DEPARTMENT OF ENERGY

10 CFR Part 430

[EERE–2014–BT–STD–0058]

RIN 1904–AD99

Energy Conservation Program: Energy Conservation Standards for Consumer Clothes Dryers

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

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

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

DATES:

Meeting: DOE will hold a public meeting via webinar on September 13, 2022, from 1:00 p.m. to 4:00 p.m. See section VII, ''Public Participation'' for webinar registration information, participant instructions and information about the capabilities available to webinar participants.

Comments: DOE will accept comments, data, and information regarding this NOPR no later than October 24, 2022.

Comments regarding the likely competitive impact of the proposed standard should be sent to the Department of Justice contact listed in the **ADDRESSES** section on or before September 22, 2022.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov.* Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2014–BT–STD–0058, by any of the following methods:

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

2. *Email:* to *ResClothesDryers2014STD0058@ee.doe.gov.* Include docket number EERE–2014–BT–STD–0058 in the subject line of the message.

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

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

The docket web page can be found at *www.regulations.gov/docket/EERE-2014-BT-STD-0058.* The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section VII for information on how to submit comments through *www.regulations.gov.*

Written comments regarding the burden-hour estimates or other aspects of the collection-of-information requirements contained in this proposed rule may be submitted to Office of Energy Efficiency and Renewable Energy following the instructions at *www.RegInfo.gov.*

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

FOR FURTHER INFORMATION CONTACT:

Mr. Bryan Berringer, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE–5B, 1000 Independence Avenue SW, Washington, DC 20585–0121. Email: *ApplianceStandardsQuestions@ee.doe.gov.*

Ms. Kathryn McIntosh, U.S. Department of Energy, Office of the General Counsel, GC–33, 1000 Independence Avenue SW, Washington, DC 20585–0121. Telephone: (202) 586–2002. Email: *Kathryn.McIntosh@hq.doe.gov.*

For further information on how to submit a comment, review other public comments and the docket, or participate in the public meeting, contact the Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *ApplianceStandardsQuestions@ee.doe.gov.*

SUPPLEMENTARY INFORMATION:

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I. Synopsis of the Proposed Rule

Title III, Part B [1] of EPCA,[2] established the Energy Conservation Program for Consumer Products Other Than Automobiles. (42 U.S.C. 6291–6309) These products include consumer clothes dryers, the subject of this proposed rulemaking.

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

In accordance with these and other statutory provisions discussed in this document, DOE proposes amended energy conservation standards for consumer clothes dryers. The proposed standards, which are expressed as the combined energy factor as determined in accordance with the appendix D2 test procedure (''CEF_{D2}'') in pounds per kilowatt-hour (''lb/kWh'')—a metric based on the clothes dryer test load weight in pounds (''lb'') divided by the sum of ''active mode'' and ''inactive mode'' per-cycle energy use in kilowatt-hours (''kWh''), are shown in Table I.1. These proposed standards, if adopted, would apply to all consumer clothes dryers listed in Table I.1 manufactured in, or imported into, the United States starting on the date 3 years after the publication of the final rule for this proposed rulemaking.

TABLE I.1—PROPOSED ENERGY CONSERVATION STANDARDS FOR CONSUMER CLOTHES DRYERS AS MEASURED UNDER APPENDIX D2

Product class	CEF_{D2} (lb/kWh)
1. Electric, Standard (4.4 cubic feet (''ft^3'') or greater capacity)	3.93
2. Electric, Compact (120 volts (''V'')) (less than 4.4 ft^3 capacity)	4.33
3. Vented Electric, Compact (240V) (less than 4.4 ft^3 capacity)	3.57
4. Vented Gas, Standard (4.4 ft^3 or greater capacity)	3.48
5. Vented Gas, Compact (less than 4.4 ft^3 capacity)	2.02
6. Ventless Electric, Compact (240V) (less than 4.4 ft^3 capacity)	2.68
7. Ventless Electric, Combination Washer-Dryer	2.33

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

[2] All references to EPCA in this document refer to the statute as amended through the Infrastructure Investment and Jobs Act, Public Law 117–58 (Nov. 15, 2021).

DOE also considered more-stringent energy efficiency levels as potential standards, and is still considering them in this proposed rulemaking. DOE may also consider adopting more stringent-energy efficiency levels for some or all classes. However, DOE has tentatively concluded at this time that the potential burdens of the more-stringent energy efficiency levels would outweigh the projected benefits.

A. Benefits and Costs to Consumers

Table I.2 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of consumer clothes dryers, as measured by the average life-cycle cost (''LCC'') savings and the simple payback period (''PBP'').[3] The average LCC savings are positive for all product classes, and the PBP is less than the average lifetime of consumer clothes dryers, which is estimated to be 14 years (see section IV.F of this document).

TABLE I.2—IMPACTS OF PROPOSED ENERGY CONSERVATION STANDARDS ON CONSUMERS OF CONSUMER CLOTHES DRYERS

Consumer clothes dryer class	Average LCC savings (2020$)	Simple payback period (years)
Electric, Standard (4.4 ft^3 or greater capacity)	$578	0.55
Electric, Compact (120V) (less than 4.4 ft^3 capacity)	160	1.81
Vented Electric, Compact (240V) (less than 4.4 ft^3 capacity)	192	1.62
Vented Gas, Standard (4.4 ft^3 or greater capacity)	198	1.95
Vented Gas, Compact (less than 4.4 ft^3 capacity)	25.2	5.07
Ventless Electric, Compact (240V) (less than 4.4 ft^3 capacity)	145	0.33
Ventless Electric, Combination Washer-Dryer	15.1	0.00

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

B. Impact on Manufacturers

The industry net present value (''INPV'') is the sum of the discounted cash flows to the industry from the base year through the end of the analysis period (2022–2056). Using a real discount rate of 7.5 percent, DOE estimates that the INPV for manufacturers of consumer clothes dryers in the case without amended standards is $1,810.1 million in 2020$. Under the proposed standards, the change in INPV is estimated to range from –6.4 percent to –4.5 percent, which is approximately $115.6 million to $81.6 million. In order to bring products into compliance with amended standards, it is estimated that the industry would incur total conversion costs of $149.7 million.

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

C. National Benefits and Costs[4]

DOE's analyses indicate that the proposed energy conservation standards for consumer clothes dryers would save a significant amount of energy. Relative to the case without amended standards, the lifetime energy savings for consumer clothes dryers purchased in the 30-year period that begins in the anticipated year of compliance with the amended standards (2027–2056) amount to 3.11 quadrillion British thermal units (''Btu''), or quads.[5]

The cumulative net present value (''NPV'') of total consumer benefits of the proposed standards for consumer clothes dryers ranges from $9.07 billion (at a 7-percent discount rate) to $20.8 billion (at a 3-percent discount rate). This NPV expresses the estimated total value of future operating-cost savings minus the estimated increased product costs for consumer clothes dryers purchased in 2027–2056.

In addition, the proposed standards for consumer clothes dryers are projected to yield significant environmental benefits. DOE estimates that the proposed standards would result in cumulative emission reductions (over the same period as for energy savings) of 116 million metric tons (''Mt'')[6] of carbon dioxide (''CO_2''), 42.6 thousand tons of sulfur dioxide (''SO_2''), 181 thousand tons of nitrogen oxides (''NO_X''), 883 thousand tons of methane (''CH_4''), 1.09 thousand tons of nitrous oxide (''N_2O''), and 0.26 tons of mercury (''Hg'').[7]

DOE estimates the value of climate benefits from a reduction in greenhouse gases using four different estimates of the social cost of CO_2 (''SC–CO_2''), the social cost of methane (''SC–CH_4''), and the social cost of nitrous oxide (''SC–N_2O''). Together these represent the social cost of greenhouse gases (SC–GHG). DOE used interim SC–GHG values developed by an Interagency Working Group on the Social Cost of Greenhouse Gases (''IWG'').[8] The derivation of these values is discussed in section IV.L of this document. For presentational purposes, the climate benefits associated with the average SC–GHG at a 3-percent discount rate are estimated to be $5.42 billion. DOE does not have a single central SC–GHG point estimate and it emphasizes the

[3] The average LCC savings refer to consumers that are affected by a standard and are measured relative to the efficiency distribution in the no-new-standards case, which depicts the market in the compliance year in the absence of new or amended standards (*see* section IV.F.8 of this document). The simple PBP, which is designed to compare specific efficiency levels, is measured relative to the baseline product (*see* section IV.F.9 of this document).

