard from a national perspective rather than from the consumer perspective represented by the LCC. When DOE evaluates a proposed standard from a national perspective, it must consider several other factors that are different from, or not included in, the LCC analysis. One of the factors DOE modeled in the NIA was the replacement of existing, less efficient transformers with more efficient transformers over time. DOE estimated this rate of replacement using an equipment shipments model that describes the sale of transformers for replacement and for inclusion in new electrical distribution system infrastructure. A second factor included in the NIA was a discount rate. Since the national cost of capital may differ from the consumer cost of capital, the discount rate used in the NIA can be different from that used in the LCC. The third factor DOE included in the NIA was the difference between the energy savings obtained by the consumer and the energy savings obtained by the Nation. Because of the effect of distribution and generation losses, the national energy savings from a proposed standard are larger than the sum of the individual consumers' energy savings. The details of DOE's NIA are provided in Chapters 9 and 10 of the TSD.

DOE received comment on two issues related to discount rates in response to the NOPR concerning the NIA analysis. The first was the selection of the discount rate that is best for evaluating the NPV benefits to the country, and the second was the process of applying a discount rate to energy savings and emissions. In addition, there were comments regarding the need for DOE to account for other national benefits, such as potential decreases in natural gas prices and increased electrical system reliability. These natural gas price and electrical system reliability impacts are discussed above in the description of the LCC methodology and comments in section IV.C.2.e and at the end of section IV.C.3.c, respectively.

1. Discount Rate

a. Selection and Estimation Method

In response to the NOPR, DOE received a range of comments with respect to the discount rate to use in evaluating national benefits. ACEEE and Metglas recommended that DOE use a discount rate of 4.2 percent and 4.25 percent, respectively. (ACEEE, No. 127 at p. 1; Metglas, No. 144 at p. 4) ASAP and NRDC recommended that DOE use the three percent discount rate in evaluating national impacts. (Public Meeting Transcript, No. 108.6 at p. 120; NRDC, No. 117 at p. 9) NRDC further commented that the long-term average rate of return on government bonds is 1.2 percent real. (Public Meeting Transcript, No. 108.6 at pp. 124–125) EEI commented that commercial customers seek a 20- or 25-percent nominal discount rate for returns. (Public Meeting Transcript, No 108.6 at p. 122) Finally, Southern Company noted that seven percent nominal is close to their cost of capital, and commented that excessive transformer investments are likely to displace more productive distribution system investments in other parts of the company. (Public Meeting Transcript, No. 108.6 at pp. 120–121)

DOE follows OMB guidance in the selection of the discount rate for evaluating national benefits. OMB Circular A–4 provides clear guidance to DOE directing it to use discount rates of seven percent and three percent in evaluating the impacts of regulations. To address comments, DOE also reported results for the 4.2 percent discount rate in Appendix 10A of the TSD for this rulemaking. In selecting the discount rate corresponding to a public investment, OMB directs agencies to use ''the real Treasury borrowing rate on marketable securities of comparable maturity to the period of analysis.'' Office of Management and Budget (OMB) Circular No. A–94, ''Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs,'' dated October 29, 1992, section 8.c.1.

b. Discounting Energy and Emissions

In the NOPR, DOE reported both undiscounted and discounted energy savings and emissions impacts and invited comment on the appropriateness of the discount rates used. 71 FR 44407. CEC commented that DOE should not use or report discounted emissions. (Public Meeting Transcript, No. 108.6 at p. 109) EEI commented that discounted emissions and energy savings are an interesting point of information, but DOE should determine the standard based on the absolute numbers. (Public Meeting Transcript, No. 108.6 at p. 111) NRDC objected to discounting emissions and would advocate for a zero percent discount rate for emissions. (Public Meeting Transcript, No. 108.6 at pp. 113–114) Southern Company commented that discounting future sulfur dioxide (SO_2) emissions would be similar to discounting the future price or value of gold, which would depend on the projected price in the future, which will almost always be larger (not smaller) than the current price. (Public Meeting Transcript, No. 108.6 at p. 121)

Consistent with Executive Order 12866, ''Regulatory Planning and Review,'' 58 FR 51737, DOE follows the guidance of OMB regarding methodologies and procedures for regulatory impact analysis that affect more than one agency. In reporting energy and environmental benefits from energy conservation standards, DOE will report both discounted and undiscounted (i.e., zero discount-rate) values.

E. Commercial Consumer Subgroup Analysis

In analyzing the potential impacts of new or amended standards, DOE evaluates impacts on identifiable groups (i.e., subgroups) of customers, such as different types of businesses, which may be disproportionately affected by a national standard. For this rulemaking, DOE identified rural electric cooperatives and municipal utilities as transformer consumer subgroups that could be disproportionately affected, and examined the impact of proposed standards on these groups. The consumer subgroup analysis is discussed in detail in TSD Chapter 11.

F. Manufacturer Impact Analysis

For the MIA, DOE introduced one change to the methodology it described in the NOPR. In the proposed rule, DOE captured the costs of conversion, by manufacturers of liquid-immersed transformers, to production of amorphous core transformers at TSL6 (all DLs) and TSL5 (DL3 through DL5). For the final rule analysis and its associated material pricing assumptions, DOE's LCC customer choice model indicates that manufacturers would also produce significant volumes of amorphous core transformers at TSL3, TSL4, and TSLA. For TSL3 and TSL4, the model indicates that 95 percent of all transformers in DL4 would be constructed from amorphous core technology. Similarly, for TSLA, 49 percent of DL4 transformers and 84 percent of DL5 transformers would be amorphous core transformers. For the final rule, DOE modeled this partial conversion to amorphous core construction for TSL3, TSL4, and TSLA (with no change to the proposed rule methodology for TSL5 and TSL6).

G. Employment Impact Analysis

Indirect employment impacts from distribution transformer standards consist of the net jobs created or eliminated in the national economy, other than in the manufacturing sector being regulated. These indirect employment impacts are a consequence of: (1) Reduced spending by end users on energy (electricity, gas—including liquefied petroleum gas—and oil); (2) reduced spending on new energy supply by the utility industry; (3) increased spending on the purchase price of new distribution transformers; and (4) the effects of those three factors throughout the economy. DOE expects the net monetary savings from standards to be redirected to other forms of economic activity. DOE also expects these shifts in spending and economic activity to affect the demand for labor.

DOE did not receive stakeholder comments on its net national employment estimation methodology. DOE therefore retained the same methodology that it used in the NOPR. For more details on the employment impact analysis, see TSD Chapter 14.

H. Utility Impact Analysis

The utility impact analysis estimates the impacts that the energy savings from a standard has on the nation's energy production and distribution infrastructure. These impacts include the change in fuel consumed by fuel type, and the change in generation capacity by generator type.

DOE analyzed the effects of standards on electric utility industry generation capacity and fuel consumption using a variant of EIA's NEMS. NEMS, which is available in the public domain, is a large, multi-sectoral, partial-equilibrium model of the U.S. energy sector that estimates the economic supply and demand balance between the energy sector and other sectors of the U.S. and international economies from year to year. The EIA uses NEMS to produce the AEO, a widely recognized baseline energy forecast for the U.S. DOE uses a variant known as NEMS–BT for the appliance and equipment standards rulemakings. (See TSD Chapter 13). Since DOE did not receive comments on the utility impact analysis methods in response to the NOPR, DOE made no adjustments to the methodology for the final rule analysis.

For the proposed rule, DOE used AEO2005 as input to the utility analysis, which DOE updated to AEO2006 for this analysis. As in the proposed rule, the utility impact analysis was conducted as policy deviations from the *AEO*[20] applying the same basic set of assumptions. For example, the operating characteristics (e.g., energy conversion efficiency and emissions rates) of future electricity generating plants are as specified in the *AEO2006* Reference Case, as are the prospects for natural gas supply. The utility impact analysis reports the changes in installed generation capacity and changes in end-use electricity sales that result from each TSL.

I. Environmental Analysis

DOE determined the environmental impacts of the proposed standards. Specifically, DOE calculated the reduction in power plant emissions of carbon dioxide (CO_2), SO_2, NO_X, and mercury (Hg), using the NEMS–BT computer model. The environmental assessment published with the TSD, however, does not include the estimated reduction in power plant emissions of SO_2 because, as discussed below, any such reduction resulting from an efficiency standard would not affect the overall level of SO_2 emissions in the U.S.

NEMS–BT is run similarly to the *AEO2006* NEMS, except that in NEMS–BT distribution transformer energy usage is reduced by the amount of energy (by fuel type) saved due to the proposed TSLs. DOE obtained the input of energy savings from the NES spreadsheet. For the environmental analysis, the output is the forecasted physical emissions. The net benefit of the standard is the difference between emissions estimated by NEMS–BT and the *AEO2006* Reference Case. While DOE used *AEO2007* for electricity price forecasts, the most recent version of NEMS–BT available to DOE for the environmental and utility analysis was based on *AEO2006.* As discussed above, DOE found that the differences between the marginal generation mix and emissions factors between *AEO2007* and *AEO2006* forecasts are very small which implies that generation, fuel consumption and emissions estimates will have a similarly small relative difference between *AEO2007* and *AEO2006.* Therefore DOE performed no further updates to the environmental and utility analyses for the final rule analysis beyond the *AEO2006* results. (See TSD Chapter 13)

NEMS–BT tracks CO_2 emissions using a detailed module that provides robust results because of its broad coverage of all sectors and inclusion of economic interactions between sectors that can impact emissions. DOE based the NO_X reductions on forecasts of compliance with the Clean Air Interstate Rule recently promulgated by EPA. 69 FR 25184 (May 5, 2004); 69 FR 32684 (June 10, 2004); and 70 FR 25162 (May 12, 2005). In the case of SO_2, the Clean Air Act Amendments of 1990 set an emissions cap on all power generation. The attainment of this target, however, is flexible among generators and is enforced by applying market forces, through the use of emissions allowances and tradable permits. As a result, accurate simulation of SO_2 trading tends to imply that the effect of efficiency standards on physical emissions will be near zero because emissions will always be at, or near, the ceiling. Thus, there is virtually no real possible SO_2 environmental benefit from electricity savings as long as there is enforcement of the emissions ceilings. See the environmental assessment, a separate report within the TSD, for a discussion of these issues.

In response to the NOPR, DOE received comments regarding the potential economic benefits of emissions reductions. ACEEE commented that the EIA forecast does

[20] While the AEO2007 electricity price forecast data was available in time for preparation of this final rule, the full AEO2007 forecast was not available at the time DOE performed the utility and environmental impact analysis. DOE therefore used AEO2006 for the utility and environmental analysis. Following completion of the utility and environmental analysis and after the full AEO 2007 became available, DOE compared the AEO2006 and AEO2007 and found the forecasts of electricity prices, the marginal generation mix and emissions factors in the AEO2007 and AEO2006 forecasts were very similar. The two forecasts provide the same marginal fractions of coal and natural gas generation (within 3.5%), and have marginal CO_2 emissions factors that differ by less than 2%.

not factor in any potential cost due to addressing CO_2 emissions, and that this may lead to an underestimate of the potential economic benefits of CO_2 emissions reductions resulting from standards. (Public Meeting Transcript, No. 108.6 at pp. 42–43) CEC also commented that DOE did not include potential economic benefits and costs of CO_2 emissions in its electricity price forecast.

DOE did not include estimates of the economic benefits of CO_2 emissions reductions because of uncertainties in the forecast of the economic value of such emissions reductions. DOE instead provides fairly detailed reporting of the physical emissions reductions in the environmental assessment report in the TSD so that they can be evaluated as a separate environmental benefit in the selection of an energy conservation standard. Details are provided in the environmental assessment report in the TSD.

V. Discussion of Other Comments

Since DOE opened the docket for this rulemaking, it has received more than 170 comments from a diverse set of parties, including manufacturers and their representatives, States, energy conservation advocates, and electric utilities. Comments DOE received in response to the NOPR, on the soundness and validity of the methodologies DOE used, are discussed in section IV. Other stakeholder comments in response to the NOPR addressed the burdens and benefits associated with new energy conservation standards, the information DOE used in its analyses, results of and inferences drawn from the analyses, impacts of standards, the merits of the different TSLs and standards options DOE considered, other issues affecting adoption of standards for distribution transformers, and the DOE rulemaking process. DOE addresses these other stakeholder comments in response to the NOPR below.

A. Information and Assumptions Used in Analyses

1. Engineering Analysis

DOE received comments on the engineering analysis in four areas: primary voltage sensitivities, material prices, amorphous material prices, and material availability.

a. Primary Voltage Sensitivities

As an analysis for the final rule, DOE considered alternative primary voltages in its representative units designed in the engineering analysis. ERMCO commented that the voltages DOE used for its NOPR analysis were reasonable and common voltages for the representative units from DL1–DL5. However, ERMCO was concerned that there are certain voltages used in distribution networks in the U.S. today that are unusual, and may not be achievable at TSL4. ERMCO also stated that there may be impedance or size requirements, specified by utilities, that lower efficiency. (ERMCO, No. 113 at p. 2) ERMCO provided a second written comment, focusing on the voltage issue and identifying dozens of voltages that it believes may be more problematic than others for achieving TSL4. (ERMCO, No. 147 at pp. 3–4) ERMCO also noted that, while primary voltages and basic impulse insulation level (BIL)[21] ratings have the most effect on the ability to achieve a high efficiency design, a low secondary voltage of, for example, 208Y/120 volts on a large kVA unit (1500 kVA) also can be difficult to manufacture because of the large cross-sectional area of the secondary winding. Finally, ERMCO noted that dual-voltage designs are more difficult to manufacture because of complications with how the windings are prepared. (ERMCO, No. 147 at pp. 1–2)

In response to this comment, DOE conducted an engineering sensitivity analysis to understand more about the potential impact of different voltages on the efficiency of the resulting designs. DOE conducted sensitivity analysis runs on DL2 (i.e., 25 kVA pole-mount), DL4 (150 kVA three-phase), and DL5 (1500 kVA three-phase). Using all the same inputs (including material prices), but changing the primary and/or secondary voltages, DOE found that some of the transformers with the different primary and/or secondary voltages had a higher first cost and were less efficient. The impact on DL4 was the most significant, with efficiency shifts as great as 0.18 percent with certain BIL ratings. This means that, all else being equal, a DL4 transformer designed with the reference voltage may be 99.34 percent efficient, while one with the higher BIL-rated primary voltage would be 99.16 percent efficient. This impact on the transformer designs was one of the ''other factors'' taken into consideration by the Secretary when reviewing each of the TSLs and selecting today's standard (see section VI.D.1 of this final rule). The results of the voltage sensitivity analysis can be found in Appendix 5D of the TSD.

[21] The BIL rating represents the amount of electrical insulation incorporated into the transformer. The higher the BIL rating, the more insulation and the greater the transformer's ability to handle high voltages.

b. Increased Raw Material Prices

DOE received comments expressing concern over material prices that DOE used in developing the proposed standards, including prices for core steel and conductors. ACEEE commented that material prices are unusually high right now, citing press articles and futures markets which are anticipating that materials prices may come down. ACEEE believes electrical steel prices will come down because of announced capacity additions in the industry. (ACEEE, No. 127 at p. 6) NPCC commented that fluctuating material prices are not a reason for concern in setting the standard because transformer material prices are correlated with the materials used to construct power plants. NPCC stated that if the standard is set low because of high material prices, the cost of adding electricity generation capacity (i.e., powerplants) will also be higher under any high material price scenario. (NPCC, No. 141 at p. 4)

Cooper Power Systems commented that it believes DOE should obtain current material price data to determine which should be used as the benchmark. Cooper found that the 2005 material price sensitivity analysis conducted in the NOPR was more representative than DOE's five-year average material price analysis. (Cooper, No. 154 at p. 3) Howard Industries commented that its material prices have increased 30–40 percent in the last two to three years, and it believes DOE should recalculate its engineering curves based on 2005/2006 material prices. (Howard, No. 143 at p. 7) NEMA expressed concern that DOE's baseline analysis used outdated material costs, and requested that DOE obtain 2005 and 2006 material pricing to use as the new benchmark. NEMA stated that the demand for electrical products in China is very high, and this demand is driving up the prices of commodity materials that are used in the production of transformers. (Public Meeting Transcript, No. 108.6 at p. 142; NEMA, No. 125 at pp. 1–2) The National Rural Electric Cooperative Association (NRECA) also expressed concern about core steel availability and prices. (NRECA, No. 123 at p. 3)

In response to these comments, DOE developed a revised set of reference material prices. The revised five-year average material price for the final rule spans the years 2002 through 2006, and is based on discussion with manufacturers and material suppliers. This approach is consistent with a comment from EEI, which noted that commodity materials can fluctuate over time, and that EEI believed DOE was correct to use material price averages in its analysis. (EEI, No. 137 at p. 5) Compared with the NOPR average material prices, which spanned from 2000 through 2005, most of the final rule material prices are approximately 15 to 30 percent higher, after adjusting for inflation. Copper wire had a much more dramatic increase in price, with as much as a 50% increase in its cost per pound. Cold-rolled grain-oriented core steel increased by approximately 25% per pound.

DOE used the new five-year average material prices to develop new engineering analysis cost-efficiency curves, which it then incorporated into the LCC spreadsheets for the final rule analysis. The new five-year average material prices and revised engineering analysis cost-efficiency curves can be found in Chapter 5 of the TSD.

c. Amorphous Material Price

DOE received several comments on amorphous core material, questioning primarily the pricing that DOE used in the engineering analysis prepared as a basis for the NOPR. ACEEE commented that DOE should check Metglas' assertion that DOE had overestimated the cost of amorphous core transformers. (ACEEE, No. 127 at p. 6) National Grid commented that DOE should re-evaluate the information presented by the amorphous material manufacturer. (NGrid, No. 138 at p. 2) Metglas stated a concern that the DOE analysis portrayed amorphous metal transformers as too expensive. Metglas commented that the software input cost for a finished core should have been $1.75/lb and not $2.85/lb, based on the fact that the raw material price for amorphous material was $0.80 to $0.90/lb for 2000 to 2004, and $0.95/lb for the first quarter of 2005. (Public Meeting Transcript, No. 108.6 at p. 36; Metglas, No. 144 at p. 2)

In response to this comment, DOE reviewed its material pricing for amorphous core material, as part of its review (discussed in the previous subsection) of all the material prices used in its engineering analysis. DOE's review found that the five-year average finished amorphous core material price was $2.14 per pound. Details on the review of raw material and mark-up costs associated with sourcing a finished amorphous core can be found in Chapter 5 of the TSD.

d. Material Availability

DOE received several comments expressing concern over the availability of materials—including core steel and conductors—for building energy efficient distribution transformers. These issues pertain to a global scarcity of materials as well as issues of materials access for small manufacturers.

NEMA expressed concern over the effective date of the standard because of a lack of core steel availability. (Public Meeting Transcript, No. 108.6 at p. 220) NRECA also expressed concern about core steel availability. (Public Meeting Transcript, No. 108.6 at p. 51; NRECA, No. 123 at p. 3) Central Moloney commented that it supports TSL2 because it is concerned about the availability of materials needed for higher efficiency transformers. (Public Meeting Transcript, No. 108.6 at p. 60) Howard Industries expressed a similar concern, stating that it believes suppliers of raw materials (e.g., aluminum magnet wire) cannot meet the demand that will be required at TSL2, and the situation would be much worse at TSL4. Howard recommends TSL1. (Howard, No. 143 at p. 6) HVOLT also supports TSL1, because there is a wide array of materials that could be used to meet this level of the minimum efficiency standard. (Public Meeting Transcript, No. 108.6 at p. 229)

Other stakeholders, however, emphasized the changes in the core steel market that would increase availability and may mitigate the impact of potential shortages of core steel. AK Steel stated that it is expanding its steel production capacity to meet the demand needs of more efficient transformers. It indicated that it will increase steel production by 50,000 tons per year starting in early 2007, and that other producers around the world are adding capacity as well. (Public Meeting Transcript, No. 108.6 at pp. 34 and 228) Metglas commented that core steel will become increasingly available, and cited DOE's core steel report (Appendix 3A), showing that AK Steel, POSCO, and Wuhan are each adding significant capacity by 2007. Therefore, Metglas stated that core steel availability concerns should not deter DOE from selecting TSL4. (Metglas, No. 144 at p. 4)

DOE wanted to ensure that it did not adopt a standard level that could only be achieved by one type of core steel, which might be proprietary. To better understand and address the issue of core steels used by selected standards-compliant designs in the LCC, DOE evaluated the types (e.g., M6, M3, SA1) of core steel selected by the LCC consumer choice model at all the liquid-immersed TSLs. Knowing what proportion of the selected designs are built with each of the steel type for each TSL enabled DOE to consider this information in the standard level selection. Details of core steel type proportions for each TSL and each design line are provided in Appendix 8H of the TSD.