[4] All monetary values in this document are expressed in 2020 dollars.

[5] The quantity refers to full-fuel-cycle (''FFC'') energy savings. FFC energy savings includes the energy consumed in extracting, processing, and transporting primary fuels (*i.e.,* coal, natural gas, petroleum fuels), and, thus, presents a more complete picture of the impacts of energy efficiency standards. For more information on the FFC metric, *see* section IV.H.2 of this document.

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

[7] DOE calculated emissions reductions relative to the no-new-standards case, which reflects key assumptions in the *Annual Energy Outlook 2021* (''*AEO2021*''). *AEO2021* represents current Federal and State legislation and final implementation of regulations as of the time of its preparation. *See* section IV.K of this document for further discussion of *AEO2021* assumptions that effect air pollutant emissions.

[8] *See* Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide. Interim Estimates Under Executive Order 13990, Washington, DC (February 2021) (Available at: *www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf*) (Last accessed March 17, 2022).

importance and value of considering the benefits calculated using all four SC–GHG estimates.[9]

DOE also estimates health benefits from SO_2 and NO_X emissions reductions. DOE estimates the present value of the health benefits would be $3.59 billion using a 7-percent discount rate, and $9.14 billion using a 3-percent discount rate. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions.

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

TABLE I.3—SUMMARY OF MONETIZED ECONOMIC BENEFITS AND COSTS OF PROPOSED ENERGY CONSERVATION STANDARDS FOR CONSUMER CLOTHES DRYERS

[TSL 3]

	Billion 2020$
3% discount rate	
Consumer Operating Cost Savings	22.2
Climate Benefits *	5.42
Health Benefits **	9.14
Total Benefits †	36.8
Consumer Incremental Product Costs ‡	1.36
Net Benefits	35.4
7% discount rate	
Consumer Operating Cost Savings	9.83
Climate Benefits *	5.42
Health Benefits **	3.59
Total Benefits †	18.8
Consumer Incremental Product Costs ‡	0.76
Net Benefits	18.1

Note: This table presents the costs and benefits associated with consumer clothes dryers shipped in 2027–2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027–2056.

* Climate benefits are calculated using four different estimates of the social cost of carbon ($SC–CO_2$), methane ($SC–CH_4$), and nitrous oxide ($SC–N_2O$) (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate), as shown in Table V.36, Table V.38, and Table V.40. Together these represent the global social cost of greenhouse gases (SC–GHG). For presentational purposes of this table, the climate benefits associated with the average SC–GHG at a 3 percent discount rate are shown, but the Department does not have a single central SC–GHG point estimate. *See* section. IV.L of this document for more details. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the Federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the Federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. As reflected in this rule, DOE has reverted to its approach prior to the injunction and presents monetized greenhouse gas abatement benefits where appropriate and permissible under law.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. *See* section IV.L of this document for more details.

† Total and net benefits include those consumer, climate, and health benefits that can be monetized. For presentation purposes, total and net benefits for both the 3-percent and 7-percent cases are presented using the average SC–GHG with 3-percent discount rate, but the Department does not have a single central SC–GHG point estimate. DOE emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates. See Table V.46 for net benefits using all four SC–GHG estimates.

‡ Costs include incremental equipment costs as well as installation costs.

The benefits and costs of the proposed standards, for consumer clothes dryers sold in 2027–2056, can also be expressed in terms of annualized values. The monetary values for the total annualized net benefits are (1) the reduced consumer operating costs, minus (2) the increase in product purchase prices and installation costs, plus (3) the value of the benefits of NO_X and SO_2 emission reductions, all annualized.[10]

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

[10] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2021, the year used for discounting the NPV of total consumer costs and savings. For the benefits, DOE calculated a present value associated with each year's shipments in the year in which the shipments occur (*e.g.,* 2030), and then discounted the present value from each year to 2021. The calculation uses discount rates of 3 and 7 percent for all costs and benefits. Using the present value, DOE then calculated the fixed annual payment over a 30-year period, starting in the compliance year, that yields the same present value.

The national operating savings are domestic private U.S. consumer monetary savings that occur as a result of purchasing the covered products and are measured for the lifetime of consumer clothes dryers shipped in 2027–2056. The benefits associated with reduced emissions achieved as a result of the proposed standards are also calculated based on the lifetime of consumer clothes dryers shipped in 2027–2056. Total benefits for both the 3-percent and 7-percent cases are presented using the average GHG social costs with 3-percent discount rate. Estimates of SC–GHG values are presented for all four discount rates in section V.B.8 of this document. Estimates of annualized benefits and costs of the proposed standards are shown in Table I.4. The results under the primary estimate are as follows.

Using a 7-percent discount rate for consumer benefits and costs and health benefits from reduced SO_2 and NO_X emissions, the estimated cost of the standards proposed in this rule is $85.7 million per year in increased equipment costs, while the estimated annual benefits are $1,111 million in reduced equipment operating costs, $320 million in climate benefits, and $406 million in health benefits (accounting for reduced NO_X emissions and increased SO_2 emissions). In this case, the net benefit would amount to $1,752 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards is $80.7 million per year in increased equipment costs, while the estimated annual benefits are $1,313 million in reduced operating costs, $320 million in climate benefits, and $541 million in health benefits (accounting for reduced NO_X emissions and increased SO_2 emissions). In this case, the net benefit would amount to $2,094 million per year.

TABLE I.4—ANNUALIZED MONETIZED BENEFITS AND COSTS OF PROPOSED ENERGY CONSERVATION STANDARDS FOR CONSUMER CLOTHES DRYERS

[TSL 3]

	Million 2020$/year		
	Primary estimate	Low-net-benefits estimate	High-net-benefits estimate
3% discount rate			
Consumer Operating Cost Savings	1,313	1,227	1,403
Climate Benefits *	320	311	327
Health Benefits **	541	526	551
Total Benefits †	2,174	2,065	2,280
Consumer Incremental Product Costs ‡	80.7	80.5	76.6
Net Benefits	2,094	1,984	2,204
7% discount rate			
Consumer Operating Cost Savings	1,111	1,050	1,178
Climate Benefits *	320	311	327
Health Benefits **	406	395	413
Total Benefits †	1,837	1,757	1,917
Consumer Incremental Product Costs ‡	85.7	85.3	82.4
Net Benefits	1,752	1,671	1,835

Note: This table presents the costs and benefits associated with consumer clothes dryers shipped in 2027–2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027–2056.

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

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. *See* section IV.L of this document for more details.

† Total benefits for both the 3-percent and 7-percent cases are presented using the average SC–GHG with 3-percent discount rate, but the Department does not have a single central SC–GHG point estimate. DOE emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates.

‡ Costs include incremental equipment costs as well as installation costs.

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

D. Conclusion

DOE has tentatively concluded that the proposed standards represent the maximum improvement in energy efficiency that is technologically feasible and economically justified, and would result in the significant conservation of energy. Specifically, with regards to technological feasibility, products achieving these standard levels are already commercially available for all product classes covered by this proposal. As for economic justification, DOE's analysis shows that the benefits of the proposed standard exceed, to a great extent, the burdens of the proposed standards. Using a 7-percent discount rate for consumer benefits and costs and NO_X and SO_2 reduction benefits, the estimated cost of the proposed standards for consumer clothes dryers is $85.7 million per year in increased product costs, while the estimated annual benefits are $1,111 million in reduced product operating costs, and $406 million in health benefits. The net benefit amounts to $1,752 million per year.