2. Shipments/National Energy Savings

DOE received a few comments regarding trends in transformer efficiency and the impact that this may have on energy savings. ACEEE commented that average transformer efficiencies appear to be coming down. (ACEEE, No. 127 at p. 7) NEMA commented that 10 years ago there was a trend where customers bought cheaper and less efficient transformers every year, but that the market has turned around and now an increasing percentage of customers are purchasing TP 1 transformers. NEMA also noted that the shipments data it has submitted over the years to DOE have shown this changing trend (Public Meeting Transcript, No. 108.6 at p. 220; NEMA, No. 125 at p. 3) NRECA commented that standards may encourage some utilities to stop evaluating transformer purchases for efficiency because the small differences between the energy savings and costs of evaluated and standard-compliant transformers may no longer justify the cost of performing evaluations. (NRECA, No. 123 at p. 3)

DOE did not include any baseline efficiency trends in its shipments and national energy savings models. As noted in comments received by DOE, it is clear that transformer efficiencies have dropped over the last decade. However, current data appears to indicate the trend towards lower efficiencies has ended, but the data are inconclusive as to whether efficiencies are remaining level or increasing slightly. Furthermore, AEO forecasts show no long term trend in transmission and distribution losses. Therefore, given the variation in comments, and the data from AEO forecasts, DOE estimates that the probability of an increasing efficiency trend and the probability of a decreasing efficiency trend are approximately equal, and therefore used a zero trend in baseline efficiency as the median scenario. DOE performed sensitivity analyses for both the low and high baseline efficiency in the LCC analysis with results presented in Appendix 8D of the TSD.

3. Manufacturer Impact Analysis

Metglas made two specific comments related to the MIA. First, Metglas said that it was ''out of context'' for DOE to incorporate conversion capital expenditures into the MIA. Since the engineering analysis and LCC analysis assumed that U.S. transformer manufacturers would purchase finished amorphous cores, Metglas identified DOE's inclusion of capital expenditures associated with conversion to amorphous core technology as inconsistent. Second, Metglas stated that the conversion capital expenditures DOE estimated were two to three times higher than actual experience has shown in commercial production. (Metglas, Inc., No. 144 at pp. 2–3)

Regarding Metglas's first point, DOE recognizes that the engineering and LCC analyses are based on a scenario where U.S. transformer manufacturers purchase finished amorphous cores (for TSLs 6, 5, A, 4, and 3), while the MIA is based on a scenario where manufacturers would largely convert their facilities to produce the amorphous cores for the amorphous core transformers. For the engineering and LCC analyses, DOE used actual market pricing in its analysis to develop its production costs and transformer price estimates. The engineering and LCC analyses are based on the assumption that manufacturers who make a decision to build an amorphous core transformer will purchase prefabricated (i.e., cut and formed) amorphous cores.

During the manufacturer interviews prior to the August 2006 NOPR, DOE learned that it was likely that many of the U.S. manufacturers would convert their facilities to produce amorphous cores if the standard required or otherwise triggered significant volumes of amorphous core transformer purchases—manufacturers indicated that production of cores is an important part of the value chain and they would likely choose to continue to produce them. Therefore, DOE decided to conduct the MIA as if manufacturers would convert their facilities to produce amorphous core transformers for TSLs where the DOE customer choice model indicated selection of amorphous core transformers in high volume. In its assessment of manufacturer impacts, DOE is not evaluating the assumption made for the engineering and LCC scenarios, namely that manufacturers would purchase finished, prefabricated amorphous cores. If it were modeled in the MIA, then the employment engaged in fabricating cores would be shifted from domestic factories to overseas businesses which would operate all the equipment needed to manufacture amorphous cores. DOE believes that both transformer production costs and transformer pricing would be similar under the two scenarios. The difference between the two scenarios would affect only the allocation of the production costs. In the MIA, instead of manufacturers buying prefabricated cores (i.e., U.S.-sourced amorphous ribbon processed in India), paying for trans-oceanic shipping, and lowering their labor costs, manufacturers would allocate costs differently by purchasing amorphous material and employing domestic labor to manufacture the amorphous cores. The decision a manufacturer makes between outsourcing amorphous core production and converting its facilities to produce amorphous core transformers depends on multiple competing factors, including the trade-off between labor and trans-oceanic shipping costs. Because of these competing factors, it is not obvious whether manufacturers would purchase amorphous cores from abroad or produce them on-site (and manufacturers indicated during interviews that they are not sure which path they would follow today)—this is tantamount to saying that the cost difference between the two scenarios is likely not major. For these reasons, DOE concludes it is appropriate to use the pricing information (based on purchased cores) together with appropriate conversion capital cost estimates in the MIA.

With respect to Metglas's second point about the magnitude of the estimated conversion capital expenditures, DOE conducted a detailed review of its amorphous-related conversion capital expenditure estimates in the August 2006 NOPR. DOE found that the conversion costs estimates in the NOPR could be reduced by using different core manufacturing equipment than DOE had assumed in the NOPR. DOE's review concluded that the final rule conversion capital expenditures at TSL5 and TSL6 are about half of those presented in the August 2006 NOPR. DOE's conclusion is consistent with Metglas's assertion that the investment costs in the August 2006 NOPR were two to three times too high. See TSD Chapter 12, Section 12.4.1, for detailed information on the capital expenditures associated with amorphous core conversion.

B. Weighing of Factors

1. Economic Impacts

a. Economic Impacts on Consumers

In response to the NOPR and NODA, DOE received comments regarding the economic impacts of the proposed standards. The vast majority of these comments discussed such impacts in terms of the life-cycle costs. This preamble discusses these comments in section V.B.2, below.

b. Economic Impacts on Manufacturers

DOE received a comment from Metglas that relates to the burden that would be placed on manufacturers if minimum efficiency standards were implemented that required amorphous core transformers. Metglas commented that while it cannot replace the entire conventional cores steel market, it is currently making investments that will allow it to double its production by mid-2007, and it has a commitment to expand as the market develops. (Metglas, No. 144 at p. 3; Public Meeting Transcript, No. 108.6 at p. 233) DOE appreciates this comment, but while Metglas may have a commitment to expand production capacity with an expanding market, this provides no guarantee that severe material shortages will not occur if demand increases faster than Metglas' ability to expand production. As part of DOE's weighing the benefits and burdens of setting standards for distribution transformers, DOE considered whether the standard would require amorphous core steel.

As discussed above, DOE is reluctant to set standard levels that would require products to be constructed of a single, proprietary design or material. In particular, in the case of amorphous material, DOE is concerned because it understands that currently there is only one significant supplier of amorphous ribbon to the U.S. market.[22] DOE found, for example, at TSL6, all design lines' representative units would necessarily be constructed of amorphous material and at TSL5 and TSLA, design lines 3–5 would be constructed of amorphous material.

DOE received comments from multiple parties about transformer commoditization [23] and foreign competition. Cooper Power Systems suggested to DOE that a standard set toward the high end of the efficiency range that can be met by large manufacturers would quickly lead to commoditization and thus foreign competition. Cooper said that it is important for there to be efficiencies that utilities desire and specify above the minimum efficiency standard because foreign manufacturers will find it more difficult to compete in the U.S.

[22] At certain very high efficiency levels, the only core material that would enable compliant transformers would be amorphous material.

[23] The term 'commoditization' in this context reflects a concern expressed by stakeholders that the mandatory minimum efficiency standards will simply become the most commonly requested transformer efficiency levels in the market, and manufacturers who currently are providing custom-build designs in a range of efficiency levels may be put at a disadvantage relative to manufacturers or importers who simply focus on mass-production of a single standards-compliant design.

when product variety is preserved. Cooper noted that recent trends indicate that many utilities are again evaluating losses when specifying transformers because utility deregulation is collapsing. (Cooper Power Systems, No. 154 at p. 1) Howard Industries supported the claim that a minimum efficiency standard will lead to offshore production. Howard's comments did not indicate at which TSLs it felt this effect would become problematic. (Howard Industries, No. 143 at p. 3)

Duke Energy stated that the risk of increments of manufacturing capacity being moved offshore is outweighed by the benefits of energy savings. (Duke Energy Corporation, No. 134 at p. 3) ACEEE submitted comments that are consistent with Duke Energy's. While ACEEE agreed with manufacturers that efficiency standards do lead to more standardization of product designs (i.e., commoditization), it believes U.S. manufacturers can still market high efficiency products (e.g., if the final standard were set high enough to exclude most silicon core steel designs, manufacturers could market amorphous core transformers as high-efficiency products). Furthermore, ACEEE contended that the cost savings of establishing offshore production are not significant for transformers since transformers are heavy and, consequently, costly to ship. (ACEEE, No. 127 at p. 8; Public Meeting Transcript, No. 108.6 at p. 95) AK Steel expressed disagreement with ACEEE's view, stating that many power transformers are shipped to the U.S. from abroad, so it is therefore clear that transformer weight and shipping costs do not deter offshore transformer manufacturing. (Public Meeting Transcript, No. 108.6 at p. 96) ASAP pointed out that the incentive for manufacturers to move offshore due to low labor costs in Asia will be present with or without standards. (Public Meeting Transcript, No. 108.6 at p. 102) Finally, the Midwest Energy Efficiency Alliance (MEEA) suggested that DOE cannot rely on the risk of outsourcing production to lower labor cost countries in choosing TSL2 (instead of higher standards) because it has not quantified the risk of this occurrence. In contrast, MEEA pointed out, DOE quantified the indirect employment benefits to the economy of higher TSLs. (MEEA, No. 126 at p. 4)

DOE appreciates the varied comments it received on the issue of transformer commoditization, the outsourcing of production, and foreign competition. While DOE understands that some manufacturers are concerned that today's rule could lead to some commoditization of liquid-immersed transformers, DOE's engineering analysis indicates that many designs exist that are more efficient than today's minimum efficiency standard. The designs available to manufacturers can be constructed of either amorphous material or silicon core steels. Moreover, today's minimum efficiency standard can be met with two or more grades of silicon core steel, depending on the design line. In addition, DOE notes that there are many other custom design factors which are built into a distribution transformer in addition to the efficiency of the unit. Utilities can (and do presently) specify transformer designs with efficiencies that are both at and above (i.e., more efficient than) the minimum efficiency standard being adopted in today's final rule. Because today's standard preserves multiple design paths and a diversity of products, DOE does not expect that today's standard will be a significant cause of increased levels of outsourced production to lower labor cost countries or affect U.S. manufacturer's ability to compete. DOE believes this is the situation for both liquid-immersed and medium-voltage dry-type transformer manufacturing. While concerns about outsourcing and foreign competition may be more relevant and valid for standard levels higher than those promulgated today, DOE rejected those standard levels based on impacts associated with other EPCA criteria, and did not reject those higher standard levels based upon explicit consideration of outsourcing and foreign competition.

2. Life-Cycle Costs

DOE received extensive comments regarding the life-cycle economic burdens and benefits from standards, in response to both the NOPR and the NODA. A large number of stakeholders recommended that DOE select a standard that minimizes life-cycle costs and encouraged DOE to select TSL4 on the ground that it achieved that goal. (ACEEE, No. 127 at p. 1–3, 9; CEC, No. 98 at p. 1–2; NASEO, No. 131 at p. 1–2; NPCC, No. 141 at p. 1–4; Public Meeting Transcript, No. 108.6 at p. 193; U.S. Congress, No. 125 at p. 1–2; Metglas, Incorporated, No. 144 at p. 3, 6; NPCC, No. 141 at p. 1–4; Office of Consumer Affairs and Business Regulation, Division of Energy Resources, Commonwealth of Massachusetts, No. 152 at p. 1–2; PNM Resources and 9 other utilities, No. 140 at p. 1–2; NYSERDA, No. 136 at p. 1; Public Meeting Transcript, No. 108.6 at p. 39; National Grid, No. 138 at p. 1–2; Public Meeting Transcript, No. 108.6 at p. 59)

Others commented that a standard that minimizes life-cycle costs creates burdens on particular subgroups, or that the minimum life-cycle cost level, TSL4, creates inconsistencies between three-phase and single-phase transformers and that these burdens justify giving less weight to life-cycle cost results than what was advocated by other stakeholders. NRECA commented that it does not support TSL4, because it believes this level would unfairly burden rural consumers who are likely at an economic disadvantage compared to urban consumers. (NRECA, No. 176 at p. 3) NRECA further commented that utilities can be encouraged to minimize life-cycle costs by being total ownership cost (TOC) evaluators. (NRECA, No. 123 at p. 1–2) ERMCO commented that single-phase liquid-units are commonly ''banked'' to supply three-phase power, therefore single-phase and three-phase units should have the same efficiency requirements. (ERMCO, No. 165 at p. 1) NPCC commented that TSL4 provides the maximum benefits compared to burdens except for design line 4 transformers where they recommended adoption of TSL2. (NPCC, No. 141 at p. 1–4)

While DOE gave substantial weight to the LCC results in selecting the standard levels in today's rule, these results were not the sole determining factor. DOE weighed all of the economic impacts in reaching its decision. DOE agrees with stakeholders who commented that differences in efficiencies between single-phase and three-phase efficiency levels would create burdens on both manufacturers and consumers. The levels selected by DOE are close to the minimum life-cycle cost levels that maintain consistency between single-phase and three-phase efficiency requirements. (see TSD Appendix 8I)

3. Energy Savings

In response to the NOPR, DOE received comments on the need to maximize energy savings. Many stakeholders commented that the TSL2 level proposed by DOE in the NOPR did not maximize energy savings. (ACEEE, No. 127 at p. 1–3, 9; Public Meeting Transcript, No. 108.6 at p. 26; CEC, No. 98 at p. 1–2; CDA, No. 111 at p. 5; Dow Chemical Company, No. 129 at p. 1–2; Exelon Corporation, No. 105 at p. 1; NARUC, No. 106 at p. 1–5; NASEO, No. 131 at p. 1–2; NRDC, No. 117 at p. 1–6; NPCC, No. 141 at p. 1–4; U.S. Congress, No. 125 at p. 1–2; U.S. Senate, No. 120 at p. 1)

DOE also received comment that some levels could create unintended consequences that could reduce energy savings. CEA expressed concerned that

TSL3 and TSL4 would force utilities to use larger kVA transformers to meet efficiency requirements because these levels are especially hard to meet for small transformers. The over-sizing of transformers because of the unavailability of moderate cost small transformers may increase losses overall compared to the case of no standards (CEA, No. 171 at p. 3) Cooper commented that higher standards for liquid-immersed transformers compared to dry-types could shift the market toward increased use of less efficient dry-type designs instead of non-flammable liquid-filled models, negating energy savings. (Cooper, No. 175 at p. 2)

DOE recognizes that inconsistencies between the stringency of efficiency levels between small and large transformers can lead to market shifts that may decrease energy savings. DOE did not quantitatively estimate such potential market shifts because of a lack of data on such market shift elasticities. But DOE did solicit stakeholder comment in the NODA regarding the possibility of recombining the efficiency levels proposed in the NOPR. 72 FR 6189–6190. In section V.C below, DOE addressed the burden of potential market shifts described in stakeholder comments by recombining the proposed efficiency levels to create more consistency between small, large, single-phase, and three-phase liquid-immersed transformers. By recombining efficiency levels into combinations that have fewer economic burdens, DOE increases the energy savings that are economically justified.

4. Lessening of Utility or Performance of Products

a. Transformers Installed in Vaults

DOE received comments that energy conservation standards may lessen the utility and performance of transformers by resulting in transformers that are heavier and larger, thus creating size and space constraint issues. DOE quantified these effects in its analysis and estimated the impacts in terms of increased installations costs. This rulemaking describes the comments and DOE's response to these issues in section IV.C.1.b above.

5. Impact of Lessening of Competition

DOE received comment from the Department of Justice, which indicated that the proposed levels in the NOPR may adversely affect competition with respect to distribution transformers used in industries, such as underground coal mining, where physical conditions limit the size of the equipment that can be effectively utilized. (DOJ, No. 157 at p. 2) DOE considered this input from DOJ, along with comments from several stakeholders, and as discussed above in section IV.A.2 of today's notice, decided to treat space-constrained underground mining transformers as a separate product class in this final rule.

6. Need of the Nation To Conserve Energy

DOE received extensive comment from stakeholders on the need of the Nation to conserve energy. NRDC commented that the need for the Nation to conserve energy was urgent from both an environmental and public benefit perspective. (NRDC, No. 117 at p. 1–6) NERC commented that the energy savings may be important for helping maintain electric system reliability. (NERC, No. 133 at p. 1) PNM Resources and nine other utilities commented that energy savings from a standard can improve the security and reduce reliability costs for the Nation's energy system, can provide national economic benefits, reduce generation capacity requirements, and reduce generation-related emissions. (PNM Resources and nine other utilities, No. 140 at p. 1) And many stakeholders commented on the need of the Nation to conserve energy when they commented that the TSL2 level proposed in the NOPR did not maximize energy savings. (ACEEE, No. 127 at p. 1–3, 9; Public Meeting Transcript, No. 108.6 at p. 26; CEC, No. 98 at p. 1–2; CDA, No. 111 at p. 5; Dow Chemical Company, No. 129 at p. 1–2; Exelon Corporation, No. 105 at p. 1; NARUC, No. 106 at p. 1–5; NASEO, No. 131 at p. 1–2; NRDC, No. 117 at p. 1–6; NPCC, No. 141 at p. 1–4; U.S. Congress, No. 125 at p. 1–2; U.S. Senate, No. 120 at p. 1)

DOE recognizes the need of the Nation to save energy. Enhanced energy efficiency improves the Nation's energy security, strengthens the economy, and reduces the environmental impacts or reduces the costs of energy production. In recognition of this national need, DOE recombined the levels proposed in the NOPR to create a new combination of levels that could increase energy savings while maintaining economic justification. The recombined levels considered by DOE are described in more detail in section V.C below.

7. Other Factors

DOE received comments from stakeholders on certain other topics that were considered by the Secretary in arriving at the standard published today. These factors included: (a) Availability of higher BIL rated primary voltages; (b) a materials price sensitivity analysis using current material prices (in addition to the reference scenario of the five-year average material prices); (c) a materials availability analysis to ensure a diverse mix of core steels in the LCC-selected designs; and (d) consistency between single-phase efficiency levels and their three-phase equivalents. Each of these comments is discussed in this rulemaking, in sections that more closely relate to the specific analysis involved.

a. Availability of High Primary Voltages

Another consideration for DOE under the ''Other Factors'' EPCA criterion was whether the standard level selected would impact the availability of transformer designs that have voltages with BIL ratings greater than the designs used in the engineering analysis (see footnote on BIL ratings in section V.A.1.a above). DOE conducted supplementary engineering analyses for selected design option combinations in four liquid-immersed design lines. Relative to the basecase (reference) transformers designed by the software, DOE found that changing the primary voltages to have a higher BIL ratings would reduce the efficiency and increase the cost of the cost-optimized transformer designs. For certain design lines, this impact was particularly significant. The results can be found in TSD Appendix 5D.

b. Materials Price Sensitivity Analysis

DOE is concerned about how material prices might change and impact the market relative to the five-year average material price scenario used for the reference analysis for the final rule. DOE therefore conducted a separate engineering analysis and LCC using the 2006 [24] annual average material prices in addition to the five-year average price scenario. Relative to the five-year average price scenario (used by DOE as the 'reference' material price scenario), DOE found that the LCC savings were generally lower and the payback periods were generally longer under the 2006 (high) material price sensitivity analysis. Material prices and the methodology followed to gather material prices can be found in TSD Chapter 5. The engineering analysis results of the material price sensitivity analysis can be found in TSD Appendix 5C and the LCC results can be found in TSD Appendix 8F.

[24] For this final rule, DOE used annual average material prices representative of a medium to large-sized transformer manufacturer. Since this analysis was performed in early 2007, the most recent data in calculating average annual material prices was data from 2006.

c. Materials Availability Analysis

DOE considered the availability of a variety of core steels that could be used to meet the standard in order to address stakeholder concerns about sources and availability of specific types of core steel. This issue is particularly significant at the higher standard levels where amorphous steel would be required. DOE wishes to ensure a diversity of core steels in the LCC-selected designs, avoiding overly constraining certain grades of steel. DOE found in its review of the core steels selected by the LCC model that certain standard levels had transformer designs based on a disproportionately large percentages of a particular steel grade due to the minimum efficiency standard. The analysis of the core steels selected by the LCC consumer choice model can be found in TSD Appendix 8H.

d. Consistency Between Single-Phase and Three-Phase Designs

DOE is concerned about the consistency between the efficiency values required for single-phase transformers and their three-phase equivalents (per phase). DOE understands from comments submitted that having different standards for single-phase and three-phase liquid-immersed distribution transformers will cause disturbances or distortions in the market if the efficiency requirements promulgated by DOE are inconsistent between single-phase transformers and their three-phase equivalents (see section V.C below).[25] Thus, unless the efficiency of the two per-phase equivalent transformers is equal, distortions may be introduced into the market due to the minimum efficiency standard. In DOE's analysis, this is an issue that only affects liquid-immersed distribution transformers because liquid-immersed single-phase and three-phase units were analyzed separately. For medium-voltage dry-type distribution transformers, the three-phase units were analyzed and the same standard level is being adopted for both three-phase and single-phase units. DOE's evaluation of the consistency of the TSLs considered in the proposed rule and the new TSLs developed for the final rule which address this consistency issue, can be found in TSD Appendix 8I.

[25] For example, if the standard level were lower for single-phase transformers than their three-phase equivalents, transformer consumers may stop purchasing three-phase transformers, and instead purchase three single-phase transformers, and connect them to function as a three-phase transformer.

C. Other Comments

1. Development of Trial Standard Levels for the Final Rule

DOE received comments on three interrelated topics that led DOE to create additional TSLs for liquid-immersed transformers for consideration in deciding what standards to adopt: (1) Consistency of minimum efficiency values for single and three-phase transformers; (2) continuity across capacities (or kVA ratings) at the interfaces between design lines; and (3) reasons for not setting standards for design line 4 at TSL3 or higher. These topics are interrelated because, taken together, they produce a rationale for DOE's construction of additional TSLs: TSLs A, B, C and D.

First, several manufacturers of liquid-immersed distribution transformers recommended that DOE establish minimum efficiency standards that equally treat a single-phase transformer with its corresponding three-phase analog. (Cooper Power Systems, No. 154 at p. 2; Howard Industries, No. 143 at p. 2; Public Meeting Transcript, No. 108.6 at p. 65) For example, a 100 kVA single-phase transformer should be held to the same standard as a 300 kVA three-phase transformer. (Public Meeting Transcript, No. 108.6 at p. 46) (In this example, the 300 kVA three-phase transformer is the analog to the 100 kVA single-phase transformer, that is, the per-phase capacities of the two transformers are identical.) While expressing concern about the inconsistent treatment of single-phase and three-phase transformers in the proposed rule, ERMCO suggested that there may be some rationale for more stringent regulation of the three-phase transformers. (ERMCO, No. 96 at p. 2)

NRDC also commented in support of the construction of a new TSL that achieves consistency between single-phase and three-phase transformers. (Public Meeting Transcript, No. 108.6 at pp. 162–163) ACEEE supported averaging the efficiency values for the single-phase and three-phase transformers to achieve the consistency requested by manufacturers. ACEEE expressed opposition to a simple reduction in the three-phase efficiency levels to match the single-phase levels. (ACEEE, No. 127 at p. 8) DOE analyzed the consistency of its existing TSLs and presents those findings in TSD Appendix 8I.

Second, stakeholders commented on the separate but related issue concerning alleged inconsistent treatment of design lines in the proposed rule. This related issue has to do with smoothing the interfaces between small and large three-phase transformers (i.e., smoothing the interface between design lines 4 and 5). Stakeholders asserted that where the small and large kVA design lines intersect, DOE's proposal might contain a discontinuity, such as a lower efficiency requirement for a higher kVA rating or a significant change in the incremental step increases in efficiency with kVA. Stakeholders suggested that DOE address these discontinuities in the final rule through the use of a smoothing function. ERMCO, Howard Industries, HVOLT, and NEMA are the stakeholders who commented on the discontinuities between small and large three-phase transformers. (Public Meeting Transcript, No. 108.6 at pp. 72, 76, 77, and 78; ERMCO, No. 96 at p. 1; Howard Industries, No. 143 at pp. 1–2)

Third, DOE received comments which called to its attention the problems associated with setting the standard for design line 4 at TSL3 or TSL4 (TSL3 and TSL4 are the same for this design line). NPCC suggested that DOE regulate design line 4 at the TSL2 level. (NPCC, No. 141 at p. 4) Similarly, ERMCO commented that while designs based on silicon core steel can meet TSL3 and TSL4 for DOE's chosen representative units, there are examples of primary voltages that are specified and purchased by utilities today which would not be able to meet levels higher than TSL2 using conventional silicon core steel. (ERMCO, No. 113 at pp. 1–2) In response, DOE conducted a voltage sensitivity analysis considering higher primary voltages and BIL ratings on design lines 2, 3, 4 and 5, and determined that the greatest impact of the higher primary voltages was experienced by design line 4. (See TSD Appendix 5D) DOE agrees with ERMCO's assertion that certain primary voltages, when specified for design line 4, cannot meet TSL4 (or TSL3) using conventional silicon core steel. Furthermore, the DOE customer choice model (in the LCC analysis) indicates that, for the design line 4 representative unit, approximately 95 percent of the transformers selected would be constructed with amorphous cores at TSL3 and TSL4. While TSL3 and TSL4 could be met for all voltage classes using amorphous material, DOE has decided not to regulate to a level that would require amorphous material, for reasons having to do with material availability and the limited number of ribbon suppliers. (see Section V.A.7.c above and Section V.B.1.b below)

In response to the above comments, DOE created TSLs A, B, C and D. Each of these additional TSLs assures the following: (1) Consistency between single-phase and three-phase analogs; (2) that there are no discontinuities between adjacent design lines of the same phase as kVA increases; and (3) that the level for design line 4 is not at TSL3 or higher (i.e., not at 99.26 percent or higher).

TSLA ensures single-phase versus three-phrase consistency by mapping from the single-phase transformers to the three-phase transformers. DOE constructed TSLA based on first selecting the highest design line 1 efficiency level considered in the proposed rule that does not exceed 99.26 percent, which is 99.19 percent (to ensure that the level for design line 4 is not at TSL3 or higher). DOE then chose this same level of 99.19 percent for the three-phase analog, design line 4 (to achieve single-phase versus three-phase consistency). For design line 2, DOE chose the level of 99.04 percent by implementing 0.75 scaling based on design line 1 (to achieve continuity between adjacent design lines). For the last single-phase design line, design line 3, DOE chose the highest efficiency level considered in the proposed rule that yields positive mean LCC savings and does not create a significant discontinuity with design line 1, that is, 99.54 percent efficient. It used this same level for the three-phase analog, design line 5 (to achieve single-phase versus three-phase consistency).

TSLB ensures single-phase versus three-phrase consistency by mapping from the three-phase transformers to the single-phase transformers (i.e., the mapping direction is reversed). DOE constructed TSLB by choosing the highest design line 4 efficiency level considered in the proposed rule that does not exceed 99.26 percent, which is 99.08 percent (to ensure that the level for design line 4 is not at TSL3 or higher). DOE chose this same level of 99.08 percent for the single-phase analog, design line 1 (to achieve single-phase versus three-phase consistency). For design line 2, DOE chose the level of 98.91 percent by implementing 0.75 scaling based off on design line 1 (to achieve continuity between adjacent design lines). For the other three-phase design line, design line 5, DOE chose the highest efficiency level considered in the proposed rule that yields positive mean LCC savings, 99.47 percent. It used this same level for the single-phase analog, design line 3 (to achieve single-phase versus three-phase consistency).

TSLC is similar to TSLB; the only difference is in the treatment of the large kVA transformers (design line 3 and design line 5). For TSLC, instead of choosing the highest NOPR efficiency level for design line 5 that yields positive mean LCC savings (99.47 percent), DOE chose the next lower level of 99.42 percent. DOE used this same level for the single-phase analog, design line 3 (to achieve single-phase versus three-phase consistency).

TSLD is based on TSLC except it rounds down the single-phase levels to TSLs evaluated in the proposed rule. This reduces the single-phase versus three-phase consistency established in TSLC, but results in the creation of a TSL—similar to TSLC—that is based on purely NOPR levels. The resulting levels are 99.04 percent, 98.79 percent, 99.38 percent, 99.08 percent, and 99.42 percent for design lines 1–5, respectively. These correspond to the NOPR TSLs 4, 4, 2, 2, and 3 for design lines 1 through 5, respectively. While TSLD has better consistency between single and three-phase transformers than other TSLs that were considered in the NOPR, as shown in Appendix 8I, this standard level is not perfectly consistent between single and three-phase transformers (as are TSLA, TSLB and TSLC). In particular, at TSLD, the three-phase standard is higher (more stringent) than the single-phase standard at all kVA ratings.

2. Linear Interpolation of Non-Standard Capacity Ratings

NEMA and GE Energy both commented on the issue of non-standard capacity (i.e., kVA) ratings. GE Energy requested clarification on how it should derive the efficiency requirement for transformers which are covered within the scope of this rulemaking, but have a kVA rating that does not appear in the table of efficiency values—for example, 458 kVA. (GE Energy, No. 145 at p. 1) NEMA commented that they believe it would be problematic if DOE were to hold efficiency standards for any kVA ratings not appearing in the tables to the next higher efficiency standard. (NEMA, No. 174 at pp. 3–4) GE Energy and NEMA both recommend that DOE adopt a linear interpolation to scale the efficiency values of the kVA ratings in the table that are immediately above and below the rating that isn't shown in the table. (GE Energy, No. 145 at p. 1; NEMA, No. 174 at p. 4) DOE discussed this issue with its technical experts and reviewed industry practice for the treatment of transformers that have non-standard kVA values. DOE is today adopting this stakeholder recommendation, namely that transformers with kVA ratings not appearing in the standards tables would be subject to standard levels that are calculated by means of linear interpolation from the efficiency requirements of the two kVA ratings immediately above and below. For clarity, DOE is providing an example of the linear interpolation equation for a 458 kVA three-phase medium-voltage dry-type distribution transformer with a 60 kV BIL rating. As shown in Table I.2, the kVA ratings and efficiency requirements immediately above and below 458 kVA are 500 kVA at 98.83% and 300 kVA at 98.67%. This data enables the user to prepare a table with the five known values (i.e., x_1, x_2, x_3, y_1, and y_3) and the one value to solve for, y_2.

TABLE V.1.—EXAMPLE CALCULATION FOR LINEAR INTERPOLATION TO DETERMINE EFFICIENCY REQUIREMENT FOR KVA RATINGS NOT APPEARING IN STANDARDS TABLES

kVA Rating	Efficiency
300 kVA (x_1)	98.67% (y_1)
458 kVA (x_2)	? (y_2)
500 kVA (x_3)	98.83% (y_3)

The kVA and efficiency values (i.e., x_1, x_2, x_3, y_1, and y_3) should then be plugged into the linear interpolation equation shown below, with the result being rounded off to the hundredths decimal place:

$$y_2 = \frac{(x_2 - x_1)(y_3 - y_1)}{(x_3 - x_1)} + y_1$$

For this example, the resultant efficiency requirement (i.e., y_2) calculated for a 458 kVA medium-voltage dry-type distribution transformer with a 60 kV BIL is 98.80%.

VI. Analytical Results and Conclusions

A. Trial Standard Levels

For today's final rule, DOE examined 10 TSLs for liquid-immersed distribution transformers (consisting of the six TSLs DOE considered in the NOPR plus the four new TSLs discussed in section V.C. of this Notice) and six TSLs for medium-voltage, dry-type distribution transformers (the same TSLs that DOE considered in the NOPR since these levels had no single-phase/three-phase consistency issues). Table VI.1 presents the TSLs analyzed and the efficiency level within each TSL for each transformer design line. DOE used the specific transformers from the design lines to represent a range of distribution transformers within the each product class. This table presents the efficiency values of TSLs A, B, C, and D, in the context of the other efficiency values considered in TSL1 through TSL6. TSL6 is the maximum technologically feasible level (max tech) for each class of product.

TABLE VI.1.—EFFICIENCY VALUES (%) OF THE TRIAL STANDARD LEVELS BY DESIGN LINE

Type	Design lines	kVA	Phase	Trial standard level									
				1	2	D	C	B	3	4	A	5	6
Liquid-Immersed	DL1	50	1	98.90	98.90	99.04	99.08	99.08	98.90	99.04	99.19	99.19	99.59
	DL2	25	1	98.70	98.73	98.79	98.91	98.91	98.76	98.79	99.04	98.96	99.46
	DL3	500	1	99.30	99.38	99.38	99.42	99.47	99.46	99.54	99.54	99.74	99.75
	DL4	150	3	98.90	99.08	99.08	99.08	99.08	99.26	99.26	99.19	99.58	99.61
	DL5	1500	3	99.30	99.36	99.42	99.42	99.47	99.42	99.47	99.54	99.71	99.71
Medium-Voltage Dry-Type *	DL9	300	3	98.60	98.82	....	....	....	99.04	99.26	....	99.41	99.41
	DL10	1500	3	99.10	99.22	....	....	....	99.30	99.39	....	99.51	99.51
	DL11	300	3	98.50	98.67	....	....	....	98.84	99.01	....	99.09	99.09
	DL12	1500	3	99.00	99.12	....	....	....	99.23	99.35	....	99.51	99.51
	DL13	2000	3	99.00	99.15	....	....	....	99.30	99.45	....	99.55	99.55

* Design Lines 9 through 13 represent medium-voltage dry-type distribution transformers, and there were no corresponding trial standard levels set for TSLA through TSLD because their efficiency levels are consistent between single-phase and three-phase designs.

Table VI.1 illustrates how the recombined TSLs A, B, C, and D have much greater consistency between the single-phase efficiency levels and the levels for the three-phase counterparts. For example, design line 4 is the three-phase design line that is equivalent to using three design line 1 transformers, while design line 5 is the three-phase design line that is equivalent to three transformers from design line 3. For TSLs A, B, and C, the efficiency levels for DL4 and DL1, and for DL5 and DL3 are equal.

DOE presents the tables of efficiency values for all the preferred kVA ratings (i.e., not only the representative kVA ratings that were analyzed) at each of the various TSLs in the Environmental Assessment report, which is included in the Technical Support Document.

B. Significance of Energy Savings

To estimate the energy savings through 2038 due to new standards, DOE compared the energy consumption of distribution transformers under the base case (no new standards) to energy consumption of distribution transformers under the standards. Table VI.2 summarizes DOE's NES estimates. DOE based these estimates on the results of the revised NIA, which uses energy price forecasts from *AEO2007.* These estimates are described in more detail in TSD Chapter 10.

TABLE VI.2.—NATIONAL ENERGY SAVINGS (QUADS) OF THE TRIAL STANDARD LEVELS

Type	Discount rate	Trial standard level									
		1	2	D	C	B	3	4	A	5	6
Liquid-Immersed	none	1.38	1.94	2.18	2.61	2.75	2.76	3.00	4.07	5.07	7.37
	3%	0.77	1.08	1.21	1.45	1.53	1.53	1.67	2.27	2.82	4.10
	7%	0.39	0.55	0.62	0.74	0.78	0.78	0.85	1.15	1.44	2.09
Medium-Voltage Dry-Type *	none	0.06	0.13	....	....	....	0.19	0.27	....	0.40	0.40
	3%	0.03	0.07	....	....	....	0.10	0.20	....	0.22	0.22
	7%	0.02	0.04	....	....	....	0.05	0.10	....	0.11	0.11

* Medium-voltage dry-type distribution transformers did not have any trial standard levels set for TSLA through TSLD.

C. Economic Justification

1. Economic Impact on Commercial Consumers

a. Life-Cycle Costs and Payback Period

Commercial consumers will be affected by the standards since they will experience higher purchase prices and lower operating costs. To estimate these impacts, DOE calculated the LCC and PBP for the ten trial standards levels considered in this proceeding. DOE's LCC and PBP analyses provided five outputs for each TSL, which are reported in Tables VI.3 through VI.12 below. The first three outputs are the proportion of transformer purchases where the purchase of a design that complies with the TSL would create a net life-cycle cost, no impact, or a net life-cycle savings for the consumer, respectively. The fourth output is the average net life-cycle savings from purchase of a design complying with the standard.

Finally, the fifth output is the PBP for the average consumer purchase of a design that complies with the TSL. The PBP is the number of years it would take for the customer to recover, as a result of energy savings, the increased costs of higher efficiency equipment, based on the operating cost savings from the first year of ownership. The PBP is an economic benefit-cost measure that uses benefits and costs without discounting. However, DOE based the PBP analysis for distribution transformers on energy consumption under actual in-service loading conditions, whereas, in accordance with EPCA, the rebuttable presumption test is based on consumption as determined using loading levels prescribed by the DOE test procedure. As discussed above, while DOE examined the rebuttable presumption criteria (see TSD section 8.7), it determined today's standard levels to be economically justified through an analysis of the economic impacts of increased efficiency levels pursuant to section 325(o)(2)(B)(i) of EPCA. (42 U.S.C. 6295(o)(2)(B)(i)) Detailed information on the LCC and PBP analyses can be found in TSD Chapter 8.

TABLE VI.3.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 1 REPRESENTATIVE UNIT

	Trial standard level									
	1	2	D	C	B	3	4	A	5	6
Efficiency (%)	98.90	98.90	99.04	99.08	99.08	98.90	99.04	99.19	99.19	99.59
Transformers with Net Increase in LCC (%)	2.0	2.0	16.9	24.8	24.8	2.0	16.9	63.3	63.3	96.7
Transformers with No Change in LCC (%)	66.1	66.1	50.0	38.8	38.8	66.1	50.0	7.0	7.0	0.0
Transformers with Net Savings in LCC (%)	31.9	31.9	33.2	36.5	36.5	31.9	33.2	29.7	29.7	3.3
Mean LCC Savings ($)	124	124	98	90	90	124	98	(62)	(62)	(1074)
Payback of Average Transformer (years)	2.4	2.4	9.7	11.4	11.4	2.4	9.7	20.9	20.9	37.9

TABLE VI.4.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 2 REPRESENTATIVE UNIT

	Trial standard level									
	1	2	D	C	B	3	4	A	5	6
Efficiency (%)	98.70	98.73	98.79	98.91	98.91	98.76	98.79	99.04	98.96	99.46
Transformers with Net Increase in LCC (%)	12.1	10.5	12.4	42.5	42.5	9.6	12.4	79.6	57.7	99.5
Transformers with No Change in LCC (%)	42.0	38.4	34.1	16.5	16.5	36.3	34.1	0.1	10.0	0.0
Transformers with Net Savings in LCC (%)	45.9	51.1	53.5	41.0	41.0	54.2	53.5	20.3	32.3	0.5
Mean LCC Savings ($)	59	65	76	22	22	76	76	(113)	(24)	(1094)
Payback of Average Transformer (years)	7.6	7.8	8.0	15.6	15.6	7.1	8.0	24.0	19.7	52.1

TABLE VI.5.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 3 REPRESENTATIVE UNIT

	Trial standard level									
	1	2	D	C	B	3	4	A	5	6
Efficiency (%)	99.30	99.38	99.38	99.42	99.47	99.46	99.54	99.54	99.74	99.75
Transformers with Net Increase in LCC (%)	1.4	1.4	1.4	2.5	8.1	7.7	44.3	44.3	83.7	87.3
Transformers with No Change in LCC (%)	66.6	59.0	59.0	56.5	47.1	49.1	2.1	2.1	0.2	0.0
Transformers with Net Savings in LCC (%)	32.0	39.6	39.6	41.0	44.8	43.2	53.6	53.6	16.2	12.7
Mean LCC Savings ($)	1132	1464	1464	1555	1597	1560	1308	1308	(2341)	(3460)
Payback of Average Transformer (years)	2.3	3.6	3.6	4.3	6.1	6.2	10.6	10.6	23.5	26.2

TABLE VI.6.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 4 REPRESENTATIVE UNIT

	Trial standard level									
	1	2	D	C	B	3	4	A	5	6
Efficiency (%)	98.90	99.08	99.08	99.08	99.08	99.26	99.26	99.19	99.58	99.61
Transformers with Net Increase in LCC (%)	9.6	20.7	20.7	20.7	20.7	18.9	18.9	32.4	78.0	86.9
Transformers with No Change in LCC (%)	54.4	20.6	20.6	20.6	20.6	13.0	13.0	13.0	0.1	0.0
Transformers with Net Savings in LCC (%)	36.0	58.7	58.7	58.7	58.7	68.2	68.2	54.6	21.9	13.1
Mean LCC Savings ($)	368	503	503	503	503	737	737	397	(780)	(1586)
Payback of Average Transformer (years)	7.8	10.4	10.4	10.4	10.4	11.3	11.3	13.6	22.0	26.0

TABLE VI.7.— SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 5 REPRESENTATIVE UNIT

	Trial standard level									
	1	2	D	C	B	3	4	A	5	6
Efficiency (%)	99.30	99.36	99.42	99.42	99.47	99.42	99.47	99.54	99.71	99.71
Transformers with Net Increase in LCC (%)	5.1	4.8	12.6	12.6	21.4	12.6	21.4	52.3	84.8	84.8
Transformers with No Change in LCC (%)	66.7	61.7	45.5	45.5	33.0	45.5	33.0	4.7	0.0	0.0
Transformers with Net Savings in LCC (%)	28.2	33.5	41.9	41.9	45.6	41.9	45.6	43.1	15.2	15.2
Mean LCC Savings ($)	1597	2168	2480	2480	2626	2480	2626	1193	(5905)	(5905)
Payback of Average Transformer (years)	5.1	6.0	7.4	7.4	8.9	7.4	8.9	13.8	21.6	21.6

TABLE VI.8.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 9 REPRESENTATIVE UNIT

	Trial standard level					
	1	2	3	4	5	6
Efficiency (%)	98.60	98.82	99.04	99.26	99.41	99.41
Transformers with Net Increase in LCC (%)	0.3	2.3	8.6	31.9	62.1	62.1
Transformers with No Change in LCC (%)	61.0	41.4	22.0	0.0	0.0	0.0
Transformers with Net Savings in LCC (%)	38.7	56.3	69.4	68.1	37.9	37.9
Mean LCC Savings ($)	1032	1863	3114	3223	186	186
Payback of Average Transformer (years)	0.7	1.8	3.4	7.2	13.8	13.8

TABLE VI.9.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 10 REPRESENTATIVE UNIT

	Trial standard level					
	1	2	3	4	5	6
Efficiency (%)	99.10	99.20	99.30	99.39	99.51	99.51
Transformers with Net Increase in LCC (%)	14.3	16.6	18.5	31.1	69.4	69.4
Transformers with No Change in LCC (%)	44.8	31.6	24.1	9.5	0.0	0.0
Transformers with Net Savings in LCC (%)	41.0	51.7	57.4	59.5	30.7	30.7
Mean LCC Savings ($)	4370	5719	7408	7774	(2116)	(2116)
Payback of Average Transformer (years)	5.0	6.4	7.0	8.3	15.2	15.2

TABLE VI.10.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 11 REPRESENTATIVE UNIT

	Trial standard level					
	1	2	3	4	5	6
Efficiency (%)	98.50	98.67	98.84	99.01	99.09	99.09
Transformers with Net Increase in LCC (%)	3.4	5.1	13.1	24.9	36.5	36.5
Transformers with No Change in LCC (%)	36.4	27.7	10.8	0.7	0.0	0.0
Transformers with Net Savings in LCC (%)	60.3	67.2	76.1	74.4	63.5	63.5
Mean LCC Savings ($)	3110	4280	5057	5365	4472	4472
Payback of Average Transformer (years)	2.4	3.0	4.3	5.9	7.8	7.8

TABLE VI.11.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 12 REPRESENTATIVE UNIT

	Trial standard level					
	1	2	3	4	5	6
Efficiency (%)	99.00	99.12	99.23	99.35	99.51	99.51
Transformers with Net Increase in LCC (%)	5.0	4.0	8.6	24.2	71.9	71.9
Transformers with No Change in LCC (%)	66.8	56.5	43.8	16.7	0.0	0.0
Transformers with Net Savings in LCC (%)	28.2	39.5	47.6	59.1	28.1	28.1
Mean LCC Savings ($)	2790	4863	6471	7904	(3417)	(3417)
Payback of Average Transformer (years)	3.4	3.9	4.9	6.7	16.0	16.0

TABLE VI.12.—SUMMARY LIFE-CYCLE COST AND PAYBACK PERIOD RESULTS FOR DESIGN LINE 13 REPRESENTATIVE UNIT

	Trial standard level					
	1	2	3	4	5	6
Efficiency (%)	99.00	99.15	99.30	99.45	99.55	99.55
Transformers with Net Increase in LCC (%)	5.6	7.2	7.4	46.0	78.1	78.1
Transformers with No Change in LCC (%)	71.4	55.2	45.4	1.5	0.0	0.0
Transformers with Net Savings in LCC (%)	23.1	37.6	47.2	52.6	21.9	21.9
Mean LCC Savings ($)	827	3658	6950	6832	(9886)	(9886)
Payback of Average Transformer (years)	4.4	5.6	5.6	9.6	18.7	18.7

b. Commercial Consumer Subgroup Analysis

DOE estimated commercial consumer subgroup impacts by determining the LCC impacts of the TSLs on rural electric cooperatives and municipal utilities. DOE's analysis indicated that, for municipal utilities, the economics are similar to those of the national sample of utilities, but that rural cooperatives will achieve smaller operating cost savings from higher standards than will the average utility. Consequently, rural cooperatives, but not municipal utilities, will generally have a longer payback period for any given standard level than will the average utility. 71 FR 44389–90. (See TSD Chapter 11 for information on the LCC Subgroup Analysis) Thus, on average, rural cooperatives will benefit less per affected transformer from efficiency improvements than either the average utility or municipal utilities.