The significance of energy savings offered by a new or amended energy conservation standard cannot be determined without knowledge of the specific circumstances surrounding a given rulemaking.[11] For example, some covered products and equipment have substantial energy consumption occur during periods of peak energy demand. The impacts of these products on the energy infrastructure can be more pronounced than products with relatively constant demand. In evaluating the significance of energy savings, DOE considers differences in primary energy and FFC effects for different covered products and equipment when determining whether energy savings are significant. Primary energy and FFC effects include the energy consumed in electricity production (depending on load shape), in distribution and transmission, and in extracting, processing, and transporting primary fuels (*i.e.,* coal, natural gas, petroleum fuels), and thus present a more complete picture of the impacts of energy conservation standards. Accordingly, DOE evaluates the significance of energy savings on a case-by-case basis.

As previously mentioned, the standards are projected to result in estimated national energy savings of 3.11 quads, the equivalent of the electricity consumption of 78 million residential homes in one year.[12] DOE has initially determined the energy savings from the proposed standard levels are ''significant'' within the meaning of 42 U.S.C. 6295(o)(3)(B). A more detailed discussion of the basis for these tentative conclusions is contained in the remainder of this document and the accompanying technical support document (''TSD'').

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

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

II. Introduction

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

A. Authority

EPCA authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part B of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles. These products include consumer clothes dryers, the subject of this document. (42 U.S.C. 6292(a)(8)) EPCA prescribed energy conservation standards for these products (42 U.S.C. 6295(g)(3)), and directs DOE to conduct future rulemakings to determine whether to amend these standards. (42 U.S.C. 6295(g)(4)) EPCA further provides that, not later than 6 years after the issuance of any final rule establishing or amending a standard, DOE must publish either a notice of determination that standards for the product do not need to be amended, or a NOPR including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6295(m)(1)).

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

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297(a)–(c)) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions set forth under EPCA. (*See* 42 U.S.C. 6297(d)).

Subject to certain criteria and conditions, DOE is required to develop test procedures to measure the energy efficiency, energy use, or estimated annual operating cost of each covered product. (42 U.S.C. 6295(o)(3)(A) and 42 U.S.C. 6295(r)) Manufacturers of covered products must use the prescribed DOE test procedure as the basis for certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA and when making representations to the public regarding the energy use or efficiency of those products. (42 U.S.C. 6293(c) and 42 U.S.C. 6295(s)) Similarly, DOE must use these test procedures to determine whether the products comply with standards adopted pursuant to EPCA. (42 U.S.C. 6295(s)) The DOE test procedures for consumer clothes dryers appear at title 10 of the Code of Federal Regulations (''CFR'') part 430, subpart B, appendix D1 and appendix D2 (''appendix D1'' and ''appendix D2'', respectively).

DOE must follow specific statutory criteria for prescribing new or amended standards for covered products, including consumer clothes dryers. Any new or amended standard for a covered product must be designed to achieve the maximum improvement in energy efficiency that the Secretary of Energy determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A) and 42 U.S.C. 6295(o)(3)(B)) Furthermore, DOE may not adopt any standard that would not result in the significant conservation of energy. (42 U.S.C. 6295(o)(3) (B))

Moreover, DOE may not prescribe a standard if DOE determines by rule that the standard is not technologically feasible or economically justified. (42 U.S.C. 6295(o)(3)(B)) In deciding whether a proposed standard is economically justified, DOE must determine whether the benefits of the standard exceed its burdens. (42 U.S.C. 6295(o)(2)(B)(i)) DOE must make this determination after receiving comments

[11] Procedures, Interpretations, and Policies for Consideration in New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Commercial/Industrial Equipment, 86 FR 70892, 70901 (Dec. 13, 2021).

[12] U.S. Environmental Protection Agency, Greenhouse Gas Equivalencies Calculator. Available at *www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.*

on the proposed standard, and by considering, to the greatest extent practicable, the following seven statutory factors:

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

(42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

Further, EPCA establishes a rebuttable presumption that a standard is economically justified if the Secretary finds that the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure. (42 U.S.C. 6295(o)(2)(B)(iii))

EPCA also contains what is known as an ''anti-backsliding'' provision, which prevents the Secretary from prescribing any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. (42 U.S.C. 6295(o)(1)) Also, the Secretary may not prescribe an amended or new standard if interested persons have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States. (42 U.S.C. 6295(o)(4))

Additionally, EPCA specifies requirements when promulgating an energy conservation standard for a covered product that has two or more product classes. DOE must specify a different standard level for a type or class of product that has the same function or intended use, if DOE determines that products within such group: (A) consume a different kind of energy from that consumed by other covered products within such type (or class); or (B) have a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a higher or lower standard. (42 U.S.C. 6295(q)(1)) In determining whether a performance-related feature justifies a different standard for a group of products, DOE must consider such factors as the utility to the consumer of the feature and other factors DOE deems appropriate. *Id.* Any rule prescribing such a standard must include an explanation of the basis on which such higher or lower level was established. (42 U.S.C. 6295(q)(2))

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

B. Background

1. Current Standards

The most recent standards rulemaking for consumer clothes dryers was promulgated on April 21, 2011. Specifically, DOE published a direct final rule (the ''2011 Direct Final Rule'') amending the energy conservation standard for consumer clothes dryers manufactured on and after January 1, 2015. 76 FR 22454 (Apr. 21, 2011). The energy conservation standards, as amended in the 2011 Direct Final Rule, represent the current standards and are in accordance with the appendix D1 test procedure as discussed in section III.B of this document. They are based on combined energy factor (''CEF'')—a metric that incorporates energy use in active mode, standby mode, and off mode. Compliance with the current standards was required as of January 1, 2015. 76 FR 52852 (Aug. 24, 2011).

Even though DOE maintained the same energy-efficiency descriptor for both appendix D1 and appendix D2, DOE notes that the CEF values are not equivalent because of the extensive differences in test methods. To avoid potential confusion that would result from using the same efficiency descriptor for both test procedures as it relates to the standards discussed in this document, DOE is including a ''D1'' or ''D2'' subscript when referring to the appendix D1 CEF and appendix D2 CEF, respectively (*i.e.,* CEF_{D1} and CEF_{D2}), in this document.[13]

These current consumer clothes dryer standards as measured under appendix D1 are set forth in DOE's regulations at 10 CFR 430.32(h) and are repeated in Table II.1. DOE has conducted the rulemaking analysis for this proposed rule under the appendix D2 test procedure because compliance will be required concurrent with amended energy conservation, if finalized. DOE discusses additional details about the engineering baseline in section IV.C.1 of this document.

[13] Note that while the current standards are based on CEF as determined in accordance with appendix D1, manufacturers are permitted to use the appendix D2 test procedure to comply with the current standards, as long as they use a single appendix for all representations.

TABLE II.1—FEDERAL ENERGY CONSERVATION STANDARDS FOR CONSUMER CLOTHES DRYERS AS MEASURED UNDER APPENDIX D1

Product class	CEF_{D1} (lbs/kWh)
(A) Vented Electric, Standard (4.4 ft^3 or greater capacity)	3.73
(B) Vented Electric, Compact (120V) (less than 4.4 ft^3 capacity)	3.61
(C) Vented Electric, Compact (240V) (less than 4.4 ft^3 capacity)	3.27
(D) Vented Gas	3.30
(E) Ventless Electric, Compact (240V) (less than 4.4 ft^3 capacity)	2.55
(F) Ventless Electric, Combination Washer-Dryer	2.08

On December 16, 2020, DOE published a final rule establishing a separate product class for consumer clothes dryers that offer cycle times for a ''normal'' cycle[14] of less than 30 minutes. 85 FR 81359 (Dec. 16, 2020) (''December 2020 Final Rule''). Because no such ''short-cycle'' consumer clothes dryers are currently on the market in the United States, DOE did not include analysis of this newly established product class in the preliminary TSD.

While these short-cycle products had previously been subject to energy and water conservation standards, the December 2020 Final Rule stated that short-cycle product classes were no longer subject to any water or energy conservation standards. 85 FR 68723, 68742; 85 FR 81359, 81376. As a result, the short-cycle products were allowed to consume unlimited amounts of energy and water.