For each of the two commercial consumer subgroups, Table VI.13 shows the mean LCC savings at each TSL, and Table VI.14 shows the mean PBP (in years). DOE included only the liquid-immersed design lines in this analysis since those types are more than ninety percent of the transformers purchased by electric utilities.

TABLE VI.13.—MEAN LIFE-CYCLE COST SAVINGS FOR LIQUID-IMMERSED TRANSFORMERS PURCHASED BY CERTAIN CONSUMER SUBGROUPS ($)

Design line	Trial standard level									
	1	2	D	C	B	3	4	A	5	6
Municipal Utility Subgroup										
1	118	118	116	109	109	118	116	(23)	(23)	(1003)
2	55	59	75	21	21	74	75	(106)	(19)	(1073)
3	1357	1691	1690	1798	1920	1885	1674	1674	(1779)	(2837)
4	435	577	577	577	577	661	661	442	(563)	(1338)
5	2370	3154	3708	3708	4094	3708	4094	2096	(3192)	(3192)
Rural Cooperative Subgroup										
1	120	120	61	49	49	120	61	(131)	(131)	(1218)
2	54	61	67	4	4	71	67	(148)	(51)	(1174)
3	835	1151	1151	1215	1155	1114	786	786	(3324)	(4518)
4	247	353	353	353	353	653	653	173	(1216)	(2064)
5	945	1371	1537	1537	1505	1537	1505	292	(8122)	(8122)

TABLE VI.14.— PAYBACK PERIOD FOR AVERAGE LIQUID-IMMERSED TRANSFORMERS PURCHASED BY CERTAIN CONSUMER SUBGROUPS (YEARS)

Design line	Trial standard level									
	1	2	D	C	B	3	4	A	5	6
Municipal Utility Subgroup										
1	2.5	2.5	9.0	10.6	10.6	2.5	9.0	18.5	18.5	35.4
2	8.4	8.6	8.0	15.6	15.6	7.1	8.0	24.0	18.5	50.6
3	2.0	3.3	3.3	3.9	5.5	5.5	9.7	9.7	21.8	24.2
4	7.0	9.8	9.8	9.8	9.8	11.8	11.8	13.3	20.5	24.2
5	4.3	5.3	6.6	6.6	8.0	6.6	8.0	14.1	20.5	20.5
Rural Cooperative Subgroup										
1	2.5	2.5	11.9	13.4	13.4	2.5	11.9	24.8	24.8	44.6
2	8.4	8.6	8.8	16.9	16.9	7.8	8.8	26.7	21.5	58.1
3	3.3	4.7	4.7	5.5	7.8	7.9	12.7	12.7	27.6	31.0
4	9.6	11.8	11.8	11.8	11.8	12.0	12.0	15.6	25.1	30.0
5	7.9	8.8	10.5	10.5	12.2	10.5	12.2	16.9	27.6	27.6

Chapter 11 of the TSD explains DOE's method for conducting the commercial consumer subgroup analysis and presents the detailed results of that analysis.

2. Economic Impact on Manufacturers

DOE determined the economic impacts of today's standard on manufacturers, as described in the proposed rule. 71 FR 44363, 44376, 44381–44383, 44390–44393. As described in Section IV.F above, for this final rule DOE modeled the partial conversion to amorphous core construction for TSL3, TSL4, and TSLA (with no change in the methodology for TSL5 and TSL6). DOE analyzed manufacturer impacts under two scenarios—the 'preservation-of-gross-margin-percentage' scenario and the 'preservation-of-operating-profit' scenario. Under the preservation-of-gross-margin-percentage scenario, DOE applied a single uniform ''gross margin percentage'' markup across all efficiency levels. As production costs increase with efficiency, this scenario implies that the absolute dollar markup will increase. Under the preservation-of-operating-profit scenario, operating profit is defined as earnings before interest and taxes. The implicit assumption behind this markup scenario is that the industry can maintain its operating profit (in absolute dollars) after the standard. The industry would do so by passing through its increased costs to customers without increasing its operating profits in absolute dollars. DOE fully describes these two scenarios and the complete manufacturer impact analysis in Chapter 12 of the TSD.

a. Industry Cash-Flow Analysis Results

Using the two markup scenarios, Tables VI.15 and VI.16 show the estimated impacts for the liquid-immersed and medium-voltage, dry-type transformer industries, respectively. These tables show the change in INPV, which is the primary metric from the MIA. DOE calculated the INPV in the base and standards cases by discounting the projected free cash flows at the real corporate discount rate of 8.9 percent. This method of calculating INPV provides one measure of the value of the industry in present value terms. The impact of new standards on INPV is then the difference between the INPV in the base case and the INPV in the standards case (with new standards). The tables also present the product conversion expenses and capital investments that the industry would incur at each TSL. Product conversion expenses include engineering, prototyping, testing, and marketing expenses incurred by a manufacturer as it prepares to come into compliance with a standard. Capital investments are the one-time outlays for equipment and buildings required for the industry to come into compliance (i.e., conversion capital expenditures).

TABLE VI.15.—MANUFACTURER IMPACT ANALYSIS FOR LIQUID-IMMERSED TRANSFORMER INDUSTRY

	Units	Base case	Trial standard level									
			1	2	D	C	B	3	4	A	5	6
Product Conversion Expenses.	($M)*	*n/a	0	0	0	0	0	87	89	103	120	176
Capital Investments	($M)	n/a	5.2	2.8	2.8	8.0	5.4	17	17	18	41	178
Total Investment Required.	($M)	n/a	5.2	2.8	2.8	8.0	5.4	104	106	121	161	354
Preservation-of-Gross-Margin-Percentage Scenario												
INPV	($M)	609	622	637	646	656	662	598	606	657	703	809
Change in INPV	($M)	n/a	13	28	37	47	53	(11)	(2.9)	48	94	200
	(%)	n/a	2.1	4.6	6.0	7.7	8.8	(1.9)	(0.5)	7.9	16	33
Preservation-of-Operating-Profit Scenario												
INPV	($M)	609	590	587	577	562	558	509	497	440	357	33.3
Change in INPV	($M)	n/a	(19)	(22)	(32)	(47)	(51)	(100)	(112)	(169)	(252)	(576)
	(%)	n/a	(3.2)	(3.7)	(5.2)	(7.7)	(8.3)	(17)	(18)	(28)	(41)	(95)

* ($M) = millions of dollars; n/a = not applicable.

TABLE VI.16.—MANUFACTURER IMPACT ANALYSIS FOR MEDIUM-VOLTAGE, DRY-TYPE TRANSFORMER INDUSTRY

	Units	Base case	Trial standard level					
			1	2	3	4	5	6
Product Conversion Expenses	($M)*	*n/a	0	0	3.7	4.1	5.8	5.8
Capital Investments	($M)	n/a	2.1	5.5	6.8	7.1	15	15
Total Investment Required	($M)	n/a	2.1	5.5	10.5	11.2	20.8	20.8
Preservation-of-Gross-Margin-Percentage Scenario								
INPV	($M)	36	35	33	31	33	37	37
Change in INPV	($M)	n/a	(1.1)	(3.2)	(5.2)	(3.2)	0.9	0.9
	(%)	n/a	(3.1)	(8.9)	(15)	(8.9)	2.5	2.5
Preservation-of-Operating-Profit Scenario								
INPV	($M)	36						

TABLE VI.16.—MANUFACTURER IMPACT ANALYSIS FOR MEDIUM-VOLTAGE, DRY-TYPE TRANSFORMER INDUSTRY—Continued

	Units	Base case	Trial standard level					
			1	2	3	4	5	6
Change in INPV	($M)	n/a	(2.1)	(5.2)	(8.8)	(11)	(24)	(24)
	(%)	n/a	(5.9)	(15)	(25)	(29)	(67)	(67)

* ($M) = millions of dollars; n/a = not applicable.

The proposed rule provides additional information on the methodology, assumptions, and results of this analysis. 71 FR 44382, 44390, 44399–44400, 44403. Chapter 12 of the TSD explains DOE's method for conducting the manufacturer impact analysis and presents the detailed results of that analysis.

b. Impacts on Employment

For liquid-immersed transformers, DOE expects no significant, discernable direct employment impacts among transformer manufacturers for TSLs 1, 2, D, C, B, 3, and 4, but potentially significant changes in employment for TSLA (44 percent increase), TSL5 (18 percent increase), and TSL6 (38 percent increase). Employment impacts are changes in the numbers of employees involved with transformer production at the manufacturing facilities. These estimated changes are due to the increased labor time needed to construct the cores and assemble the transformers. At these higher TSLs, the cores tend to be larger and the processing time per pound of amorphous material is higher than that of silicon steel—both of these effects lead to the need for more labor. Thus, the larger cores would increase the direct employment at transformer manufacturing facilities.

These conclusions—which are separate from any conclusions regarding employment impacts on the broader U.S. economy—are based on modeling results that address neither the possible relocation of domestic transformer manufacturing employment to lower labor-cost countries, nor the possibility of outsourcing amorphous core production under TSLs 3, 4, A, 5 and 6 to companies in other countries. The reported modeling results simply capture the changes in direct labor needed to produce transformers at each TSL. DOE discussed this scenario of outsourcing amorphous core production to other countries during several interviews with manufacturers of liquid-immersed transformers, and it appears that outsourcing would be a serious consideration for some liquid-immersed transformer manufacturers under TSLs 3, 4, A, 5, and 6.

In addition, as discussed in the proposed rule, DOE expects today's standard to have a relatively minor differential impact on small manufacturers of liquid-immersed distribution transformers. 71 FR 44382, 44392–44393, 44401–44403. For medium-voltage, dry-type manufacturers, however, all manufacturers would have to develop designs to enable compliance with TSL3 or higher, and small businesses would be at a relative disadvantage.

DOE expects no significant, discernable employment impacts among medium-voltage, dry-type transformer manufacturers for any TSL compared to the base case. DOE's conclusion regarding employment impacts in the medium-voltage, dry-type transformer industry is separate from any conclusions regarding employment impacts on the broader U.S. economy. Increased employment levels are not expected at higher TSLs because the core-cutting equipment typically purchased by the medium-voltage, dry-type industry is highly automated and includes core-stacking equipment.

Another concern conveyed by some manufacturers of medium-voltage, dry-type transformers during the interviews is the potential impact stemming from cast-coil transformer competitiveness at higher TSLs. These manufacturers claimed that setting a standard above a certain threshold may trigger a market switch from open-wound ventilated transformers to cast-coil transformers. Manufacturers suggest that this crossover point likely occurs at TSL3 and higher. If the market does shift to cast-coil transformers, there is a risk of imported, pre-fabricated cast coils dominating the market in the long term. This would have a significant impact on domestic industry value and domestic employment in the medium-voltage, dry-type industry.

The basis for the conclusions presented above is set forth in Chapter 12 of the TSD, Sections 12.4.4.1 and 12.5.4.1 for liquid-immersed and medium-voltage, dry-type transformers, respectively.

c. Impacts on Manufacturing Capacity

For the liquid-immersed distribution transformer industry, DOE believes that there are only minor production capacity implications for a standard at TSLs 1, 2, D, C, and B. At TSL6, all liquid-immersed design lines would have to convert to amorphous technology, the most energy efficient core material. At TSL5, three design lines would have to convert to amorphous core designs. For TSLs A, 4, and 3, there would likely be partial conversion to amorphous core designs for one or two design lines. Conversion to amorphous core designs would render obsolete a large portion of the equipment used today for the affected design lines (e.g., annealing furnaces, core-cutting and winding equipment). Based on the manufacturer interviews, DOE believes that TSLs 3, 4, A, 5, and 6 would cause liquid-immersed transformer manufacturers to decide whether they would need to invest in retooling their production equipment for amorphous technology or attempt to purchase pre-fabricated amorphous cores (for the affected design lines). For TSL6, some manufacturers indicated that they would close their companies, rather than attempt to manufacturer transformers at that standard level. Manufacturers also indicated that, if they were to choose to produce amorphous cores themselves, they would face a critical decision about whether or not to relocate outside of the U.S., since much of their equipment would become obsolete. As mentioned above, if manufacturers choose to purchase pre-fabricated amorphous cores, they might purchase them from foreign manufacturers.

Energy conservation standards will affect the medium-voltage, dry-type industry's manufacturing capacity because the core stack heights (or core steel piece length) will increase and laminations will become thinner. Thinner laminations require more cuts and are more cumbersome to handle. Therefore, manufacturers would have to invest in additional core-mitering machinery or modifications and improvements to recover any losses in productivity, and these factors might also contribute to a need for more plant floor space. Because more efficient transformers tend to be larger, this could also contribute to the need for additional manufacturing floor space.

d. Impacts on Manufacturers That Are Small Businesses

Converting from a company's current basic product line involves designing, prototyping, testing, and manufacturing a new product. These tasks have associated capital investments and product conversion expenses. Small businesses, because of their limited access to capital and their need to spread conversion costs over smaller production volumes, may be affected more negatively than major manufacturers by an energy conservation standard. For these reasons, DOE specifically evaluated the impacts on small businesses of an energy conservation standard.

The Small Business Administration defines a small business, for the distribution transformer industry, as a business that has 750 or fewer employees. DOE estimates that, of the approximately 25 U.S. manufacturers that make liquid-immersed distribution transformers, about 15 of them are small businesses. About five of the small-liquid-immersed-transformer businesses have fewer than 100 employees. DOE estimates that, of the 25 U.S. manufacturers that make medium-voltage, dry-type distribution transformers, about 20 of them are small businesses. About one-half of the medium-voltage, dry-type small businesses have fewer than 100 employees. Medium-voltage, dry-type transformer manufacturing is more concentrated than liquid-immersed transformer manufacturing; the top three companies manufacture over 75 percent of all transformers in this category.

As discussed in the proposed rule, DOE expects minimum efficiency standards to have a relatively minor differential impact on small manufacturers of liquid-immersed distribution transformers. 71 FR 44401–44402. Although DOE proposed to adopt TSL2, and is today promulgating a standard higher than that for all liquid-immersed design lines other than design line 4, DOE believes that the reasoning presented in the proposed rule is still relevant and valid: DOE does not expect today's standard to have a significant economic impact on a substantial number of small manufacturers of liquid-immersed transformers. Since the standard does not require manufacturers to change manufacturing equipment, DOE concludes that the standards adopted today will have minor differential impact on small manufacturers of liquid-immersed transformers. This is based on the fact that manufacturing equipment and materials that are currently available will be used to meet the standard which will provide manufacturers flexibility in meeting the standards, and manufacturers will not be required to re-tool in order to meet the standards. (See Section VII.B.4). For medium-voltage, dry-type manufacturers, DOE stated in the proposed rule that it would anticipate some small business impacts at all TSLs. However, DOE believes that the incremental impact on small businesses in moving from TSL2 to TSL3 is greater than that in moving from TSL1 to TSL2 (see Section VII.B.4 for a more detailed discussion). DOE explicitly considered impacts on small businesses in selecting TSL2 and rejecting higher levels for medium-voltage, dry-type transformers. 71 FR 44382, 44392–44393, 44401–44403. See section VII.B on the Regulatory Flexibility Act for more discussion on this point.

3. National Net Present Value and Net National Employment

The NPV analysis estimates the cumulative benefits or costs to the Nation that would result from particular standard levels. While the NES analysis estimates the energy savings from a proposed energy conservation standard, the NPV analysis provides estimates of the national economic impacts of a proposed standard relative to a base case of no new standard. Tables VI.17 and VI.18 provide an overview of the NPV results, using both a seven percent and a three percent real discount rate. See TSD Chapter 10 for more detailed NPV results.

TABLE VI.17.—OVERVIEW OF NATIONAL NET PRESENT VALUE ($, BILLION) FOR LIQUID-IMMERSED TRANSFORMERS

Type	Discount rate (%)	Trial standard level									
		1	2	D	C	B	3	4	A	5	6
Liquid-Immersed Single-Phase	3	3.15	3.42	3.58	2.97	2.98	3.74	3.60	(0.31)	1.02	(24.5)
	7	0.98	1.04	0.94	0.14	0.14	1.17	0.93	(2.28)	(1.33)	(18.5)
Liquid-Immersed Three-Phase	3	2.42	3.64	3.98	3.98	4.28	5.42	5.72	4.78	0.38	(1.58)
	7	0.71	0.91	0.96	0.96	0.97	1.20	1.21	0.38	(3.56)	(4.75)

TABLE VI.18.—OVERVIEW OF NATIONAL NET PRESENT VALUE ($, BILLION) FOR MEDIUM-VOLTAGE, DRY-TYPE TRANSFORMERS

Type	Discount rate (%)	Trial standard level					
		1	2	3	4	5	6
Medium-Voltage Dry-Type Single-Phase	3	0.005	0.008	0.011	0.015	0.010	0.010
	7	0.002	0.003	0.004	0.004	0.001	0.001
Medium-Voltage Dry-Type Three-Phase	3	0.461	0.843	1.170	1.531	1.008	1.008
	7	0.157	0.280	0.375	0.441	(0.086)	(0.086)

DOE also estimated the national employment impacts that would result from each of the TSLs. As discussed in the proposed rule, 71 FR 44383–44384, 44394, DOE expects the net monetary savings from standards to be redirected to other forms of economic activity. DOE also expects these shifts in spending and economic activity to affect the demand for labor as spending shifts from less labor-intensive to more labor-intensive sectors of the economy.

As shown in Tables VI.19 and VI.20, DOE estimated net indirect employment impacts (i.e., those changes of employment in the larger economy, other than in the manufacturing sector being regulated) from today's distribution transformer energy conservation standards to be positive. According to DOE's analysis, the number of jobs that may be generated by 2038 through indirect impacts ranged from 4,000 to 14,000 for liquid-immersed transformers, and from 400 to 1,500 for medium voltage, dry-type transformers for the range of TSLs considered in this rulemaking. While DOE's analysis suggests that the distribution transformer standards could result in a very small increase in the net demand for labor in the economy, relative to total national employment, this increase would likely be sufficient to offset fully any adverse impacts on employment that might occur in the distribution transformer or energy industries. For details on the employment impact analysis methods and results, see TSD Chapter 14.

TABLE VI.19.—NET NATIONAL CHANGE IN JOBS (THOUSANDS): LIQUID-IMMERSED TRANSFORMER STANDARDS

Year	Trial standard level									
	1	2	D	C	B	3	4	A	5	6
2010	1.7	2.3	2.5	2.8	2.9	3.2	3.4	3.7	4.5	3.3
2020	1.5	2	2.2	2.4	2.5	2.7	2.9	3.0	4.1	1.5
2030	2.8	3.9	4.4	4.9	5.2	5.3	5.7	6.8	9.5	8.0
2038	4	5.4	6.2	7.0	7.4	7.4	8.1	10	14	13.4

TABLE VI.20.—NET NATIONAL CHANGE IN JOBS (THOUSANDS): DRY-TYPE, MEDIUM-VOLTAGE TRANSFORMER STANDARDS

Year	Trial standard level					
	1	2	3	4	5	6
2010	0.1	0.2	0.2	0.3	0.4	0.4
2020	0.1	0.2	0.3	0.4	0.5	0.5
2030	0.2	0.3	0.4	0.6	0.8	0.8
2038	0.3	0.5	0.8	1.1	1.5	1.5

4. Impact on Utility or Performance of Equipment

As discussed in section V.A.4 of the proposed rule, DOE believes that, because of the steps it had taken in establishing classes of products and in evaluating design options and the impact of potential standard levels (71 FR 44394), as well as the additional steps taken in today's final rule, including the consideration of design constraints for vault-transformers (see section V.B.4.a) and the evaluation of higher BIL voltages (see section V.A.1.a), the new standards it is adopting today will not lessen the utility or performance of distribution transformers. (See also TSD, Chapters 4 and 5)

5. Impact of Any Lessening of Competition

As previously discussed in the NOPR, 71 FR 44363–44364, 44394, and in section III.D.5 of this preamble, DOE considers any lessening of competition that is likely to result from standards. The Attorney General determines the impact, if any, of any such lessening of competition.

DOJ concluded that the distribution transformer standards contained in the proposed rule may adversely affect competition with respect to distribution transformers used in industries, such as underground coal mining, where physical conditions limit the size of the equipment that may be effectively utilized. DOJ understands that manufacturers would not be able to satisfy the proposed standard without increasing the size (or decreasing the power) of each class of distribution transformer. Mining companies facing space constraints would incur significantly increased costs due to enlarging the required installation space (which, for example, could involve removal of solid rock around coal seams in underground mines) or reconfiguring the size and number of each class of distribution transformer at each site. The resulting cost increases could constitute production inefficiencies that could make certain products less competitive. For example, the rule could, by raising the costs of certain coal mines, adversely affect production decisions at those mines and potentially result in increased use of less efficient energy alternatives. DOJ urged the DOE to consider these concerns carefully in its analysis, and to consider creating an exception for distribution transformers used in industries with space constraints. (DOJ, No. 157 at p.2) DOE considered this input from DOJ, along with comments from several stakeholders, and as discussed in section IV.A.2 of this preamble, decided to treat space-constrained underground mining transformers as a separate product class in this final rule, and not to apply today's standards to these transformers. DOE is also reserving a subsection in section 431.196 for underground mining transformer efficiency standards. Energy conservation standards for underground mining transformers are not included as part of today's final rule and will be determined at a later date.

6. Need of the Nation to Conserve Energy

The Secretary of Energy recognizes the need of the Nation to save energy. Enhanced energy efficiency, where economically justified, improves the Nation's energy security, strengthens the economy, and reduces the environmental impacts or costs of energy production. The energy savings from distribution transformer standards result in reduced emissions of CO_2. Reduced electricity demand from today's energy conservation standards is also likely to reduce the cost of maintaining the reliability of the electricity system, particularly during peak-load periods. As a measure of this reduced demand, DOE expects today's standards to eliminate the need for the construction of approximately six new 400-megawatt combined-cycle gas turbine power plants by 2038 and to save 2.74 quads of electricity (cumulative, 2010–2038). The energy savings are higher in the final rule analysis compared to DOE's NOPR savings of 2.4 quads of electricity over the same period. Table VI.21 provides DOE's estimate of cumulative power sector CO_2 reductions for an uncapped emissions scenario for the TSLs considered in this rulemaking.

As discussed in the NOPR, the Clean Air Interstate Rule (CAIR), which the U.S. Environmental Protection Agency (EPA) issued on March 10, 2005, will permanently cap emissions of NO_X in 28 eastern states and the District of Columbia. 70 FR 25162 (May 12, 2005). As with SO_2 emissions, for which a cap was previously in place, a cap on NO_X emissions means that equipment efficiency standards may have no physical effect on these emissions. Similarly, emissions of Hg for the power sector are also subject to emissions caps during the evaluation period, so that distribution transformer standards may similarly result in no physical effect on these emissions. DOE evaluated the emissions forecasts from *AEO2006* and *AEO2007* and found that, because these new regulations capped most power sector NO_X and Hg emissions, decreasing energy use from the proposed standard would not have any net physical emissions reduction. The economic effects of emissions reductions are included in the forecasted projection of electricity prices and thus are included in DOE's NPV analysis, but are not reported separately. For details of the emissions reduction calculations and discussion, see the environmental analysis report in the TSD.

DOE also calculated discounted values for future emissions, using the same seven percent and three percent real discount rates that it used in calculating the NPV. Table VI.21 also shows the discounted cumulative emissions impacts for both liquid-immersed and dry-type, medium-voltage transformers.

TABLE VI.21.—CO_2 EMISSION REDUCTIONS OF THE TRIAL STANDARD LEVELS

[In millions of metric tons]

Type	Discount rate	Trial standard level									
		1	2	D	C	B	3	4	A	5	6
Liquid-Immersed	none	125	176	199	238	251	248	272	369	464	674
	3%	62	87	99	118	124	123	135	183	230	334
	7%	27	38	43	51	54	53	59	80	100	145
Medium-Voltage Dry-Type*	none	5.8	11.8	....	....	....	17.1	24.8	....	36.9	36.9
	3%	2.9	5.8	....	....	....	8.5	12.3	....	18.3	18.3
	7%	1.2	2.5	....	....	....	3.7	5.3	....	8.0	8.0

* Medium-voltage dry-type distribution transformers did not have any trial standard levels set for TSLA through TSLD.

Emissions are roughly proportional to energy savings. The emissions reductions are slightly higher in the final rule analysis compared to DOE's NOPR analysis because of the slightly greater amount of coal-generated electricity in the updated *AEO2006* and AEO2007 forecasts that DOE used for the utility and environmental analysis (See TSD Chapter 13 and the Environmental Impact Analysis Report in the TSD).

7. Other Factors

In developing today's standard, the Secretary took into consideration four 'Other Factors': (1) Availability of high BIL primary voltages (see TSD Appendix 5D); (2) materials price sensitivity analysis (see TSD Appendices 5C and 8F); (3) materials availability analysis (see TSD Appendix 8H); and (4) consistency between single-phase and three-phase designs (for liquid-immersed distribution transformers only, see TSD Appendix 8I). Each of these factors is described briefly in section V.7 of today's rule and discussed in some detail in other parts of today's rule. Specifically section V.A.1.a discusses voltage issues, section V.A.1.b discusses materials price issues, in section V.A.1.d describes materials availability issues, and section V.B.7.d describes single-phase and three-phase consistency issues.

D. Conclusion

EPCA contains criteria for prescribing new or amended energy conservation standards. DOE must prescribe standards only for those distribution transformers for which DOE: (1) has determined that standards would be technologically feasible and economically justified and would result in significant energy savings, and (2) has prescribed test procedures. (42 U.S.C. 6317(a)) Moreover, DOE has analyzed whether today's standards for distribution transformers will achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (See 42 U.S.C. 6295(o)(2)(A), 6316(a), and 6317(a) and (c)) Today's final rule will not result in the unavailability in the U.S. of any covered product type (or class) of transformer with performance characteristics (i.e., reliability, features, sizes, capacities and voltages) that are substantively the same as those generally available in the U.S. prior to these new standards.

In determining whether a standard is economically justified, DOE determines whether the benefits of the standard exceed its costs. (See 42 U.S.C. 6295(o)(2)(B)(i)) Any new or amended standard for distribution transformers must result in significant energy savings. (42 U.S.C. 6317(a); 42 U.S.C. 6295 (o)(3)(B); see 42 U.S.C. 6295(o)(2)(B))

In selecting energy conservation standards for distribution transformers, DOE started by comparing the maximum technologically feasible levels with the base case, and determined whether those levels were economically justified. Upon finding the maximum technologically feasible levels not to be justified, DOE analyzed the next lower TSL to determine whether that level was economically justified. DOE repeated this procedure until it identified a TSL that was economically justified.

Tables VI.22 and VI.23 summarize DOE's quantitative analysis results for each TSL. Each table presents the results or, in some cases, a range of results, for the underlying design lines for liquid-immersed transformers (Table VI.22), and medium-voltage, dry-type transformers for (Table VI.23). The range of values reported in these tables for LCC, payback, and average increase in consumer equipment cost before installation encompasses the range of results DOE calculated for either the liquid-immersed or medium-voltage, dry-type representative units. The range of values for manufacturer impact represents the results for the preservation-of-operating-profit scenario and preservation-of-gross-margin scenario at each TSL for liquid-immersed and medium-voltage, dry-type transformers.

TABLE VI.22.—SUMMARY OF LIQUID-IMMERSED DISTRIBUTION TRANSFORMERS ANALYTICAL RESULTS

Criteria	Trial standard level									
	TSL1	TSL2	TSLD	TSLC	TSLB	TSL3	TSL4	TSLA	TSL5	TSL6
Energy saved (quads)	1.38	1.94	2.18	2.61	2.75	2.76	3.00	4.07	5.07	7.37
Generation capacity offset (GW)	1.4	1.9	2.1	2.5	2.7	2.7	2.9	3.9	5.0	7.2
NPV ($ billions)										
@ 7% discount	1.68	1.95	1.91	1.11	1.11	2.37	2.13	(1.89)	(4.89)	(23.3)
@ 3% discount	5.57	7.06	7.56	6.95	7.26	9.17	9.33	4.47	1.40	(26.1)
Emission reductions, CO_2 (Mt)	125	176	199	238	251	248	272	369	464	674
Life-cycle cost *										
Net increase in LCC (%)	1.4–12.1	1.4–20.7	1.4–20.7	2.5–42.5	8.1–42.5	2.0–18.9	12.4–44.3	32.4–79.6	57.7–84.8	84.8–99.5
No change in LCC (%)	42.0–66.7	20.6–66.1	20.6–59.0	16.5–56.5	16.5–47.1	13.0–66.1	2.1–50.0	0.1–13.0	0.0–10.0	0.0–0.0
Net savings in LCC (%)	28.2–45.9	31.9–58.7	33.2–58.7	36.5–58.7	36.5–58.7	31.9–68.2	33.2–68.2	20.3–54.6	15.2–32.3	0.5–15.2
Payback for average transformer (years) *	2.3–7.8	2.4–10.4	3.6–10.4	4.3–15.7	8.9–15.7	2.4–11.4	7.8–11.4	10.6–24.7	19.3–23.4	21.6–52.1
Life-cycle cost, 2006 Material Price *										
Net increase in LCC (%)	6.8–48.2	15.9–54.4	16.4–45.3	13.4–53.8	17.7–53.8	11.1–48.3	11.1–65.2	11.4–88.5	56.4–91.4	91.4–99.8
No change in LCC (%)	17.2–54.9	12.3–46.8	8.9–32.2	1.8–32.2	1.8–23.5	9.2–46.8	0.4–29.7	0.1–14.7	0.0–1.7	0.0–0.0
Net savings in LCC (%)	29.6–39.5	33.4–59.0	25.0–59.0	25.1–62.4	25.1–58.8	36.2–74.2	25.0–74.2	11.4–73.9	8.6–41.9	0.3–8.6
Payback for average transformer, 2006 Material Price (years) *	4.7–17.8	8.4–19.5	8.4–19.4	8.7–20.8	10.2–20.8	9.8–17.8	10.7–19.4	10.7–29.1	18.8–26.7	26.7–58.3
Average increase in consumer equipment cost before installation (%) *, **, †	3.2–7.1	2.7–20.7	8.1–20.7	10.0–21.1	10.0–22.1	2.7–45.9	8.0–45.9	20.0–60.6	24.7–138.6	132.9–161.3
Manufacturer impact ***										
INPV ($ millions)	(19)–13	(22)–28	(32)–37	(47)–47	(51)–53	(100)–(11)	(112)–(2.9)	(169)–48	(252)–94	(576)–200
INPV change (%)	(3.2)–2.1	(3.7)–4.6	(5.2)–6.0	(7.7)–7.7	(8.3)–8.8	(17)–(1.9)	(18)–(0.5)	(28)–7.9	(41)–16	(95)–33
LCC selected designs with amorphous (%) *	0–13	0–14	0–14	0–14	0–14	0–95	0–95	0–84	0–100	100–100
LCC selected designs with core steel better than M3 (i.e., M2, ZDMH, SA1) (%) *	1–54	2–79	2–100	2–84	2–100	2–99	2–100	4–100	4–100	100–100
Voltage sensitivity–achieve standard with silicon core steel	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Single-phase, three-phase consistency	Yes	No	Yes	Yes	Yes	No	No	Yes	No	No

* Range represents the results for each of the five representative units derived from the individual design lines analyzed in the LCC.
** Percent increase in consumer equipment cost before installation, five-year average material pricing.
† DOE recognizes that these cost changes are the average changes for the Nation, and that some individual customers will experience larger changes, particularly if these customers are not evaluating losses when purchasing transformers.
*** Range represents the results of the 'preservation-of-operating-profit' and 'preservation-of-gross-margin-percentage' scenarios in the MIA.

TABLE VI.23.—SUMMARY OF MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS ANALYTICAL RESULTS

Criteria	Trial standard level					
	TSL1	TSL2	TSL3	TSL4	TSL5	TSL6
Energy saved (quads)	0.06	0.13	0.19	0.27	0.40	0.40
Generation capacity offset (GW)	0.1	0.1	0.2	0.4	0.6	0.6
Discounted energy saved, 7% (quads)	0.02	0.04	0.05	0.10	0.11	0.11
NPV ($ billions):						
@ 7% discount	0.16	0.28	0.38	0.45	(0.08)	(0.08)
@ 3% discount	0.47	0.85	1.18	1.55	1.02	1.02
Emission reductions CO_2 (Mt)	5.8	11.8	17.1	24.8	36.9	36.9
Life-cycle cost: *						
Net increase in LCC (%)	0.3–14.3	2.3–16.6	7.4–18.5	24.2–46.0	36.5–78.1	36.5–78.1
No change in LCC (%)	36.4–71.4	27.2–56.5	10.8–45.4	0.0–16.7	0	0
Net savings in LCC (%)	23.1–60.3	36.6–67.2	47.2–76.1	52.6–74.4	21.9–63.5	21.9–63.5
Payback for average transformer (years) *	0.7–5.0	1.8–6.4	3.4–7.0	5.9–9.6	7.8–18.7	7.8–18.7
Average increase in consumer equipment cost before installation (%) *, **, †	0.6–7.4	3.4–15.1	9.7–24.2	20.4–39.6	43.6–95.1	43.6–95.1
Life-cycle cost, 2006 Material Price:*						
Net increase in LCC (%)	0.7–23.8	4.2–61.3	18.7–54.5	33.7–62.7	49.7–88.3	49.7–88.3
No change in LCC (%)	10.8–66.2	1.7–33.2	0.9–11.1	0–3.1	0–0	0–0
Net savings in LCC (%)	26.5–75.3	37–78.1	44.6–76.8	37.2–66.2	11.7–50.3	11.7–50.3

TABLE VI.23.—SUMMARY OF MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS ANALYTICAL RESULTS—Continued

Criteria	Trial standard level					
	TSL1	TSL2	TSL3	TSL4	TSL5	TSL6
Payback for average transformer, 2006 Material Price (years) *	0.7–5.9	2.1–12.9	6.3–12.2	8.5–14.0	11.4–24.3	11.4–24.3
Manufacturer impact:***						
INPV ($ millions)	(2.1)–(1.1)	(5.2)–(3.2)	(8.8)–(5.2)	(11)–(3.2)	(24)–0.9	(24)–0.9
INPV change (%)	(5.9)–(3.1)	(15)–(8.9)	(25)–(15)	(29)–(8.9)	(67)–2.5	(67)–2.5
LCC designs with thin laminations of core steel (i.e., M3, HO) (%) *	30–69	40–88	92–100	100–100	100–100	100–100

* Range represents the results for each of the five representative units derived from the individual design lines analyzed in the LCC.
** Percent increase in consumer equipment cost before installation, five-year average material pricing.
†DOE recognizes that these cost changes are the average changes for the Nation, and that some individual customers will experience larger changes, particularly if these customers are not evaluating losses when purchasing transformers.
*** Range represents the results of the 'preservation-of-operating-profit' and 'preservation-of-gross-margin-percentage' scenarios in the MIA.

1. Results for Liquid-Immersed Distribution Transformers

a. Liquid-Immersed Transformers—Trial Standard Level 6

First, DOE considered the most efficient level (max tech), which would save an estimated total of 7.37 quads of energy through 2038, a significant amount of energy. For the Nation as a whole, TSL6 would have a net cost of $23.3 billion and $26.1 billion at seven percent and three percent discount rates, respectively. At this level, the majority of customers would experience an increase in life-cycle costs. As shown in Table VI.22, only 0.5–15.2 percent of customers would experience lower life-cycle costs, depending on the design line. Under the 2006 materials price sensitivity analysis, this percentage reduces to 0.3 to 8.6 percent of customers. The payback periods for the five-year average materials price scenario at this standard level are between 21.6 and 52.1 years, some of which exceed the anticipated operating life of the transformer (i.e., 32 years). Under the 2006 materials price sensitivity analysis, the paybacks periods are longer, ranging from 26.7 to 58.3 years. The consumer equipment cost before installation would more than double for all design lines, a significant increase for consumers. The impacts on manufacturers would be very significant because TSL6 would require a complete conversion to amorphous core technology. These conversion costs would reduce the INPV by as much as 95 percent under the preservation-of-operating-profit scenario. DOE estimates that $49 million of existing assets would be stranded (i.e., rendered useless) and $178 million of conversion capital expenditures would be required to enable the industry to manufacture compliant distribution transformers. Additionally, TSL6 would be disruptive for manufacturers because it does not achieve the consistent treatment of single-phase and three-phase transformers (see Appendix 8I). This lack of consistency may cause large market distortions (i.e., shifts between single-phase and three-phase transformers) and impact manufacturers or plants that specialize in either single-phase or three-phase construction. Furthermore, DOE is concerned that TSL6 requires all distribution transformers to be constructed of amorphous material, and there isn't sufficient amorphous-ribbon production capacity to replace silicon core steel. Moreover, DOE's primary voltage sensitivity analysis found that TSL6 cannot be achieved using even the most efficient conventional silicon steels for any of the four design lines studied (see TSD Appendix 5D), and thus TSL6 could eliminate certain voltages from the marketplace unless amorphous core transformers were constructed.

The energy savings at TSL6 would reduce the installed generating capacity by 7.2 gigawatts (GW), or roughly 18 large, 400 MW power plants. The estimated emissions reductions through this same time period are 674 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, and emission reductions would be outweighed by the potential multi-billion dollar negative net economic cost to the Nation, the economic burden on customers as indicated by large payback periods, significant increases in installed cost, and the large percentage of customers who would experience life-cycle cost increases, the stranded asset and conversion capital costs that could result in a large reduction in INPV for manufacturers, the requirement of amorphous material construction, and the inconsistency between single-phase and three-phase efficiency requirements. Consequently, DOE concludes that TSL6, the max tech level, is not economically justified.

b. Liquid-Immersed Transformers—Trial Standard Level 5

Next, DOE considered TSL5, which would save an estimated total of 5.07 quads of energy through 2038, a significant amount of energy. For the Nation as a whole, TSL5 would have a net cost of $4.89 billion at a seven percent discount rate or a net saving of $1.40 billion at a three percent discount rate. Under the five-year average materials price scenario, between 15.2 to 32.3 percent of customers would experience lower life-cycle costs, and 57.7 to 84.8 percent of customers would have increased life-cycle costs, depending on the design line. Under the 2006 materials price sensitivity analysis, the percentage of customers with increased life-cycle costs ranges between 56.4 and 91.4 percent. The payback periods for the five-year average material price at this standard level are between 19.3 and 23.4 years. Under the 2006 materials price sensitivity analysis, these payback periods range between 18.8 and 26.7 years. The consumer equipment cost before installation would increase by as much as 138.6 percent for one of the design lines analyzed, a significant increase for consumers. The impacts on manufacturers would be very significant because TSL5 would require partial conversion to amorphous core technology. The conversion costs would contribute to as much as a 41 percent reduction in the INPV under the preservation-of-operating-profit scenario. DOE estimates that $13 million of existing assets would be stranded and approximately $41 million in conversion capital expenditures would be required to enable the industry to manufacture compliant transformers. Additionally, TSL5 would be disruptive for manufacturers because it does not achieve the consistent treatment of single-phase and three-phase transformers (see Appendix 8I). This lack of consistency may cause large market distortions (i.e., shifts between single-phase and three-phase transformers) and impact manufacturers or plants that specialize in either single-phase or three-phase construction. Furthermore, DOE is concerned that TSL5 requires three design lines to be constructed of amorphous material, and there may not be sufficient amorphous-ribbon production capacity to replace silicon core steel for these design lines. Moreover, DOE's primary voltage sensitivity analysis found that TSL5 cannot be achieved using even the most efficient conventional silicon steels for three of the four design lines studied (see TSD Appendix 5D), and thus TSL5 could eliminate certain voltages from the marketplace unless amorphous core transformers were constructed. As explained above, DOE has decided not to set a standard that requires the use of amorphous material, even if the requirement would affect only a small portion of the market.