As discussed in a NOPR subsequently published on August 11, 2021, DOE noted that in amending the standards for short-cycle products to allow for unlimited water and energy usage, DOE failed to consider whether the amended standards met the criteria in EPCA for issuing an amended standard. Notably, among other things, DOE did not determine, as required, that the amended standards for short-cycle products were designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) 86 FR 43970, 43971. DOE has since published a final rule on January 19, 2022, which revoked the December 2020 Final Rule that improperly promulgated standards for this new product class and reinstated the prior product classes and applicable standards for these covered products. 87 FR 2673, 2686. Therefore, DOE did not include analysis of a short-cycle product class in the NOPR TSD.

2. Current Process

DOE published a request for information (''RFI'') on March 27, 2015 (the ''March 2015 RFI'') describing the approaches and methods DOE will use in evaluating potential amended standards for consumer clothes dryers. 80 FR 16309 (Mar. 27, 2015). In addition, the RFI solicited information from the public to help DOE determine whether amended standards for consumer clothes dryers would result in a significant amount of additional energy savings, and whether those standards would be technologically feasible and economically justified. *Id.* The March 2015 RFI is available at *www.regulations.gov/document/EERE-2014-BT-STD-0058-0001*.

DOE published a notice of public webinar and availability of the preliminary TSD on April 19, 2021 (''April 2021 Preliminary Analysis'') to collect data and information to inform its decision consistent with its obligations under EPCA. 86 FR 20327. DOE subsequently held a public webinar on May 26, 2021, to discuss and receive comments on the preliminary TSD. The preliminary TSD that presented the methodology and results of the preliminary analysis is available at: *www.regulations.gov/document/EERE-2014-BT-STD-0058-0020*.

DOE received comments in response to the April 2021 Preliminary Analysis from the interested parties listed in Table II.2.

TABLE II.2—APRIL 2021 PRELIMINARY ANALYSIS WRITTEN COMMENTS

Commenter(s)	Abbreviation	Commenter type
Association of Home Appliance Manufacturers	AHAM	Trade Association.
Appliance Standards Awareness Project, Natural Resources Defense Council.	ASAP, NRDC	Efficiency Organizations.
California Investor-Owned Utilities	California IOUs	Utilities.
GE Appliances, a Haier Company	GEA	Manufacturer.
Whirlpool Corporation	Whirlpool	Manufacturer.
Samsung Electronics America	Samsung	Manufacturer.
Northwest Energy Efficiency Alliance	NEEA	Efficiency Organization.
Institute for Policy Integrity at NYU School of Law	IPI	Efficiency Organization.

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[15]

In response to the preliminary analysis, AHAM and Whirlpool stated that as laundry products are designed and used in pairs, DOE should harmonize its rulemaking processes such that the compliance dates for residential clothes washers and consumer clothes dryers are, if not identical, very close in time. According to AHAM and Whirlpool, this would

[14] Section 3.3.2 of appendix D2 requires that the ''normal'' program shall be selected for the test cycle; for clothes dryers that do not have a ''normal'' program, the cycle recommended by the manufacturer for drying cotton or linen clothes shall be selected.

[15] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop energy conservation standards for consumer clothes dryers. (Docket No. EERE–2014–BT–STD–0058, which is maintained at *www.regulations.gov*). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

greatly reduce burden on manufacturers as they work to design products to meet amended standards as well as on retailers and consumers as products are re-floored leading up to and on the compliance date of any amended energy conservation standards. (AHAM, No. 23 at p. 6; Whirlpool, No. 27 at p. 13)

DOE appreciates the comments from AHAM and Whirlpool and recognizes the benefits of aligning the schedule for future amended standards for both products and may investigate harmonization of future rulemaking processes.

Additionally, AHAM stated its strong opposition to Natural Resources Canada's (''NRCan'') proposal to make ENERGY STAR levels the minimum energy conservation standard for clothes dryers in Canada and strongly urged DOE to not only weigh in against NRCan's approach through the U.S.-Canada Regulatory Cooperation Council and under the recently signed Memorandum of Understanding on energy cooperation, but also to account for the burden of any misalignment in DOE's analysis. According to AHAM it is critical that amended standards are coordinated in both substance and timing in order to maintain a consistent U.S.-Canadian market for home appliances. (AHAM, No. 23 at p. 9)

DOE notes that review of efficiency standards efforts in other regions is discussed in chapter 3 of the NOPR TSD. DOE will continue to review and track these efforts as part of its analysis.

C. Deviation From Appendix A

Section 3(a) of 10 CFR part 430, subpart C, appendix A (''appendix A'') specifies that, in those instances where the Department may find it necessary or appropriate to deviate from the procedures, interpretations or policies that are generally applicable to the development of energy conservation standards and test procedures, DOE will provide interested parties with notice of the deviation and an explanation. DOE finds that it is appropriate to deviate from its existing procedures by publishing this NOPR instead of releasing an additional framework document because such activity would be redundant due to the information previously obtained through the March 2015 RFI and the preliminary analysis. Additionally, DOE finds it necessary to deviate from its existing procedures by providing a 60-day comment period for this NOPR because interested parties received sufficient time to comment on earlier rulemaking documents that relied on many of the same analytical assumptions and approaches presented in this proposal.

In accordance with section 3(a) of appendix A, DOE notes that it is deviating from the provision in appendix A regarding the pre-NOPR stages for an energy conservation standards rulemaking. Section 6(a)(2) of appendix A states that if the Department determines it is appropriate to proceed with a rulemaking, the preliminary stages of a rulemaking to issue or amend an energy conservation standard that DOE will undertake will be a framework document and preliminary analysis, or an advance notice of proposed rulemaking. DOE is opting to deviate from this step by publishing a NOPR following the preliminary analysis without a framework document. A framework document is intended to introduce and summarize the various analyses DOE conducts during the rulemaking process and requests initial feedback from interested parties. As discussed, prior to the preliminary analysis and this NOPR, DOE published the March 2015 RFI, in which DOE identified and sought comment on the technical and economic analyses to be conducted in determining whether amended energy conservation standards would be justified. *See* 80 FR 16309. DOE provided a 45-day comment period for the RFI. *Id.* Comments received following publication of the March 2015 RFI assisted DOE in identifying and resolving issues related to the preliminary analyses. 86 FR 20327, 20330. Given the level of comments received to the March 2015 RFI, publication of a framework document would be largely redundant with the published RFI and preliminary analysis. As such, DOE is deviating from the procedures provided in appendix A and is not publishing a framework document prior to the publication of this NOPR. The Department has determined that it is appropriate to proceed with this proposal due to the information obtained through the March 2015 RFI and the preliminary analysis.

Section 6(f)(2) of appendix A specifies that the length of the public comment period for a NOPR will vary depending upon the circumstances of the particular rulemaking, but will not be less than 75 calendar days. For this NOPR, DOE has opted to instead provide a 60-day comment period. As stated previously DOE requested comment in the March 2015 RFI on the technical and economic analyses and provided stakeholders a 45-day comment period. Additionally, DOE provided a 75-day comment period for the preliminary analysis. 86 FR 20327. DOE has relied on many of the same analytical assumptions and approaches as used in the preliminary assessment and has determined that a 60-day comment period in conjunction with the prior comment periods provides sufficient time for interested parties to review the proposed rule and develop comments. As such, DOE has determined that a 75-comment period is not necessary for this proposal and that a 60-day comment period is sufficient time for interested stakeholders to submit their comments on this document.

III. General Discussion

DOE developed this proposal after considering oral and written comments, data, and information from interested parties that represent a variety of interests. The following discussion addresses issues raised by these commenters.

A. Product Classes and Scope of Coverage

When evaluating and establishing energy conservation standards, DOE divides covered products into product classes by the type of energy used or by capacity or other performance-related features that justify differing standards. In determining whether a performance-related feature justifies a different standard, DOE must consider such factors as the utility of the feature to the consumer and other factors DOE determines are appropriate. (42 U.S.C. 6295(q)) DOE's review of the preliminary analysis and comments received in response to the preliminary analysis, in addition to results from an updated test sample, are discussed in more detail in section IV.A of this document.

B. Test Procedure

EPCA sets forth generally applicable criteria and procedures for DOE's adoption and amendment of test procedures. (42 U.S.C. 6293) Manufacturers of covered products must use these test procedures to certify to DOE that their product complies with energy conservation standards and to quantify the efficiency of their product. On October 8, 2021, DOE published a final rule for the test procedure rulemaking (86 FR 56608) (the ''October 2021 TP Final Rule''), in which it amended appendix D1 and appendix D2, both entitled ''Uniform Test Method for Measuring the Energy Consumption of Clothes Dryers,'' to provide additional detail in response to questions from manufacturers and test laboratories, including additional detail regarding the testing of ''connected'' models, dryness level selection, and the procedures for maintaining the required heat input rate for gas clothes dryers;

additional detail for the test procedures for performing inactive and off mode power measurements; specifications for the final moisture content (''FMC'') required for testing automatic termination control dryers; specification of a narrower scale resolution for the weighing scale used to determine moisture content of test loads; and specification that the test load must be weighed within 5 minutes after a test cycle has terminated. In addition, DOE amended the test procedures to update the estimated number of annual use cycles for clothes dryers; provide further direction for additional provisions within the test procedures; specify rounding requirements for all reported values; apply consistent use of nomenclature and correct typographical errors; remove obsolete sections of the test procedures, including appendix D; and update the reference to the applicable industry test procedure to the version certified by the American National Standards Institute (''ANSI''). 86 FR 56608, 56610 DOE's current energy conservation standards for consumer clothes dryers are expressed in terms of CEF_{D1}. (*See* 10 CFR 430.32(h)(3).)

In response to the preliminary analysis, commenters requested that DOE finalize the test procedure rulemaking prior to proceeding with energy conservation standards rulemaking in order to capture any impacts a finalized test procedure would have on amended standards. (AHAM, No. 22 at pp. 7–8; AHAM, No. 23 at pp. 2–4; California IOUs, No. 26 at pp. 4–5; GEA, No. 28 at p. 2; NEEA, No. 30 at p. 8).

At the time of the publication of the preliminary analysis, the October 2021 TP Final Rule had not yet published; however, DOE noted in the October 2021 TP Final Rule that the amendments adopted, other than the amendment to the number of annual use cycles in appendix D2, would not substantively alter the measured efficiency of consumer clothes dryers, and that the test procedures would not be unduly burdensome to conduct. The amendment to the number of annual use cycles specified for calculating per-cycle standby mode and off mode energy consumption would alter the measured energy efficiency of consumer clothes dryers when using appendix D2, but use of the amended value in appendix D2 is not required until such time as DOE were to amend the energy conservations standards accounting for such changes in the test procedure, should such amended energy conservation standards be adopted. 86 FR 56608, 56611.

GEA, AHAM, and Samsung requested that DOE review the FMC requirement according to appendix D2, stating that the current 2-percent FMC requirement is too strict and not representative of consumer preference. (GEA, No. 22 at pp. 42–44; AHAM, No. 23 at p. 4; Samsung, No. 29 at pp. 2–3) AHAM questioned the degree of savings that can be achieved through more stringent standards, stating that the energy conservation standards would have less of an impact on consumer clothes dryer energy use than the FMC itself. As stated in the October 2021 TP Final Rule, the current 2-percent FMC requirement using the DOE test cloth was adopted as representative of approximately 5-percent FMC for ''real-world'' clothing, based on data submitted in a joint petition for rulemaking.[16] DOE determined in the August 2013 Final Rule that the specified 2-percent FMC using the DOE test load was representative of consumer expectations for dryness of clothing in field use. 78 FR 49608, 49620–49622, 49610–49611 (Aug. 14, 2013). DOE has not identified any systemic problems with any consumer clothes dryer types being able to achieve the required FMC of 2 percent or less, such that amendments to the test procedure would be warranted and therefore did not amend the FMC requirement for either appendix D1 or appendix D2 in the October 2021 TP Final Rule. 86 FR 56608, 56626.

ASAP, NRDC, and Samsung requested that DOE consider the testing of an additional smaller test load to supplement the current test load, stating a smaller test load could better represent consumer use and clothes dryer efficiency. (ASAP, NRDC, No. 25 at p. 1; Samsung, No. 29 at p. 3) As stated in the October 2021 TP Final Rule, with little expected change to the CEF_{D2} value when considering the energy consumption associated with a range of load sizes, DOE does not believe the additional testing would provide consumers with improved information that would change their purchasing decisions compared to the current test procedure. As such, any incremental benefit of testing with additional load sizes would be outweighed by the significant added burden that would be imposed by conducting such tests. For these reasons, DOE did not propose or adopt any amendments to the test procedure requiring additional test load sizes in the October 2021 TP Final Rule. 86 FR 56608, 56621.

In response to the preliminary analysis, the California IOUs presented data suggesting that consumer clothes dryers that have identical ratings under appendix D1 can vary considerably when tested to appendix D2, and also stated that DOE's analysis in the preliminary TSD shows that baseline efficiency consumer clothes dryers tested under appendix D1 significantly underperform when tested under appendix D2. For these reasons, the California IOUs recommended that DOE use this rulemaking or the open test procedure rulemaking to phase out appendix D1 in favor of an updated appendix D2 test procedure. Samsung further supported DOE requiring the appendix D2 test procedure for manufacturers as the mandatory procedure for testing consumer clothes dryers. (California IOUs, No. 26 at p. 5) According to Samsung, appendix D2 has been recognized by stakeholders as truly representing how automatic termination control dryers are used by consumers, and manufacturers of ENERGY STAR-qualified consumer clothes dryers are familiar with, and have invested in, the test procedure in appendix D2, as it is already mandated for ENERGY STAR qualification. Furthermore, Samsung asserted that the appendix D1 test procedure was intended as a stopgap measure to test ''sensor [automatic termination control] dryers'' using ''non-sensing'' settings (*i.e.,* timer drying cycle) and does not represent how automatic termination clothes dryers are used by consumers as accurately as the appendix D2 test procedure. Samsung recommended that, since appendix D2 has been used for many years for ENERGY STAR qualification, appendix D1 be phased out now, with an appropriate adjustment to the underlying energy conservation standards to reflect the change in test method as described in EPCA. (Samsung, No. 29 at p. 2)

As discussed in the October 2021 TP Final Rule, the version of appendix D2 adopted in that final rule would be used for the evaluation and issuance of updated energy conservation standards, with compliance with that version of appendix D2 required on the

[16] The petition was submitted by AHAM, Whirlpool Corporation, General Electric Company, Electrolux, LG Electronics, Inc., BSH, Alliance Laundry Systems, Viking Range, Sub-Zero Wolf, Friedrich A/C, U-Line, Samsung, Sharp Electronics, Miele, Heat Controller, AGA Marvel, Brown Stove, Haier, Fagor America, Airwell Group, Arcelik, Fisher & Paykel, Scotsman Ice, Indesit, Kuppersbusch, Kelon, and DeLonghi, American Council for an Energy Efficient Economy, Appliance Standards Awareness Project, Natural Resources Defense Council, Alliance to Save Energy, Alliance for Water Efficiency, Northwest Power and Conservation Council, and Northeast Energy Efficiency Partnerships, Consumer Federation of America and the National Consumer Law Center. See Docket No. EERE–2011–BT–TP–0054, No. 3.

implementation date of updated standards. 86 FR 56608, 56635–56636 (Oct. 8, 2021). Accordingly, DOE notes that the preliminary analysis and this NOPR analysis are based on the appendix D2 test procedure, and therefore the proposed amended energy conservation standards in this document are also based on the appendix D2 test procedure. These proposed amendments are discussed in more detail in section IV.C of this document.

C. Technological Feasibility

1. General

In evaluating potential amendments to energy conservation standards, DOE conducts a screening analysis based on information gathered on all current technology options and prototype designs that could improve the efficiency of the products or equipment that are the subject of the rulemaking. As the first step in such an analysis, DOE develops a list of technology options for consideration in consultation with manufacturers, design engineers, and other interested parties. DOE then determines which of those means for improving efficiency are technologically feasible. DOE considers technologies incorporated in commercially-available products or in working prototypes to be technologically feasible. Sections 6(b)(3)(i) and 7(b)(1) of appendix A.