The energy savings at TSL5 would reduce the installed generating capacity by 5.0 GW, or roughly 13 large, 400 MW powerplants. The estimated emissions reductions through this same time period are 464 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, and emission reductions would be outweighed by the potential negative net economic cost to the Nation, the economic burden on customers as indicated by long payback periods, significant increases in installed cost, and the large percentage of customers who would experience life-cycle cost increases, the stranded asset and conversion capital costs that could result in a large reduction in INPV for manufacturers, the requirement of amorphous material construction for certain design lines, and the inconsistency between single-phase and three-phase efficiency requirements. Consequently, DOE concludes that TSL5 is not economically justified.

c. Liquid-Immersed Transformers—Trial Standard Level A

Next, DOE considered TSLA, which would save an estimated total of 4.07 quads of energy through 2038, a significant amount of energy. For the Nation as a whole, TSLA would have a net cost of $1.89 billion at a seven percent discount rate or a net saving of $4.47 billion at three percent discount rate. Under the five-year average materials price scenario, 20.3 to 54.6 percent of customers would experience lower life-cycle costs, while between 32.4 to 79.6 percent of customers would have increased life-cycle costs. Under the 2006 materials price sensitivity analysis, 88.5 percent of consumers would experience a net increase in life-cycle costs for one design line. Under the five-year average materials price scenario, the payback periods at this standard level are between 10.6 and 24.7 years. Under the 2006 materials price sensitivity analysis, the payback periods are longer, ranging between 10.7 and 29.1 years. The consumer equipment cost before installation would increase by as much as 60.6 percent for one of the design lines analyzed, a significant increase for consumers. The impacts on manufacturers would be significant because TSLA would likely trigger partial conversion to amorphous core technology (design lines 4 and 5). The conversion costs would contribute to as much as a 28 percent reduction in the INPV under the preservation-of-operating-profit scenario. DOE estimates that $3.5 million of existing assets would be stranded and approximately $18 million in conversion capital expenditures would be required to enable the industry to manufacture compliant transformers. Furthermore, DOE is concerned that TSLA requires 84 percent of one design line to be constructed of amorphous material, and there may not be sufficient amorphous-ribbon production capacity to replace silicon core steel for that design line and others that use amorphous material. Moreover, DOE's primary voltage sensitivity analysis found that TSLA cannot be achieved using even the most efficient conventional silicon steels for two of the four design lines studied (see TSD Appendix 5D), and thus TSLA could eliminate certain voltages from the marketplace unless amorphous core transformers were constructed. As explained above, DOE has decided not to set a standard that requires the use of amorphous material, even if the requirement would affect only a small portion of the market.

The energy savings at TSLA would reduce the installed generating capacity by 3.9 GW, or roughly 10 large, 400 MW powerplants. The estimated emissions reductions through this same time period are 369 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, and emission reductions would be outweighed by the potential negative net economic cost to the Nation, the economic burden on customers as indicated by large payback periods, significant increases in installed cost for certain design lines, and the large percentage of customers who would experience life-cycle cost increases, the stranded asset and conversion capital costs that could result in a significant reduction in INPV for manufacturers, and the high proportion of amorphous material for certain design lines. Consequently, DOE concludes that TSLA is not economically justified.

d. Liquid-Immersed Transformers—Trial Standard Level 4

Next, DOE considered TSL4, which would save an estimated total of 3.00 quads of energy through 2038, a significant amount of energy. For the Nation as a whole, TSL4 would result in a net savings of $2.13 billion and $9.33 billion at seven percent and three percent discount rates, respectively. Under the five-year average materials price scenario, lower life-cycle costs would be experienced by between 33.2 and 68.2 percent of customers, depending on the design line. Under this same materials price scenario, 12.4 to 44.3 percent of customers would have increased life-cycle costs. Under the 2006 materials price sensitivity analysis, increased life-cycle costs are experienced by up to 65.2 percent of customers for one design line. Under the five-year average materials price scenario, the payback periods are between 7.8 and 11.4 years. Under the 2006 materials price sensitivity analysis, the payback periods increase to between 10.7 and 19.4 years. The consumer equipment cost before installation would increase by 45.9 percent for one design line, a significant increase for transformer consumers. The LCC consumer choice model estimates that for one design line, approximately 95 percent of the transformers sold would have amorphous cores. The impacts on manufacturers would be significant because TSL4 would therefore likely trigger partial conversion to amorphous core technology (design line 4). The manufacturer conversion costs would contribute to as much as an 18 percent reduction in the INPV under the preservation-of-operating-profit scenario. DOE estimates that $8.2 million of existing assets would be stranded and approximately $17 million in conversion capital expenditures would be required to enable the industry to manufacture compliant transformers. Additionally, TSL4 would be disruptive for manufacturers because it does not achieve the consistent treatment of single-phase and three-phase transformers (see Appendix 8I).

This lack of consistency may cause large market distortions (i.e., shifts between single-phase and three-phase transformers) and impact manufacturers or plants that specialize in either single-phase or three-phase construction. Moreover, DOE's primary voltage sensitivity analysis found that TSL4 cannot be achieved using even the most efficient conventional silicon steels for one of the four design lines studied (see TSD Appendix 5D), and thus TSL4 could eliminate certain voltages from the marketplace unless amorphous core transformers were constructed. As explained above, DOE has decided not to set a standard that requires the use of amorphous material, even if the requirement would affect only a small portion of the market.

The energy savings at TSL4 would reduce the installed generating capacity by 2.9 GW, or roughly 7 large, 400 MW powerplants. The estimated emissions reductions through this same time period are 272 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, emission reductions, and national NPV would be outweighed by the economic burden on customers as indicated by the increased life-cycle costs for certain design lines under the 2006 materials price sensitivity analysis and large increases in installed equipment cost for some transformers, the stranded asset and conversion capital costs that could result in a significant reduction in INPV for manufacturers, the inconsistent treatment of single-phase and three-phase transformers, and the partial conversion to amorphous core material for at least one design line. Consequently, DOE concludes that TSL4 is not economically justified.

e. Liquid-Immersed Transformers—Trial Standard Level 3

Next, DOE considered TSL3, which would save an estimated total of 2.76 quads of energy through 2038, a significant amount of energy. For the Nation as a whole, TSL3 would result in a net savings of $2.37 billion and $9.17 billion at seven percent and three percent discount rates, respectively. Under the five-year average materials price scenario, lower life-cycle costs would be experienced by between 31.9 and 68.2 percent of customers, while between 2.0 to 18.9 percent of customers would have increased life-cycle costs. Under the 2006 materials price sensitivity analysis, increased life-cycle costs are experienced by between 11.1 and 48.3 percent of customers. Under this five-year average materials price scenario, the payback periods are between 2.4 and 11.4 years. Under the 2006 materials price sensitivity analysis, the payback periods are between 9.8 and 17.8 years. The consumer equipment cost before installation would increase by 45.9 percent for one design line, a significant increase for transformer consumers. The LCC consumer choice model estimates that for one design line, approximately 95 percent of the transformers sold would have amorphous cores. The impacts on manufacturers would be significant because TSL3 would therefore likely trigger partial conversion to amorphous core technology; partial conversion is disruptive in and of itself (but cannot be quantified). The manufacturer conversion costs would contribute to as much as a 17 percent reduction in the INPV under the preservation-of-operating-profit scenario. DOE estimates that $8.2 million of existing assets would be stranded and approximately $17 million in conversion capital expenditures would be required to enable the industry to manufacture compliant transformers. Additionally, TSL3 would be disruptive for manufacturers because it does not achieve the consistent treatment of single-phase and three-phase transformers (see Appendix 8I). This lack of consistency may cause large market distortions (i.e., shifts between single-phase and three-phase transformers) and impact manufacturers or plants that specialize in either single-phase or three-phase construction. Moreover, DOE's primary voltage sensitivity analysis found that TSL3 cannot be achieved using even the most efficient conventional silicon steels for one of the four design lines studied (see TSD Appendix 5D), and thus TSL3 could eliminate certain voltages from the marketplace unless amorphous core transformers were constructed. As explained above, DOE has decided not to set a standard that requires the use of amorphous material, even if the requirement would affect only a small portion of the market.

The energy savings at TSL3 would reduce the installed generating capacity by 2.7 GW, or roughly 7 large, 400 MW powerplants. The estimated emissions reductions through this same time period are 248 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, emission reductions, and national NPV would be outweighed by the economic burden on customers as indicated by large increases in installed equipment cost for some transformers, the stranded asset and conversion capital costs that could result in a significant reduction in INPV for manufacturers, the inconsistent treatment of single-phase and three-phase transformers, and the partial conversion to amorphous core material for at least one design line. Consequently, DOE concludes that TSL3 is not economically justified.

f. Liquid-Immersed Transformers—Trial Standard Level B

Next, DOE considered TSLB, which would save an estimated total of 2.75 quads of energy through 2038, a significant amount of energy. For the Nation as a whole, TSLB would result in a net savings of $1.11 billion and $7.26 billion at seven percent and three percent discount rates, respectively. Under the five-year average materials price scenario, lower life-cycle costs would be experienced by between 36.5 and 58.7 percent of customers, while 8.1 to 42.5 percent of customers would have increased life-cycle costs. Under the 2006 materials price sensitivity analysis, increased life-cycle costs are experienced by between 17.7 and 53.8 percent of customers. Under the five-year average materials price scenario, the payback periods are between 8.9 and 15.7 years, which at most is approximately half the anticipated operating life of the transformer. Under the 2006 materials price sensitivity analysis, the payback periods are slightly longer, ranging from 10.2 to 20.8 years. The manufacturer conversion costs would contribute to an 8 percent reduction in the INPV under the preservation-of-operating-profit scenario. TSLB concerns DOE because most (i.e., 87 percent) of the transformers manufactured for design line 5 at this level would require the most efficient conventional silicon core steel, M2. The LCC consumer choice model shows that no transformers in design line 5 would be built with M3 (or lower grade) core steel. DOE is uncertain whether there would be adequate supplies of M2 steel and whether this steel would be available to all manufacturers. These factors may force manufacturers to more expensive options, including amorphous core material.

The energy savings at TSLB would reduce the installed generating capacity by 2.7 GW, or roughly 7 large, 400 MW powerplants. The estimated emissions reductions through this same time period are 251 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, emission reductions, and national NPV would be outweighed by the economic burden placed on manufacturers as the vast majority would have to rely on the most efficient conventional silicon core steel for one design line. A clear cost disadvantage would be imposed on those manufacturers who could not secure sufficient or consistent M2 core steel supplies, potentially necessitating the use of amorphous material. Consequently, DOE concludes that TSLB is not economically justified.

g. Liquid-Immersed Transformers—Trial Standard Level C

Next, DOE considered TSLC, which would save an estimated total of 2.61 quads of energy through 2038, a significant amount of energy. For the Nation as a whole, TSLC would result in a net savings of $1.11 billion and $6.95 billion at seven percent and three percent discount rates, respectively. Under the five-year average materials price scenario, lower life-cycle costs would be experienced by between 36.5 and 58.7 percent of customers, depending on the design line. At this level, 2.5 to 42.5 percent of customers would have increased life-cycle costs, depending on the design line. Under the 2006 materials price sensitivity analysis, increased life-cycle costs will be experienced by between 13.4 and 53.8 percent of customers. Under the five-year average materials price scenario, the payback periods are between 4.3 and 15.7 years, which at most is approximately half the anticipated operating life of the transformer. Under the 2006 materials price sensitivity analysis, the payback periods range between 8.7 and 20.8 years. The conversion costs of manufacturers would contribute to an 8 percent reduction in the INPV under the preservation-of-operating-profit scenario. The quantified impact on manufacturers is not prohibitive. In comparison to TSLB, TSLC does not raise the same material availability concerns for design line 5. At TSLC, the LCC consumer choice model shows that 63% of designs would be constructed with M2 core steel, and 27% would be constructed with M3. DOE is satisfied that this provides reasonable diversity of core steel construction options for manufacturers. Additionally, the voltage sensitivity analysis found that even the highest BIL ratings do not eliminate the use of M3 or M2 core steel for any of the four liquid-immersed design lines analyzed.

The energy savings at TSLC would reduce the installed generating capacity by 2.5 GW, or roughly 6 large, 400 MW powerplants. The estimated emissions reductions through this same time period are 238 Mt of CO_2. After considering the benefits and burdens of TSLC, DOE finds that this trial standard level will offer the maximum improvement in efficiency that is technologically feasible and economically justified, and will result in significant energy savings. Therefore, DOE today is adopting TSLC as the energy conservation standard for liquid-immersed distribution transformers.

2. Results for Medium-Voltage, Dry-Type Distribution Transformers

a. Medium-Voltage, Dry-Type Transformers—Trial Standard Level 6

First, DOE considered the most efficient level (max tech), which would save an estimated total of 0.40 quads of energy through 2038. For the Nation as a whole, TSL6 would have a net cost of $80 million at a seven percent discount rate and a net benefit of $1.02 billion at three percent discount rate. At this level, the percentage of customers experiencing lower life-cycle costs would be less than 37.9 percent for the majority of the units analyzed, with one representative unit as low as 21.9 percent. More than three-quarters of transformer customers making purchases in that design line would experience increases in life-cycle cost. Customer payback periods at this standard level for the majority of units analyzed are 13.8 years or greater, with one representative unit as high as 18.7 years. The consumer equipment cost before installation would increase by as much as 95.1 percent for one design line, a significant increase for customers. At TSL6, the impacts on manufacturers would be significant, with this level contributing to a 67 percent reduction in the INPV under the preservation-of-operating-profit scenario. DOE projects that manufacturers would experience negative net annual cash flows during the time period between the final rule and the effective date of the standard, irrespective of the markup scenario. The magnitude of the peak, negative, net annual cash flow would be approximately twice that of the positive-base-case cash flow. DOE is also concerned that, at TSL6, the thin core steels (i.e., M3, HO) selected by the LCC (see TSD Appendix 8H) pose operational difficulties for the type of core-mitering equipment typically purchased by small manufacturers.

Under the 2006 materials price sensitivity analysis, the percentage of transformer customers who would experience higher life-cycle costs increases relative to their life-cycle costs under the average materials price scenario. For the 2006 materials price sensitivity, four of the five design lines have the majority of transformer customers experiencing higher life-cycle costs. Payback periods also increase under the 2006 material price scenario, to between 11.4 and 24.3 years, with four of the five design lines having average payback periods in excess of 20 years.

The energy savings at TSL6 would reduce installed generating capacity by 0.6 GW, or roughly 1.5 large, 400 MW powerplants. DOE estimates the associated emissions reductions through 2038 of 36.9 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, emission reductions, and national NPV would be outweighed by the economic burdens on customers as indicated by long payback periods and significantly greater first costs under both the average materials price and 2006 materials price sensitivity scenario, the economic impacts on manufacturers who may experience a drop in INPV of up to 67 percent, and the materials handling issue for small manufacturers. Consequently, DOE concludes that TSL6, the max tech level, is not economically justified.

b. Medium-Voltage, Dry-Type Transformers—Trial Standard Level 5

Since TSL5 is identical to TSL6 [26] (i.e., for all the representative units, TSL5 and TSL6 have the efficiency values), DOE found that TSL5 was not economically justified for the same reasons as TSL6, as described above in section VI.D.2.a.

c. Medium-Voltage, Dry-Type Transformers—Trial Standard Level 4

Next, DOE considered TSL4, which would save a total of 0.27 quads of energy through 2038. For the Nation as a whole, TSL4 would have a net savings of $0.45 billion and $1.55 billion at a seven percent and three percent discount rate, respectively. For both discount rates, this TSL represents the maximum NPV for medium-voltage, dry-type distribution transformers. The percentage of customers experiencing lower life-cycle costs would range between 52.6 and 74.4 percent, depending on the design line. Payback periods at this standard level range from 5.9 to 9.6 years. The consumer equipment cost before installation

[26] DOE's criteria for establishing TSLs were discussed in the NOPR. 71 FR 44378. TSL6 represents the maximum technologically feasible standard level. TSL5 represents the standard level that has maximum energy savings with approximately no net increase in LCC. For medium-voltage dry-type distribution transformers, the efficiency point values selected under these two criteria for TSL6 and TSL5 are the same, therefore the results are the same.

would increase by as much as 39.6 percent for one design line, a significant increase for customers. Furthermore, the impacts of TSL4 on manufacturers would be significant, contributing to as much as a 29 percent reduction in the INPV under the preservation-of-operating-profit scenario. Additionally, DOE projects that manufacturers would experience negative net annual cash flows during the time period between the final rule and the effective date of the standard, irrespective of the markup scenario. The magnitude of the peak, negative, net annual cash flow would be approximately half of the positive-base-case cash flow. Under the 2006 materials price sensitivity analysis, the percentage of transformer customers who would experience higher life-cycle costs increases relative to their life-cycle costs under the average materials price scenario. For the 2006 materials price sensitivity, three of the five design lines have the majority of transformer customers experiencing higher life-cycle costs. Payback periods also increase under the 2006 material price scenario, to between 8.5 and 14.0 years.

The energy savings at TSL4 would reduce the installed generating capacity by 0.4 GW, or roughly one large, 400 MW powerplant. DOE estimates associated emissions reductions through 2038 of 24.8 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, positive national NPV, and emission reductions would be outweighed by the long payback periods and significantly greater first costs for some transformer customers, the economic impacts associated with the 2006 materials price sensitivity and the economic impacts on manufacturers, including materials handling for small manufacturers. Consequently, DOE concludes that TSL4 is not economically justified.

d. Medium-Voltage, Dry-Type Transformers—Trial Standard Level 3

Next, DOE considered TSL3, which would save an estimated 0.19 quads of energy through 2038. For the Nation as a whole, TSL3 would have a net savings of $0.38 billion and $1.18 billion at a seven percent and three percent discount rate, respectively. The percentage of transformer customers who would experience lower life-cycle costs ranges between 47.2 and 76.1 percent, depending on the design line, with payback periods of 7.0 years or less. The impacts on manufacturers at TSL3 would be significant, contributing to as much as a 25 percent reduction in the INPV under the preservation-of-operating-profit scenario. In addition, DOE projects the net annual cash flows to be negative during the time period between the final rule and the effective date of the standard, irrespective of the markup scenario. The magnitude of the peak negative net annual cash flow would be approximately one-third of the positive-base-case cash flow. DOE is also concerned that, at TSL3, the thin core steels (i.e., M3, HO) selected by the LCC (see TSD Appendix 8H) pose operational difficulties for the type of core-mitering equipment typically purchased by small manufacturers. Under the 2006 materials price sensitivity analysis, the percentage of transformer customers who would experience higher life-cycle costs increases relative to their life-cycle costs under the average materials price scenario. For the 2006 materials price sensitivity, one design line has the majority of transformer customers experiencing higher life-cycle costs. Payback periods also increase under the 2006 material price scenario, nearly doubling with respect to payback periods for the five-year average material price.

The energy savings at TSL3 would reduce the installed generating capacity by 0.2 GW, or roughly 0.5 of a large, 400 MW powerplant. DOE estimates the associated emissions reductions through 2038 of 17.1 Mt of CO_2. DOE concludes that at this TSL, the benefits of energy savings, generating capacity reductions, positive national NPV, LCC savings, and emission reductions would be outweighed by the economic impacts on manufacturers, the materials handling for small manufacturers and the economic impacts associated with the 2006 materials price sensitivity. Consequently, DOE concludes that TSL3 is not economically justified.

e. Medium-Voltage, Dry-Type Transformers—Trial Standard Level 2

Next, DOE considered TSL2, which would save an estimated total of 0.13 quads of energy through 2038. For the Nation as a whole, TSL2 would have a net savings of $0.28 billion and $0.85 billion at a seven percent and three percent discount rate, respectively. The percentage of transformer customers experiencing lower life-cycle costs ranges between 37 and 67 percent, depending on the design line, with payback periods of six years or less. DOE considers impacts on manufacturers at this standard level (at most a 15 percent reduction in the INPV under the preservation-of-operating-profit scenario) to be reasonable. At TSL2, DOE is satisfied that there is a sufficiently diverse variety of core steels selected by the LCC (see TSD Appendix 8H), including M5 and M4, so that there will not be operational difficulties for the type of core-mitering equipment typically purchased by small manufacturers.

The energy savings at TSL2 would reduce the installed generating capacity by 0.1 GW, or roughly one-quarter of a large, 400 MW powerplant. DOE estimates associated emissions reductions through 2037 of 11.8 Mt of CO_2. DOE concludes that this TSL has positive energy savings, generating capacity reductions, emission reductions, national NPV, benefits to transformer customers, and reasonable impacts on transformer manufacturers. After considering the costs and benefits of TSL2, DOE finds that this trial standard level will offer the maximum improvement in efficiency that is technologically feasible and economically justified, and will result in significant conservation of energy. Therefore, DOE today adopts the energy conservation standards for medium-voltage, dry-type distribution transformers at TSL2.

VII. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

Today's regulatory action is a ''significant regulatory action'' under section 3(f)(1) of Executive Order 12866, ''Regulatory Planning and Review.'' 58 FR 51735 (October 4, 1993). Accordingly, DOE has prepared and submitted to the Office of Management and Budget (OMB) for review the assessment of costs and benefits required under section 6(a)(3) of the Executive Order. The Executive Order requires agencies to identify the specific market failure or other specific problem that it intends to address that warrants new agency action, as well as assess the significance of that problem, to enable assessment of whether any new regulations is warranted. (Executive Order 12866, § 1(b)(1)).

The specific problem that the energy conservation standard addresses for distribution transformers is that a substantial portion of distribution transformer purchasers are not evaluating the cost of transformer losses when they make distribution transformer purchase decisions. Therefore, distribution transformers are being purchased that do not provide the minimum life-cycle cost service to equipment owners. DOE requested and received data on, and suggestions for evaluating the existence and extent of the problem, which DOE used to complete an assessment in the NOPR of the significance of the problem and the net benefits of regulation.

For distribution transformers, the Institute of Electrical and Electronics Engineers, Inc. (IEEE) has voluntary guidelines for the economic evaluation of distribution transformer losses, IEEE PC57.12.33/D8. These guidelines document economic evaluation methods for distribution transformers that are common practice in the utility industry. But while economic evaluation of transformer losses is common, it is not a universal practice. DOE collected information during the course of the conservation standards rulemaking to estimate the extent to which distribution transformer purchases are evaluated. Data received from the National Electrical Manufacturers Association indicated that these guidelines or similar criteria are applied to approximately 75 percent of liquid-immersed transformer purchases, 50 percent of small capacity medium-voltage dry-type transformer purchases, and 80 percent of large capacity medium-voltage dry-type transformer purchases. Therefore, 25 percent, 50 percent, and 20 percent of distribution transformer purchases do not have economic evaluation of transformer losses. The benefits from the energy conservation standards result from eliminating those distribution transformers designs from the market that are purchased on a purely minimum first cost basis and which are unlikely to be purchased by equipment buyers when the economic value of equipment losses are properly evaluated. Detailed specifications of DOE's consumer purchase behavior model, and the consumer impact estimates are provided in Chapter 8 of the TSD.

Of course, there are likely to be certain ''external'' benefits resulting from the improved efficiency of units that are not captured by the users of such equipment. These include both environmental and energy security-related externalities that are not already reflected in energy prices such as reduced emissions of greenhouse gases and reduced use of natural gas (and oil) for electricity generation. DOE invited comments on the weight that should be given to these factors in DOE's determination of the maximum efficiency level at which the total benefits are likely to exceed the total burdens resulting from a DOE standard. Discussion of the comments regarding these externalities is provided in sections IV.D.2.e and IV.I.

DOE presented to OIRA for review the draft final rule and other documents prepared for this rulemaking, including the RIA, and has included these documents in the rulemaking record. They are available for public review in the Resource Room of DOE's Building Technologies Program, 1000 Independence Avenue, SW., Washington, DC, (202) 586–9127, between 9 a.m. and 4 p.m., Monday through Friday, except Federal holidays.

The proposed rule contained a summary of the RIA, which evaluated the extent to which the major alternatives to standards for distribution transformers could achieve significant energy savings at reasonable cost, as compared to the effectiveness of the proposed rule. 71 FR 44400–44401. The complete RIA, formally entitled, ''Regulatory Impact Analysis for Proposed Energy Conservation Standards for Electrical Distribution Transformers,'' is contained in the TSD prepared for today's rule. The RIA consists of: (1) A statement of the problem addressed by this regulation, and the mandate for government action; (2) a description and analysis of the feasible policy alternatives to this regulation; (3) a quantitative comparison of the impacts of the alternatives; and (4) the national economic impacts of the proposed standards.

As explained in the NOPR, DOE determined that none of the alternatives it examined would save as much energy or have an NPV as high as the proposed standards. That same conclusion applies to the standards in today's rule. Also, several of the alternatives would require new enabling legislation, since authority to carry out those alternatives does not presently exist. Additional detail on the regulatory alternatives is found in the RIA report in the TSD.

B. Review Under the Regulatory Flexibility Act/Final Regulatory Flexibility Analysis

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, and a final regulatory flexibility analysis (FRFA) for any such rule that an agency adopts as a final rule, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. A regulatory flexibility analysis examines the impact of the rule on small entities and considers alternative ways of reducing negative impacts. Also, 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 General Counsel's Web site: *http://www.gc.doe.gov.*

Small businesses, as defined by the Small Business Administration (SBA) for the distribution transformer manufacturing industry, are manufacturing enterprises with 750 employees or fewer. Prior to issuing the proposed rule in this rulemaking, DOE interviewed six small businesses affected by the rulemaking. DOE also obtained information about small business impacts while interviewing manufacturers that exceed the small business size threshold of 750 employees.

DOE reviewed the proposed rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. 71 FR 44401. On the basis of this review, DOE determined that it could not certify that the proposed rule (TSL2), if promulgated, would have no significant economic impact on a substantial number of small entities. *Id.* DOE made this determination because of the potential impacts that the proposed standard levels for medium-voltage, dry-type distribution transformers would have on the small businesses that manufacture them. However, DOE noted that it had explicitly considered the impacts on small businesses that manufacture medium-voltage, dry-type transformers in proposing to adopt TSL2 rather than a higher trial standard level. *Id.* In the proposed rule, DOE also stated and explained its belief that the proposed standards would not have significant economic impacts on a substantial number of small manufacturers of liquid-immersed transformers. 71 FR 44401–02.

Because of the potential impacts of the proposed standards on small manufacturers of medium-voltage, dry-type transformers, DOE prepared an IRFA during the NOPR stage of this rulemaking. DOE provided the IRFA in its entirety in the NOPR, 71 FR 44401–03, and also transmitted a copy to the Chief Counsel for Advocacy of the SBA for review. In addition, DOE gave a presentation concerning the key portions of the IRFA to the Chief Counsel for Advocacy of the SBA. DOE did not receive any indication that the IRFA was insufficient either in writing or during the aforementioned presentation to the SBA. Chapter 12 of the TSD contains more information about the impact of this rulemaking on manufacturers.

The IRFA divided potential impacts on small businesses into two broad categories: (1) Impacts associated with transformer design and manufacturing; and (2) impacts associated with demonstrating compliance with the standard using DOE's test procedure. DOE's test procedure rule does not require manufacturers to take any action in the absence of final energy conservation standards for distribution transformers, and thus any impact of that rule on small businesses would be triggered by the promulgation of today's standards. Thus, the IRFA discussed the potential impacts of the proposed standards on small manufacturers of medium-voltage, dry-type transformers, and of the compliance demonstration costs on all small manufacturers of distribution transformers.

DOE has prepared a FRFA for this rulemaking, and it is presented in the following discussion. DOE has transmitted a copy of this FRFA to the Chief Counsel for Advocacy of the SBA for review. The FRFA below is written in accordance with the requirements of the Regulatory Flexibility Act, and addresses the stakeholder comments received in response to the IRFA.

1. Need for and Objectives of the Rule

Today's rule is needed to satisfy the requirement in EPCA that DOE prescribe energy conservation standards for those distribution transformers for which DOE determines that standards would be technologically feasible and economically justified, and would result in significant energy savings. (42 U.S.C. 6317(a)) DOE had previously determined that standards for distribution transformers appear to be technologically feasible and economically justified, and are likely to result in significant savings. 62 FR 54809 (October 22, 1997).

In accordance with EPCA, the objective of today's final rule is to set energy conservation standards that achieve the maximum improvement in the energy efficiency of distribution transformers that are technologically feasible and economically justified. (See 42 U.S.C. 6295(o)(2)(A), 6313(a), and 42 U.S.C. 6317(a) and (c)) After DOE reviewed the comments received on the proposed rule and conducted further analyses, DOE determined that the economic benefits of today's standards exceed the costs to the greatest extent practicable, taking into consideration the seven factors set forth in 42 U.S.C. 6295(o)(2)(B)(i) (see Section II.A of this notice of final rulemaking). DOE concluded, therefore, that today's standards are economically justified. Further information concerning the background of this rulemaking is provided in Chapter 1 of the TSD.

2. Description and Estimated Number of Small Entities Regulated

By researching the distribution transformer market, developing a database of manufacturers, and conducting interviews with manufacturers (both large and small), DOE was able to estimate the number of small entities that would be regulated under an energy conservation standard. See chapter 12 of the TSD for further discussion about the methodology used in DOE's manufacturer impact analysis and its analysis of small business impacts.

Liquid-immersed transformers account for about $1.3 billion in annual sales and employment of about 4,230 production employees in the United States. DOE estimates that, of the approximately 25 U.S. manufacturers that make liquid-immersed distribution transformers, about 15 of them are small businesses. About five of the small businesses have fewer than 100 employees.

Medium-voltage, dry-type transformers account for about $84 million in annual sales and employment of about 250–330 production employees in the United States. The medium-voltage, dry-type market is relatively small compared to that of liquid-immersed transformers. The revenue attributable to the medium-voltage, dry-type transformers represents only about six percent of the total revenue of the industry affected by this rulemaking (i.e., the sum of revenues from the liquid-immersed and the medium-voltage, dry-type transformers). DOE estimates that, of the 25 U.S. manufacturers that make medium-voltage, dry-type distribution transformers, about 20 of them are small businesses. About ten of these small businesses have fewer than 100 employees. Thus, in relative terms, small businesses play a more dominant role in the market for medium-voltage, dry-type transformers than for liquid-immersed transformers.

3. Description and Estimate of Compliance Requirements

Potential impacts on small businesses come from two broad categories of compliance requirements: (1) Impacts associated with transformer design and manufacturing, and (2) impacts associated with demonstrating compliance with the standard using the DOE test procedure.

With respect to impacts associated with transformer design and manufacturing, the margins and/or market share of small businesses in the medium-voltage, dry-type transformers could be hurt in the long term by today's promulgated level, TSL2. At TSL2, as opposed to TSL1, small manufacturers would have less flexibility in choosing a design path. However, as explained in part 6 of the IRFA, ''Significant Alternatives to the Rule,'' DOE explicitly considered the impacts on small manufacturers of medium-voltage, dry-type transformers in selecting TSL2, rather than selecting a higher trial standard level. 71 FR 44403. DOE expects that the differential impact on small manufacturers of medium-voltage, dry-type transformers (versus large businesses) would be smaller in moving from TSL1 to TSL2 than it would be in moving from TSL2 to TSL3.

With respect to compliance demonstration, DOE's test procedure for distribution transformers allows manufacturers to use an Alternative Efficiency Determination Method (AEDM) which would ease the burden on manufacturers. 10 CFR Part 431, Subpart K, Appendix A; 71 FR 24972. The AEDM involves a sampling procedure to compare manufactured products' efficiencies with those predicted by computer design software. Where the manufacturer uses an AEDM for a basic model, it would not be required to test units of the basic model to determine its efficiency for purposes of establishing compliance with DOE requirements. The professional skills necessary to execute the AEDM include the following: (1) Transformer design software expertise (or access to such expertise possessed by a third party); and (2) electrical testing expertise and moderate expertise with experimental statistics (or access to such expertise possessed by a third party). DOE's test procedure would require periodic verification of the AEDM.

DOE's test procedure also requires manufacturers to calibrate equipment used for testing the efficiency of transformers. Calibration records will need to be maintained as a result of today's standard.

The testing, reporting, and recordkeeping requirements associated with an energy conservation standard and its related test procedure would be identical, irrespective of the trial standard level chosen. Therefore, for both liquid-immersed and medium-voltage, dry-type transformers, the testing, reporting, and recordkeeping requirements have not entered into DOE's choice of trial standard level for today's final rule.

4. Significant Issues Raised by Public Comments

NEMA submitted a comment that supports DOE's assessment that TSLs higher than TSL2 would have serious impacts on small manufacturers of medium-voltage dry-type transformers and would lead to further industry consolidation. (NEMA, No. 156 at p. 1) NEMA also commented that TSL2 would disproportionately affect small manufacturers and greatly limit the range of ratings that they could produce. NEMA stated that small manufacturers do not have the investment capital to procure the equipment necessary to produce the most efficient designs, and that small manufacturers' current designs cannot meet TSL4 for many ratings (it was unclear in this specific comment whether NEMA was referring to medium-voltage dry-type transformers, liquid-immersed transformers, or both types). (NEMA, No. 125 at p. 2) NEMA also indicated that material availability and quota issues (for core steel, copper, and aluminum) impact small manufacturers more severely than large manufacturers, since small manufacturers have less leverage over suppliers and typically have less diverse businesses. (NEMA, No. 156 at pp. 2–3) HVOLT supported NEMA's view that small manufacturers are affected more than large manufacturers by material availability issues. (HVOLT, Inc., No. 144 at p. 2) HVOLT adds that the material availability problems that would arise at TSL2 or higher would drive small manufacturers out of business. (HVOLT, Inc., No. 155 at p. 3; Public Meeting Transcript, No. 108.6 at p. 138)

The PEMCO Corporation, a small manufacturer of medium-voltage dry-type transformers, submitted a comment that conflicts with NEMA and HVOLT and supports the information that DOE received during the manufacturer interview process prior to the IRFA and the NOPR. During the interviews, DOE learned that small manufacturers of medium-voltage dry-type transformers can still choose to produce their own cores at TSL2 (although some will purchase cores) and can profitably compete at TSL2. 71 FR 44403. In its comment in response to the IRFA, PEMCO stated that, with additional capital expenditures and major changes in manufacturing practices, it can meet TSL2. PEMCO further stated that levels above TSL2 would make it impossible for PEMCO to compete. (PEMCO Corporation, No. 130 at p. 1) The PEMCO comment is consistent with DOE's understanding of the potential impacts on small, medium-voltage dry-type manufacturers. DOE's MIA suggests that while TSL2 presents greater difficulties for small businesses than TSL1, the impacts at TSL3 would be much greater. DOE expects that small businesses will generally be able to profitably compete at TSL2. DOE's MIA is based on its interviews of both small and large manufacturers, and consideration of small business impacts explicitly enters into DOE's choice of TSL2 in promulgating minimum efficiency standards for medium-voltage dry-type transformers.

DOE also notes that today's promulgated standard of TSL2 can be met with a variety of materials, including multiple core steels and both copper and aluminum windings. Because TSL2 can be met with a variety of materials, DOE does not expect that material availability issues will represent a substantial problem in the long-term.

ACEEE submitted a comment stating that small, medium-voltage dry-type manufacturers would not be forced out of business at higher standard levels because they could either install the necessary mitering equipment or purchase finished cores. (ACEEE, No. 127 at p. 9) DOE recognizes both of these possibilities. While DOE agrees that standard levels higher than TSL2 would not necessarily cause all small businesses to exit, there is a risk that a significant number of small businesses would exit the market at TSL3 or higher. As reported in the IRFA, the thin steels required at TSL3 and higher (M3 or better) pose operational difficulties for the type of core-mitering equipment typically purchased by small manufacturers. In addition, small businesses would be at a relative disadvantage at TSL3 and higher because research and development efforts would be on the same scale as those for larger companies, but these expenses would be recouped over much smaller sales volumes. These research and development efforts would be required by all manufacturers (not just small manufacturers) at TSL3 and higher because these designs are demanded only in very low volumes today. 71 FR 44403.

As a separate matter, DOE also received comments pertaining to small manufacturers in the liquid-immersed distribution transformer industry (the IRFA did not pertain to liquid-immersed transformers). In the NOPR, DOE concluded that there will be no significant economic impact on a substantial number of small liquid-immersed manufacturers. DOE's conclusion in the proposed rule was based on DOE's understanding of the strategy followed by (and role played by) small liquid-immersed transformer manufacturers in the market. Since liquid-immersed distribution transformers are largely customized, small businesses can compete because many of these transformers are unique designs produced in relatively small quantities by a given customer's order. Small manufacturers of liquid-immersed transformers tend not to compete on the higher-volume products and often produce transformers for highly specific applications. This strategy allows small manufacturers of liquid-immersed units to be competitive in certain liquid-immersed product markets. In the NOPR, DOE stated that implementation of an energy conservation standard would have a relatively minor differential impact on small manufacturers of liquid-immersed distribution transformers. Disadvantages to small businesses, such as having little leverage over suppliers (e.g., core steel suppliers), are present with or without an energy conservation standard. Due to the purchasing characteristics of their customers, small manufacturers of liquid-immersed transformers currently produce transformers at TSL2, the proposed level. Thus, DOE expected that conversion costs (i.e., research and development costs and capital investments) and the associated manufacturer impacts on small businesses would be insignificant at the proposed level, TSL2. 71 FR 44401–44402. Below, DOE revisits this expectation in light of the standards promulgated today, which are higher than TSL2.

Cooper Power Systems stated that TSL1 would help U.S. manufacturers while TSL2 would greatly limit the range of designs that small manufacturers of liquid-immersed transformers could produce. Cooper also stated that TSL4 would eliminate small manufacturers. (Cooper Power Systems, No. 154 at p. 2)

NEMA commented that DOE underestimated the impacts on small manufacturers of liquid-immersed transformers because DOE failed to consider materials availability issues and the quotas typically placed on small manufacturers. NEMA pointed to quotas on both core steel and winding materials and also the need to outsource core production. (NEMA, No. 156 at pp. 1, 3) NEMA asserted that small manufacturers lack the sophistication to create the most efficient designs and that high efficiency requirements would lead to the outsourcing of core production (especially distributed gap wound cores). (NEMA, No. 156 at p. 3) HVOLT submitted similar comments, adding that small manufacturers often do not have the requisite relationships with material suppliers to enable them to purchase scarce or highly sought after materials such as aluminum wire. (HVOLT, No. 155 at pp. 1–2)

Another manufacturer, Howard Industries notes that if size and weight increases are reasonable then most of the existing manufacturing equipment should still be usable (if fundamental technology changes are not required). (Howard Industries, No. 143 at p. 4) DOE infers that Howard's reference to ''fundamental technology changes'' concerns a requirement for amorphous core technology. The information provided by Howard is relevant to today's promulgated standard because TSLC will not require fundamental technology changes and therefore existing manufacturing facilities will not have to undergo substantial upgrades.

DOE appreciates the comments pertaining to the potential impacts on small liquid-immersed transformer manufacturers. DOE believes that its conclusion as stated in the IRFA is still valid, despite promulgating a standard today that is higher than the proposed level of TSL2 for all liquid-immersed design lines, except design line 4. The comments received on the August 2006 NOPR that were suggestive of prohibitive small business impacts that fall into two categories—those concerning materials availability and pricing and those pertaining to the outsourcing of distributed gap wound cores. In regard to the first category—materials availability and pricing—DOE recognizes that there are materials availability issues in the market today and that they are more serious for small businesses. DOE believes that such disadvantages for small businesses exist with or without an energy conservation standard. DOE does not expect that the standards promulgated today will exacerbate the problem. The standard promulgated today can be met through a variety of design paths including the use of more than one type of silicon core steel; in addition, the possibility of using multiple core steels may serve to alleviate material availability concerns in the long-term. With respect to the need of small manufacturers of liquid-immersed transformers to outsource distributed gap wound cores, evidence has not been presented by small businesses or their representatives to support the claim that this practice will be widespread. The equipment used in the liquid-immersed transformer industry to produce distributed gap wound cores is relatively inexpensive, and existing capacity is unlikely to become constrained because the equipment's processing time is proportional to the mass of steel processed (and does not increase significantly as thinner core steels are processed). In addition, unlike some core steel processing equipment presently used for stacked core construction, distributed gap wound core machines are readily able to handle steel laminations as thin as M2 without modification. See Section 12.4.1 of the TSD for further discussion.

HVOLT believes that TSL4 would hurt small manufacturers. To make this point, HVOLT and ERMCO pointed out at the public meeting that ERMCO cannot generate three-phase liquid-immersed designs which meet TSL4. HVOLT added that small businesses would have even greater difficulty than a sophisticated manufacturer such as ERMCO. (Public Meeting Transcript, No. 108.6 at p. 153 and pp. 163–164) ERMCO later submitted a comment which implied that TSL4 is a feasible standard level for all design lines except for design line 4. (ERMCO, No. 182 at p. 1) Since today's final rule requires design line 4 to meet the lower level in the proposed rule (TSL2), DOE believes that HVOLT's concern expressed at the public meeting about the feasibility of TSL4 and its implications for small businesses have been addressed. Today's standard is below TSL4 for the three-phase designs, and in particular, regulates design line 4 to the proposed level of TSL2.