After DOE has determined that particular technology options are technologically feasible, it further evaluates each technology option in light of the following additional screening criteria: (1) practicability to manufacture, install, and service; (2) adverse impacts on product utility or availability; (3) adverse impacts on health or safety, and (4) unique-pathway proprietary technologies. Sections 6(b)(3)(ii)–(v) and 7(b)(2)–(5) of appendix A. Section IV.B of this document discusses the results of the screening analysis for consumer clothes dryers, particularly the designs DOE considered, those it screened out, and those that are the basis for the standards considered in this rulemaking. For further details on the screening analysis for this rulemaking, see chapter 4 of the NOPR TSD.

2. Maximum Technologically Feasible Levels

When DOE proposes to adopt an amended standard for a type or class of covered product, it must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for such product. (42 U.S.C. 6295(p)(1)) Accordingly, in the engineering analysis, DOE determined the maximum technologically feasible (''max-tech'') improvements in energy efficiency for consumer clothes dryers, using the design parameters for the most efficient products available on the market or in working prototypes. The max-tech levels that DOE determined for this rulemaking are described in section IV.C.1 of this document and in chapter 5 of the NOPR TSD.

D. Energy Savings

1. Determination of Savings

For each trial standard level (''TSL''), DOE projected energy savings from application of the TSL to consumer clothes dryers purchased in the 30-year period that begins in the year of compliance with the proposed standards (2027–2056).[17] The savings are measured over the entire lifetime of consumer clothes dryers purchased in the previous 30-year period. DOE quantified the energy savings attributable to each TSL as the difference in energy consumption between each standards case and the no-new-standards case. The no-new-standards case represents a projection of energy consumption that reflects how the market for a product would likely evolve in the absence of amended energy conservation standards.

DOE used its national impact analysis (''NIA'') spreadsheet model to estimate national energy savings (''NES'') from potential amended or new standards for consumer clothes dryers. The NIA spreadsheet model (described in section IV.H of this document) calculates energy savings in terms of site energy, which is the energy directly consumed by products at the locations where they are used. For electricity, DOE reports national energy savings in terms of primary energy savings, which is the savings in the energy that is used to generate and transmit the site electricity. For natural gas, the primary energy savings are considered to be equal to the site energy savings. DOE also calculates NES in terms of FFC energy savings. The FFC metric includes the energy consumed in extracting, processing, and transporting primary fuels (*i.e.,* coal, natural gas, petroleum fuels), and thus presents a more complete picture of the impacts of energy conservation standards.[18] DOE's approach is based on the calculation of an FFC multiplier for each of the energy types used by covered products or equipment. For more information on FFC energy savings, see section IV.H.2 of this document.

2. Significance of Savings

To adopt any new or amended standards for a covered product, DOE must determine that such action would result in significant energy savings.

The significance of energy savings offered by a new or amended energy conservation standard cannot be determined without knowledge of the specific circumstances surrounding a given rulemaking.[19] For example, some covered products and equipment have most of their energy consumption occur during periods of peak energy demand. The impacts of these products on the energy infrastructure can be more pronounced than products with relatively constant demand. In evaluating the significance of energy savings, DOE considers differences in primary energy and FFC effects for different covered products and equipment when determining whether energy savings are significant. Primary energy and FFC effects include the energy consumed in electricity production (depending on load shape), in distribution and transmission, and in extracting, processing, and transporting primary fuels (*i.e.,* coal, natural gas, petroleum fuels), and thus present a more complete picture of the impacts of energy conservation standards.

Accordingly, DOE evaluates the significance of energy savings on a case-by-case basis, taking into account the significance of cumulative FFC national energy savings, the cumulative FFC emissions reductions, and the need to confront the global climate crisis, among other factors. As discussed in section V.C of this document, DOE is proposing to adopt TSL 3, which would save an estimated 3.11 quads of energy (FFC). DOE has initially determined that these energy savings are ''significant'' within the meaning of 42 U.S.C. 6295(o)(3)(B).

E. Economic Justification

1. Specific Criteria

As noted previously, EPCA provides seven factors to be evaluated in

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

[18] The FFC metric is discussed in DOE's statement of policy and notice of policy amendment. 76 FR 51282 (Aug. 18, 2011), as amended at 77 FR 49701 (Aug. 17, 2012).

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

determining whether a potential energy conservation standard is economically justified. (42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII)) The following sections discuss how DOE has addressed each of those seven factors in this rulemaking.

a. Economic Impact on Manufacturers and Consumers

In determining the impacts of a potential amended standard on manufacturers, DOE conducts an MIA, as discussed in section IV.J of this document. DOE first uses an annual cash-flow approach to determine the quantitative impacts. This step includes both a short-term assessment—based on the cost and capital requirements during the period between when a regulation is issued and when entities must comply with the regulation—and a long-term assessment over a 30-year period. The industry-wide impacts analyzed include (1) INPV, which values the industry on the basis of expected future cash flows; (2) cash flows by year; (3) changes in revenue and income; and (4) other measures of impact, as appropriate. Second, DOE analyzes and reports the impacts on different types of manufacturers, including impacts on small manufacturers. Third, DOE considers the impact of standards on domestic manufacturer employment and manufacturing capacity, as well as the potential for standards to result in plant closures and loss of capital investment. Finally, DOE takes into account cumulative impacts of various DOE regulations and other regulatory requirements on manufacturers.

For individual consumers, measures of economic impact include the changes in LCC and PBP associated with new or amended standards. These measures are discussed further in the following section. For consumers in the aggregate, DOE also calculates the national net present value of the consumer costs and benefits expected to result from particular standards. DOE also evaluates the impacts of potential standards on identifiable subgroups of consumers that may be affected disproportionately by a standard.

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

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

The LCC is the sum of the purchase price of a product (including its installation) and the operating expense (including energy, maintenance, and repair expenditures) discounted over the lifetime of the product. The LCC analysis requires a variety of inputs, such as product prices, product energy consumption, energy prices, maintenance and repair costs, product lifetime, and discount rates appropriate for consumers. To account for uncertainty and variability in specific inputs, such as product lifetime and discount rate, DOE uses a distribution of values, with probabilities attached to each value.

The PBP is the estimated amount of time (in years) it takes consumers to recover the increased purchase cost (including installation) of a more-efficient product through lower operating costs. DOE calculates the PBP by dividing the change in purchase cost due to a more-stringent standard by the change in annual operating cost for the year that standards are assumed to take effect.

For its LCC and PBP analysis, DOE assumes that consumers will purchase the covered products in the first year of compliance with new or amended standards. The LCC savings for the considered efficiency levels are calculated relative to the case that reflects projected market trends in the absence of new or amended standards. DOE's LCC and PBP analysis is discussed in further detail in section IV.F of this document.

c. Energy Savings

Although significant conservation of energy is a separate statutory requirement for adopting an energy conservation standard, EPCA requires DOE, in determining the economic justification of a standard, to consider the total projected energy savings that are expected to result directly from the standard. (42 U.S.C. 6295(o)(2)(B)(i)(III)) As discussed in section III.D of this document, DOE uses the NIA spreadsheet models to project national energy savings.

d. Lessening of Utility or Performance of Products

In establishing product classes and in evaluating design options and the impact of potential standard levels, DOE evaluates potential standards that would not lessen the utility or performance of the considered products. (42 U.S.C. 6295(o)(2)(B)(i)(IV)) Based on data available to DOE, the standards proposed in this document would not reduce the utility or performance of the products under consideration in this rulemaking.

e. Impact of Any Lessening of Competition

EPCA directs DOE to consider the impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from a proposed standard. (42 U.S.C. 6295(o)(2)(B)(i)(V)) It also directs the Attorney General to determine the impact, if any, of any lessening of competition likely to result from a proposed standard and to transmit such determination to the Secretary within 60 days of the publication of a proposed rule, together with an analysis of the nature and extent of the impact. (42 U.S.C. 6295(o)(2)(B)(ii)) DOE will transmit a copy of this proposed rule to the Attorney General with a request that the Department of Justice (''DOJ'') provide its determination on this issue. DOE will publish and respond to the Attorney General's determination in the final rule. DOE invites comment from the public regarding the competitive impacts that are likely to result from this proposed rule. In addition, stakeholders may also provide comments separately to DOJ regarding these potential impacts. See the **ADDRESSES** section for information to send comments to DOJ.

f. Need for National Energy Conservation

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

DOE maintains that environmental and public health benefits associated with the more efficient use of energy are important to take into account when considering the need for national energy conservation. The proposed standards are likely to result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases (''GHGs'') associated with energy production and use. DOE conducts an emissions analysis to estimate how potential standards may affect these emissions, as discussed in section IV.K of this document; the estimated emissions impacts are reported in section V.B.6 of this document. DOE also estimates the economic value of health benefits from certain emissions reductions resulting from the considered TSLs, as discussed in section IV.L of this document.