5. Steps DOE Has Taken To Minimize the Economic Impact on Small Medium-Voltage Dry-Type Manufacturers

In consideration of the benefits and burdens of standards, including the burdens posed to small manufacturers, DOE concluded TSL2 is the highest level that can be justified for medium-voltage, dry-type transformers. As explained in part 6 of the IRFA, ''Significant Alternatives to the Rule,'' DOE explicitly considered the impacts on small manufacturers of medium-voltage, dry-type transformers in selecting TSL2, rather than selecting a higher trial standard level. It is DOE's belief that levels at TSL3 or higher would place excessive burdens on small manufacturers of medium-voltage, dry-type transformers. Such burdens would include large product redesign costs and also operational problems associated with the extremely thin laminations of core steel that would be needed to meet these levels. TSL2 essentially eliminates butt-lap core designs and will therefore put more burden on small manufacturers than would TSL1. However, the differential impact on small businesses (versus large businesses) is expected to be lower in moving from TSL1 to TSL2 than in moving from TSL2 to TSL3. Today, the market already demands significant quantities of medium-voltage, dry-type transformers that meet TSL2. 71 FR 44403.

Section VI.D above discusses how small business impacts entered into DOE's selection of today's standards for medium-voltage, dry-type transformers. DOE made its decision regarding standards by beginning with the highest level considered (TSL6) and successively eliminating TSLs until it finds a TSL that is both technologically feasible and economically justified (TSL2 in this case), taking into account other EPCA criteria. Because DOE believes that TSL2 is economically justified (including consideration of small business impacts), the reduced impact on small businesses that would have been realized in moving down to TSL1 was not considered in DOE's decision (but the reduced impact on small businesses that is realized in moving down to TSL2 from TSL3 was explicitly considered in the weighing of benefits and burdens).

Finally, DOE notes that it received no comments in reference to any undue burden placed on small manufacturers by the DOE test procedure and associated compliance requirements. In the IRFA, DOE requested feedback concerning the need to abbreviate test procedure requirements. 71 FR 44403. DOE received no comments on this issue from small businesses and is therefore not considering abbreviated test procedure requirements for small businesses at this time. DOE notes that the AEDM feature of the test procedure reduces the testing burden significantly for all manufacturers. Where manufacturers use an AEDM for a basic model, they would not be required to test units of the basic model to determine its efficiency for purposes of establishing compliance with DOE requirements. 71 FR 24990 and 24997–24998.

C. Review Under the Paperwork Reduction Act

Adoption of today's final rule will have the effect of requiring that manufacturers follow DOE's test procedure for distribution transformers, not just for purposes of making representations, but also to determine compliance even in the absence of any representation. Thus, manufacturers will become subject to the record-keeping requirements contained in the test procedure when today's energy conservation standards for distribution transformers take effect. 10 CFR Part 431, Subpart K, Appendix A; 71 FR 24972, 24998, 25007–08. As described in the Notice and Request for Comments published on April 27, 2006, these record-keeping requirements concern documentation of (1) the calibration of equipment that manufacturers use in performing testing and (2) the use by manufacturers of methods other than testing to determine the efficiency of their distribution transformers. 71 FR 24844–24845. Because adoption of today's standard will have the effect of imposing new information or record-keeping requirements on liquid-immersed and medium-voltage dry-type transformer manufacturers, DOE is seeking OMB clearance for these test procedure requirements under the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*). 71 FR 24844. When today's standards become operative on January 1, 2010, manufacturers of those products also will be required to comply with the record-keeping provisions in today's rule. Section 431.197(a)(4)(i) requires manufacturers of distribution transformers to have records as to alternative efficiency determination methods available for DOE inspection; section 6.2 of Appendix A requires maintenance of calibration records. As a result, concurrent with or shortly after publication of today's rule, the Department will publish a notice seeking public comment under the Paperwork Reduction Act, with respect to manufacturers of liquid-immersed and medium-voltage dry-type distribution transformers, on the record-keeping requirements in today's rule. After considering any public comments received in response to that notice, DOE will submit the proposed collection of information to OMB for approval pursuant to 44 U.S.C. 3507.

An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The information collection requirements in section 431.197(a)(4)(i) and section 6.2 of Appendix A will not become effective until OMB approves them. The Department will publish a document in the **Federal Register** advising liquid-immersed and medium-voltage dry-type manufacturers of their effective date. That document also will display the OMB control number.

D. Review Under the National Environmental Policy Act

DOE prepared an environmental assessment of the impacts of today's standards (DOE/EA–1565), which is available from: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Forrestal building, Mail Station EE–41, 1000 Independence Avenue, SW., Washington, DC 20585–0121, (202) 586–0854. DOE found the environmental effects associated with various standard efficiency levels for distribution transformers to be not significant, and therefore it is publishing, elsewhere in this issue of the **Federal Register**, a Finding of No Significant Impact pursuant to the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), the regulations of the Council on Environmental Quality (40 CFR parts 1500–1508), and DOE's regulations for compliance with the National Environmental Policy Act (10 CFR part 1021).

E. Review Under Executive Order 13132

DOE reviewed this rule pursuant to Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 4, 1999), which 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. The Department has examined today's final rule and has determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the equipment that is the subject of today's final rule. States can petition the Department 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'' 61 FR 4729 (February 7, 1996) 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. 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 final rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

DOE reviewed this regulatory action under Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) (UMRA), which requires each Federal agency to assess the effects of Federal regulatory actions on State, local and Tribal governments and the private sector. Today's final rule may impose expenditures of $100 million or more on the private sector. It does not contain a Federal intergovernmental mandate.

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 the notice of final rulemaking and the ''Regulatory Impact Analysis'' section of the TSD for this final 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. 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 sections 325(o), 345(a) and 346(a) of EPCA (42 U.S.C. 6295(o), 6316(a) and 6317(a)), today's final rule establishes energy conservation standards for distribution transformers 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 final rule.

H. Review Under the Treasury and General Government Appropriations Act, 1999

DOE determined that, for this rulemaking, it need not prepare a Family Policymaking Assessment under section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277). 71 FR 44405. DOE received no comments concerning section 654 in response to the NOPR, and, therefore, is taking no further action in today's final rule with respect to this provision.

I. Review Under Executive Order 12630

DOE determined, under Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 53 FR 8859 (March 18, 1988), that today's rule would not result in any takings which might require compensation under the Fifth Amendment to the United States Constitution. 71 FR 44405. DOE received no comments concerning Executive Order 12630 in response to the NOPR, and, therefore, is taking no further action in today's final rule with respect to this Executive Order.

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 (February 22, 2002), and DOE's guidelines were published at 67 FR 62446 (October 7, 2002). DOE has reviewed today's final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,'' 66 FR 28355 (May 22, 2001) requires Federal agencies to prepare and submit to the Office of Information and Regulatory Affairs of the OMB a Statement of Energy Effects for any significant energy action. DOE determined that the proposed rule was not a ''significant energy action'' within the meaning of Executive Order 13211. 71 FR 44405. Accordingly, it did not prepare a Statement of Energy Effects on the proposed rule. DOE received no comments on this issue in response to the NOPR. As with the proposed rule, DOE has concluded that today's final rule is not a significant energy action within the meaning of Executive Order 13211, and has not prepared a Statement of Energy Effects on the rule.

L. Review Under Section 32 of the Federal Energy Administration Act of 1974

Section 32 of the Federal Energy Administration Act (FEAA) of 1974 precludes DOE from adopting by rule any commercial standard unless the agency has consulted with the Attorney General and the Chairman of the Federal Trade Commission, and neither recommends against such requirement. (15 U.S.C. 788) DOE indicated in the proposed rule, in a slightly different context, that it was not proposing in this rulemaking to require use of a commercial standard, and it concluded that section 32 of the FEAA did not apply. DOE received no comments on this issue. As with the proposed rule, today's rule neither incorporates nor requires compliance with a voluntary commercial standard. Therefore, section 32 of the FEAA does not apply to this rule.

M. 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'' (Bulletin). 70 FR 2664 (January 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 rulemakings analyses are ''influential scientific information.'' The Bulletin defines ''influential scientific information'' 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 (January 14, 2005).

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. The ''Energy Conservation Standards Rulemaking Peer Review Report'' dated February 2007 has been disseminated and is available at the following Web site: *http://www.eere.energy.gov/buildings/appliance_standards/peer_review.html*.

N. Congressional Notification

As required by 5 U.S.C. 801, DOE will submit to Congress a report regarding the issuance of today's final rule prior to the effective date set forth at the outset of this notice. The report will state that it has been determined that the rule is a ''major rule'' as defined by 5 U.S.C. 804(2). DOE also will submit the supporting analyses to the Comptroller General in the U.S. Government Accountability Office (GAO) and make them available to each House of Congress.

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of today's final rule.

List of Subjects in 10 CFR Part 431

Administrative practice and procedure, Confidential business information, Energy conservation, Reporting and recordkeeping requirements.

Issued in Washington, DC, on September 28, 2007.

Alexander A. Karsner,

Assistant Secretary, Energy Efficiency and Renewable Energy.

■ For the reasons set forth in the preamble, Chapter II of Title 10, Code of Federal Regulations, Subpart K of Part 431 is amended to read as set forth below.

PART 431—ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT

■ 1. The authority citation for part 431 continues to read as follows:

Authority: 42 U.S.C. 6291–6317.

■ 2. Section 431.192 is amended by adding in alphabetical order the definition of ''underground mining distribution transformer'' and by revising the definition of an ''uninterruptible power supply transformer.''

§ 431.192 Definitions.

* * * * *

Underground mining distribution transformer means a medium-voltage dry-type distribution transformer that is built only for installation in an underground mine or inside equipment for use in an underground mine, and that has a nameplate which identifies the transformer as being for this use only.

Uninterruptible power supply transformer means a transformer that is used within an uninterruptible power system, which in turn supplies power to loads that are sensitive to power failure, power sags, over voltage, switching transients, line noise, and other power quality factors.

■ 3. Section 431.196 is amended by revising the introductory text in paragraph (a), revising paragraphs (b) and (c), and by adding paragraph (d) to read as follows:

§ 431.196 Energy conservation standards and their effective dates.

(a) *Low-Voltage Dry-Type Distribution Transformers.* The efficiency of a low-voltage dry-type distribution transformer manufactured on or after January 1, 2007, shall be no less than that required for their kVA rating in the table below. Low-voltage dry-type distribution transformers with kVA ratings not appearing in the table shall have their minimum efficiency level determined by linear interpolation of the kVA and efficiency values immediately above and below that kVA rating.

* * * * *

(b) *Liquid-Immersed Distribution Transformers.* The efficiency of a liquid-immersed distribution transformer manufactured on or after January 1, 2010, shall be no less than that required for their kVA rating in the table below. Liquid-immersed distribution transformers with kVA ratings not appearing in the table shall have their minimum efficiency level determined by linear interpolation of the kVA and efficiency values immediately above and below that kVA rating.

Single-phase		Three-phase	
kVA	Efficiency (%)	kVA	Efficiency (%)
10	98.62	15	98.36
15	98.76	30	98.62
25	98.91	45	98.76
37.5	99.01	75	98.91
50	99.08	112.5	99.01
75	99.17	150	99.08
100	99.23	225	99.17
167	99.25	300	99.23
250	99.32	500	99.25
333	99.36	750	99.32
500	99.42	1000	99.36
667	99.46	1500	99.42
833	99.49	2000	99.46
		2500	99.49

Note: All efficiency values are at 50 percent of nameplate-rated load, determined according to the DOE Test-Procedure. 10 CFR Part 431, Subpart K, Appendix A.

(c) *Medium-Voltage Dry-Type Distribution Transformers.* The efficiency of a medium-voltage dry-type distribution transformer manufactured on or after January 1, 2010, shall be no less than that required for their kVA and BIL rating in the table below. Medium-voltage dry-type distribution transformers with kVA ratings not appearing in the table shall have their minimum efficiency level determined by linear interpolation of the kVA and efficiency values immediately above and below that kVA rating.

TABLE I.2.—STANDARD LEVELS FOR MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS, TABULAR FORM

Single-phase				Three-phase			
BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)	BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)
15	98.10	97.86		15	97.50	97.18	
25	98.33	98.12		30	97.90	97.63	
37.5	98.49	98.30		45	98.10	97.86	
50	98.60	98.42		75	98.33	98.12	
75	98.73	98.57	98.53	112.5	98.49	98.30	
100	98.82	98.67	98.63	150	98.60	98.42	
167	98.96	98.83	98.80	225	98.73	98.57	98.53
250	99.07	98.95	98.91	300	98.82	98.67	98.63
333	99.14	99.03	98.99	500	98.96	98.83	98.80
500	99.22	99.12	99.09	750	99.07	98.95	98.91

TABLE I.2.—STANDARD LEVELS FOR MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS, TABULAR FORM—Continued

Single-phase				Three-phase			
BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)	BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)
667	99.27	99.18	99.15	1000	99.14	99.03	98.99
833	99.31	99.23	99.20	1500	99.22	99.12	99.09
				2000	99.27	99.18	99.15
				2500	99.31	99.23	99.20

Note: BIL means basic impulse insulation level.
Note: All efficiency values are at 50 percent of nameplate rated load, determined according to the DOE Test-Procedure. 10 CFR Part 431, Subpart K, Appendix A.

(d) *Underground Mining Distribution Transformers.* [RESERVED]

* * * * *

Appendix

[The following letters from the Department of Justice will not appear in the Code of Federal Regulations.]

Department of Justice

Antitrust Division, Main Justice Building, 950 Pennsylvania Avenue, NW., Washington, DC 20530–0001, (202) 514–2401/(202) 616–2645 (Fax), E-mail: *antitrust@usdoj.gov,* Web site: *http://www.usdoj.gov/atr.*

January 16, 2007.

Warren Belmar, Esq.,

Deputy General Counsel for Energy Policy, U.S. Department of Energy, Washington, DC 20585.

Dear Deputy General Counsel Belmar: I am responding to your November 14, 2006 letters seeking the views of the Attorney General about the potential impact on competition of proposed energy efficiency standards relating to (1) liquid-immersed and medium-voltage, dry-type distribution transformers (''distribution transformers''), and (2) residential furnaces and boilers (''furnaces and boilers''). The Energy Policy and Conservation Act (''EPCA'') authorizes the Department of Energy (''DOE'') to establish energy conservation standards for a number of appliances where DOE determines that those standards would be technologically feasible, economically justified, and result in significant energy savings.

Your requests were submitted pursuant to Section 325(o)(2)(B)(I) of the Energy Policy and Conservation Act, 42 U.S.C. 6291. 6295 (''EPCA''), which states that, before the Secretary of Energy may prescribe a new or amended energy conservation standard, the Secretary shall ask the Attorney General to make a determination of ''the impact of any lessening of competition * * * that is likely to result from the imposition of the standard.'' The Attorney General's responsibility for responding to requests from other departments about the effect of a program on competition has been delegated to the Assistant Attorney General for the Antitrust Division in 28 CFR 0.40(g). In conducting its analysis the Antitrust Division examines whether a standard may lessen competition, for example, by placing certain manufacturers of a product at an unjustified competitive disadvantage compared to other manufacturers, or by inducing avoidable inefficiencies in production or distribution of particular products. In addition to harming consumers directly through higher prices, these effects could undercut the ultimate goals of the legislation.

Your requests included the Notices of Proposed Rulemaking (''NOPR'') that were published in the **Federal Register** and transcripts of public hearings relating to the proposed standards. The NOPR relating to distribution transformers proposed Trial Standard Level 2 and explained why DOE had decided not to propose higher trial standard levels. The NOPR relating to furnaces and boilers proposed the following standards: 80% annual fuel utilization efficiency (''AFUE'') for non-weatherized gas furnaces and mobile home gas furnaces; 82% AFUE for oil-fired furnaces; 83% AFUE for weatherized gas furnaces and oil-fired boilers; and 84% AFUE for gas boilers. Our review regarding distribution transformers and furnaces and boilers has focused upon the standards DOE has proposed adopting; we have not determined the impact on competition of more stringent standards than those set forth in the NOPRs.

In addition to the NOPRs and transcripts, your staff provided us comments that had been submitted to DOE regarding the proposed standards. (We understand that the docket has not closed with respect to furnaces and that more comments may be forthcoming.) We have reviewed these materials and additionally conducted interviews with members of the industries.

Based on this inquiry, the Division is concerned that the distribution transformer Trial Standard Level 2 may adversely affect competition with respect to distribution transformers used in industries, such as underground coal mining, where physical conditions limit the size of equipment that can be effectively utilized. We understand manufacturers would not be able to satisfy the proposed standard without increasing the size (or decreasing the power) of each class of distribution transformer. Firms facing space constraints would incur significantly increased costs due to enlarging the required installation space (which, for example, could involve removal of solid rock around coal seams in underground mines) or reconfiguring the size and number of each class of distribution transformers at each site. The resulting cost increases could constitute production inefficiencies that could make certain products less competitive. For example, the rule could, by raising the costs of certain coal mines, adversely affect production decisions at those mines and potentially result in increased use of less efficient energy alternatives. We urge the DOE to consider these concerns carefully in its analysis, and to consider creating an exception for distribution transformers used in industries with space constraints.

The Division is also concerned that the standards for weatherized gas furnaces and gas boilers could adversely affect competition. We understand that manufacturers would have difficulty designing products that safely meet the proposed standards. For weatherized gas furnaces, meeting the standard would like result in increased condensation, potentially resulting in significant deterioration that would jeopardize the safety of the product, and, for weatherized gas-fired water boilers, meeting the standard would make effective carbon dioxide venting more difficult. Any resulting costs incurred to solve these issues could adversely affect the competitiveness of these products in relation to electric heat pumps and water heaters. We urge the DOE to carefully consider its proposed standards in light of these concerns.

Aside from the discussion above, the Division does not otherwise believe the proposed standards would adversely impact competition.

Yours sincerely,

J. Bruce McDonald,

Acting Assistant Attorney General.

Department of Justice

Antitrust Division, Main Justice Building, 950 Pennsylvania Avenue, NW., Washington, DC 20530–0001, (202) 514–2401 / (202) 616–2645 (Fax), E-mail: *antitrust@usdoj.gov,* Web site: *http://www.usdoj.gov/atr.*

September 6, 2007.

Warren Belmar, Esq.,

Deputy General Counsel for Energy Policy, U.S. Department of Energy, Washington, DC 20585.

Dear Deputy General Counsel Belmar: I am responding to your August 7, 2007 letter seeking the views of the Attorney General about the potential impact on competition of the proposed final rule regarding energy conservation standards for liquid-immersed and medium-voltage, dry-type distribution transformers (''distribution transformers''). The Energy Policy and Conservation Act (''EPCA'') authorizes the Department of Energy (''DOE'') to establish energy conservation standards for a number of appliances where DOE determines that those standards would be technologically feasible, economically justified, and result in significant energy savings.

Your request was submitted pursuant to Section 325(o)(2)(B)(I) of the Energy Policy and Conservation Act, 42 U.S.C. 6291.6295 (''EPCA''), which states that before the Secretary of Energy may prescribe a new or amended energy conservation standard, the Secretary shall ask the Attorney General to make a determination of ''the impact of any lessening of competition * * * that is likely to result from the imposition of the standard.'' The Attorney General's responsibility for responding to requests from other departments about the effect of a program on competition has been delegated to the Assistant Attorney General for the Antitrust Division in 28 CFR 0.40(g). In conducting its analysis the Antitrust Division examines whether a standard may lessen competition, for example, by placing certain manufacturers of a product at an unjustified competitive disadvantage compared to other manufacturers, or by inducing avoidable inefficiencies in production or distribution of particular products. In addition to harming consumers directly through higher prices, these effects could undercut the ultimate goals of the legislation.

Along with your request, you sent us the draft final rule and a number of other documents relating to distribution transformers, including the comments that had been submitted to DOE in response to the Notice of Proposed Rulemaking (''NOPR''), the Notice of Data Availability (''NODA'') issued by DOE earlier this year that discussed standards DOE was considering, and comments DOE received regarding the NODA.

In November of 2006, you requested DOJ's views regarding the NOPR, which proposed Trial Standard Level 2. By letter dated January 16, 2007, we responded that, based on our inquiry, we were concerned that the distribution transformer standard might adversely affect competition with respect to distribution transformers used in industries, such as underground coal mining, where physical conditions limit the size of equipment that can be effectively utilized. We urged DOE to consider creating an exception for distribution transformers used in industries with space constraints.

You have addressed our concern by establishing a separate product class for underground mining transformers and excluding that class from the proposed final rule. Although our January 16, 2007 letter did not limit our concern to underground mining transformers, we believe DOE's decision to exclude underground mining transformers from the proposed final rule adequately addresses our concern.

Our review of the NOPR was limited to the impact of Trial Standard Level 2 on competition. The proposed final rule would establish a more stringent standard than Trial Standard Level 2 for certain distribution transformers. Specifically, it establishes Trial Standard Level 3 as the standard for certain three phase liquid-immersed distribution transformers, with a commensurate standard for certain single phase liquid-immersed distribution transformers. To ascertain whether the more stringent standard would adversely impact competition, we have evaluated the comments DOE received in response to the NODA, which had stated DOE was contemplating Trial Standard Level 2 or 3 for three phase liquid-immersed distribution transformers. We have also conducted industry interviews. Based on this review, we have concluded that the proposed final rule's application of Trial Standard Level 3 to certain three phase liquid-filled distribution transformers and the comparable standard to certain single phase liquid-filled distribution transformers would not adversely affect competition.

In conclusion, the Antitrust Division does not believe the proposed final rule would adversely affect competition.

Yours sincerely,

Deborah A. Garza,
Acting Assistant Attorney General.

[FR Doc. E7–19582 Filed 10–11–07; 8:45 am]
BILLING CODE 6450–01–P