AHAM stated its continued objection to DOE's use of the social cost of carbon and other monetization of emissions reductions benefits in its analysis of the factors EPCA requires DOE to balance to determine the appropriate standard. According to AHAM, while it may be acceptable for DOE to continue its current practice of examining the social cost of carbon and monetization of other emissions reductions benefits as informational so long as the underlying interagency analysis is transparent and vigorous, the monetization analysis should not impact the trial standards levels DOE selects as a new or amended standard. (AHAM, No. 23 at pp. 11–12)

DOE's evaluation of whether a potential energy conservation standard is economically justified is guided by EPCA and also by OMB Circular A–4 (Sept. 17, 2003), which provides guidance to Federal agencies on the development of regulatory analysis. As indicated above, DOE believes that avoiding negative impacts to human health and the wide range of impacts associated with climate change are key factors behind the need for energy conservation.[20] OMB Circular A–4 states: ''Benefit-cost analysis is a primary tool used for regulatory analysis. Where all benefits and costs can be quantified and expressed in monetary units, benefit-cost analysis provides decision makers with a clear indication of the most efficient alternative, that is, the alternative that generates the largest net benefits to society.'' (p. 2) Monetizing public health benefits of regulations is a long-standing practice in Federal regulatory analysis. To not consider such benefits when evaluating whether a potential energy conservation standard is economically justified would be contrary to both EPCA and OMB's guidance. In addition, on March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. As reflected in this rule, DOE has reverted to its approach prior to the injunction and presents monetized greenhouse gas abatement benefits where appropriate and permissible under law.

[20] As mentioned previously, following the preliminary injunction issued on February 11, 2022, in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.), DOE is currently not monetizing the costs of greenhouse gas emissions.

g. Other Factors

In determining whether an energy conservation standard is economically justified, DOE may consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6295(o)(2)(B)(i)(VII)) To the extent DOE identifies any relevant information regarding economic justification that does not fit into the other categories described previously, DOE could consider such information under ''other factors.''

2. Rebuttable Presumption

As set forth in 42 U.S.C. 6295(o)(2)(B)(iii), EPCA creates a rebuttable presumption that an energy conservation standard is economically justified if the additional cost to the consumer of a product that meets the standard is less than three times the value of the first year's energy savings resulting from the standard, as calculated under the applicable DOE test procedure. DOE's LCC and PBP analyses generate values used to calculate the effects that proposed energy conservation standards would have on the payback period for consumers. These analyses include, but are not limited to, the 3-year payback period contemplated under the rebuttable-presumption test. In addition, DOE routinely conducts an economic analysis that considers the full range of impacts to consumers, manufacturers, the Nation, and the environment, as required under 42 U.S.C. 6295(o)(2)(B)(i). The results of this analysis serve as the basis for DOE's evaluation of the economic justification for a potential standard level (thereby supporting or rebutting the results of any preliminary determination of economic justification). The rebuttable presumption payback calculation is discussed in section IV.F.9 of this document.

IV. Methodology and Discussion of Related Comments

This section addresses the analyses DOE has performed for this rulemaking with regard to consumer clothes dryers. Separate sections address each component of DOE's analyses.

DOE used several analytical tools to estimate the impact of the standards proposed in this document. The first tool is a spreadsheet that calculates the LCC savings and PBP of potential amended or new energy conservation standards. The national impacts analysis uses a second spreadsheet set that provides shipments projections and calculates national energy savings and net present value of total consumer costs and savings expected to result from potential energy conservation standards. DOE uses the third spreadsheet tool, the Government Regulatory Impact Model (''GRIM''), to assess manufacturer impacts of potential standards. These three spreadsheet tools are available on the DOE website for this rulemaking: *www.regulations.gov/docket/EERE–2014–BT–STD–0058/.* Additionally, DOE used output from the latest version of the Energy Information Administration's (''EIA's'') *Annual Energy Outlook* (''*AEO*''), a widely known energy projection for the United States, for the emissions and utility impact analyses.

A. Market and Technology Assessment

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

1. Scope of Coverage and Product Classes

DOE defines ''electric clothes dryer'' under EPCA as a cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation. The heat source is electricity and the drum and blower(s) are driven by an electric motor(s). Similarly, DOE defines ''gas clothes dryer'' as a cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation. The heat source is gas and the drum and blower(s) are driven by an electric motor(s). (10 CFR 430.2)

In response to the preliminary analysis, the California IOUs offered information on at least two manufacturers producing a dry-and-steam clothing cabinet and encouraged DOE to explore the market prevalence and potential growth of this equipment and what features represent an average use cycle. The California IOUs also suggested DOE consider the current clothes washers rulemaking or dehumidifiers rulemaking to provide guidance on how this product should be classified and, if appropriate, tested and rated. (California IOUs, No. 26 at p. 7) DOE may investigate this product in a future rulemaking; however, as this product does not meet the definition of a clothes dryer because it does not include a tumble-type drum, it was not included in this analysis.

The current product classes, which were established by the April 2011 Direct Final Rule, are presented in Table IV.1.

TABLE IV.1—CURRENT CONSUMER CLOTHES DRYER PRODUCT CLASSES

Vented dryers:
Electric, Standard (4.4 cubic feet (ft^3) or greater capacity).
Electric, Compact (120 volts (V)) (less than 4.4 ft^3 capacity).
Electric, Compact (240 V) (less than 4.4 ft^3 capacity).
Gas.
Ventless dryers:
Electric, Compact (240 V) (less than 4.4 ft^3 capacity).
Electric, Combination Washer-Dryer.

Based on its review of products available on the market in the United States, DOE notes that at least six manufacturers currently offer a ventless clothes dryer with a drum capacity greater than 4.4 ft^3. As a result, in the preliminary analysis, DOE analyzed an additional product class for ventless electric standard clothes dryers, with drum capacity larger than 4.4 ft^3.

In response to the preliminary analysis, the California IOUs requested that DOE investigate potential reporting errors within the Compliance Certification Database (''CCD''), as the California IOUs asserted that multiple products were incorrectly listed in the CCD as ''vented'' products while certified as ''ventless'' products in the ENERGY STAR product database and represented as ''ventless'' in manufacturer literature. (California IOUs, No. 26 at p. 4) DOE will work to investigate any classification errors within the CCD and requests comment on additional information regarding potential classification errors.

In response to the preliminary analysis, ASAP, NRDC, the California IOUs, and NEEA requested that DOE review the efficiencies of models currently available on the market, specifically for the vented electric standard product class, stating that there are currently available models with higher efficiencies than the max-tech efficiency level considered in the preliminary analysis for this product class. (ASAP, NRDC, No. 25 at pp. 1–2; California IOUs, No. 26 at pp. 3–4; NEEA, No. 30 at pp. 10–11) Upon review of these higher efficiency models, DOE discovered that many of the higher efficiency electric standard clothes dryers on the market are ventless and employ heat pump technology and that there are no lower-efficiency ventless electric standard models associated with the less efficient condensing technology that is available with the ventless electric compact (240V) product class. Given that most heat pump designs at the standard size are inherently ventless and result in higher efficiencies, establishing a product class for ventless electric standard clothes dryers would essentially result in a separate product class for heat pump dryers and leave the vented electric standard product class with less efficient conventional resistive heating-element dryers. This would effectively restrict the efficiency of the vented electric standard product class, as higher efficiency technologies would be associated with a different product class.

DOE received comments from AHAM and Whirlpool in response to the preliminary analysis stating that ventless electric clothes dryers, especially those implementing heat pump designs, have difficulty in meeting the 2-percent FMC requirement with Whirlpool stating that ventless electric clothes dryers result in longer cycle times than conventional vented clothes dryers. (AHAM, No. 23, p. 11; Whirlpool, No. 27 at pp. 13–17) Additionally, Whirlpool recommended that DOE consider the consumer utility of the differences that arise when consumer clothes dryers utilize heat pump technology and to establish a separate product class for heat pump clothes dryers (including hybrid heat pump clothes dryers). Whirlpool stated that differences in fabric care, drying time, heating and cooling energy impacts, lower drying temperatures, and technology used are all relevant performance-related features that distinguish heat pump and hybrid heat pump clothes dryers from all other consumer clothes dryer product classes, which may justify a higher standard than for other product types. (Whirlpool, No. 27 at p. 17) DOE observes that all standard size ventless electric clothes dryers and compact ventless electric (120V) clothes dryers are rated according to appendix D2 and are ENERGY STAR-qualified, and therefore meet the 80-minute cycle time requirement to receive ENERGY STAR recognition. Additionally, DOE found no issue in its own testing of ventless electric clothes dryers inherent in the ventless electric clothes dryer design that supports the claims made by commenters regarding difficulty in meeting the FMC requirement and longer cycle times (*i.e.,* all ventless electric clothes dryers tested, including those utilizing either condensing or heat pump technology, were able to meet the 2-percent FMC requirement).

As discussed, a rule prescribing an energy conservation standard must specify a level of energy use or efficiency higher or lower than that which applies (or would apply) for any group of covered products which have the same function or intended use, if the Secretary determines that covered products within such group have a capacity or other performance-related feature which justifies a higher or lower standard. (42 U.S.C. 6295(q)(1)(B)) For standard size electric clothes dryers, the ventless feature does not justify a separate standard as compared to standard size electric clothes dryers that are vented. Standard size ventless electric clothes dryers can accommodate heat pump technology that results in improved efficiency similar to that for standard size vented electric clothes dryers. Therefore, upon further consideration, no product class distinction is proposed in this NOPR between ventless and vented electric standard clothes dryers, nor between heat pump and non-heat pump clothes dryers.

Instead, DOE proposes an ''electric standard'' product class that would comprise both ventless and vented electric standard clothes dryers. Such a product class would not impact consumer utility, given that a consumer could install a ventless electric standard clothes dryer in the same locations as vented electric standard clothes dryers, and would not result in unacceptable drying performance or cycle time, as evidenced by the existing heat pump clothes dryers that are able to achieve the 2-percent FMC requirement within an 80-minute cycle time.

In response to the preliminary analysis, the California IOUs requested that DOE consider an additional product class for ventless electric compact (120V) models, as such clothes dryers are currently available on the market. (California IOUs, No. 26 at p. 3) Upon further review, DOE found that, as for ventless electric standard clothes dryers, all currently available ventless electric compact (120V) clothes dryers utilize heat pump technology. For the same reasons as for electric standard clothes dryers (*i.e.,* to capture the energy savings associated with heat pump technology and to avoid restricting potential efficiency gains for vented electric clothes dryers), DOE proposes an ''electric compact (120V)'' product class comprising ventless and vented electric compact (120V) models.

In light of the proposal to have single product classes containing all standard size electric clothes dryers and a single product class for all compact electric (120V) clothes dryers, DOE also considered whether to maintain the current separate product classes distinction based on venting for compact electric (240V) clothes dryers. DOE has previously determined that for compact electric clothes dryers, a ventless configuration is a consumer utility because these dryers provide for installations in space-constrained environments. 76 FR 22454, 22485 (Apr. 21, 2011). Based on the analysis presented in this NOPR, DOE has tentatively determined that the higher efficiencies for ventless compact (240V) clothes dryers would not be economically justified as they would be for vented compact (240V) clothes dryers. *See* Section IV.F of this document. Therefore, DOE tentatively determines that venting characteristics continue to justify a separate product class for compact (240V) clothes dryers.

As discussed, vented electric clothes dryers are divided, in part, based on capacity such that there is a standard size product class (4.4 ft^3 or greater capacity) and compact classes (capacity less than 4.4 ft^3). There is no similar class distinction for vented gas clothes dryers. Since the previous energy conservation standards rulemaking, DOE has identified at least one manufacturer of a vented gas clothes dryer with a drum less than 4.4 ft^3. Such capacity units are subject to the energy conservation standard for vented gas clothes dryers. AHAM supported splitting the product classes for gas clothes dryers based on capacity consistent with the product classes for electric dryers. (AHAM, No. 23 at p. 7)

As discussed, DOE must specify a different standard level for a type or class of product that has the same function or intended use, if DOE determines that products within such group: (A) consume a different kind of energy from that consumed by other covered products within such type (or class); or (B) have a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a higher or lower standard. (42 U.S.C. 6295(q)(1)) In determining whether a performance-related feature justifies a different standard for a group of products, DOE must consider such factors as the utility to the consumer of the feature and other factors DOE deems appropriate. *Id.*

In evaluating potential technologies to improve the energy efficiency of vented gas clothes dryers, DOE tentatively has determined that vented gas clothes dryers with a capacity of less than 4.4 ft^3 perform in a way that is substantively different than vented gas clothes dryers that are 4.4 ft^3 or greater in capacity. For example, DOE has observed that compact vented gas clothes dryers generally perform at a lower efficiency than standard size vented gas clothes dryers, likely due to the chassis size restrictions, and due to that inherent difference, DOE believes that a separate product class is warranted. Furthermore, creating a new product class for vented gas clothes dryers with a capacity of less than 4.4 ft^3 would ensure that efficiency levels and potential amended standards could better and more directly assess the impact of design option implementations for a given product configuration. Therefore, DOE has tentatively determined that a separate product class and standard for vented gas compact clothes dryers (*i.e.,* with a capacity less than 4.4 ft^3) are justified for similar reasons as DOE determined for vented electric compact clothes dryers. *See* 76 FR 22404, 22485 (Apr. 21, 2011). As a result, DOE analyzed separate product classes for vented gas standard and vented gas compact clothes dryers.

In sum, DOE proposes the consumer clothes dryer product classes listed in Table IV.2 in this NOPR, which expand the scope of certain product classes to include both vented and ventless designs, and include an additional product class for compact vented gas dryers.

TABLE IV.2—NOTICE OF PROPOSED RULEMAKING CONSUMER CLOTHES DRYER PRODUCT CLASSES

Product Classes:
1. Electric, Standard (4.4 cubic feet (ft^3) or greater capacity).
2. Electric, Compact (120 volts (V)) (less than 4.4 ft^3 capacity).
3. Vented Electric, Compact (240 V) (less than 4.4 ft^3 capacity).
4. Vented Gas, Standard (4.4 ft^3 or greater capacity).
5. Vented Gas, Compact (less than 4.4 ft^3 capacity).
6. Ventless Electric, Compact (240 V) (less than 4.4 ft^3 capacity).
7. Ventless Electric, Combination Washer/Dryer.

2. Technology Options

In the preliminary market analysis and technology assessment, DOE identified 16 technology options that would be expected to improve the efficiency of consumer clothes dryers, as measured by the DOE test procedure. DOE continues to consider these technology options in this NOPR analysis. These technology options can be broadly grouped into five main categories: dryer control or drum upgrades, methods of exhaust heat recovery (for vented models only), heat generation options, improvements to components, and options to reduce standby power.

TABLE IV.3—PRELIMINARY ANALYSIS: TECHNOLOGY OPTIONS FOR CONSUMER CLOTHES DRYERS

Dryer Control or Drum Upgrades:
Improved termination.
Increased insulation.
Modified operating conditions.
Improved air circulation.
Improved drum design.
Methods of Exhaust Heat Recovery (Vented Models Only):
Recycle exhaust heat.
Inlet air preheat.
Inlet air preheat, condensing mode.
Heat Generation Options:
Heat pump, electric only.
Thermoelectric heating, electric only.
Microwave, electric only.
Modulating heat.
Indirect heating.
Component Improvements:
Improved motor efficiency.
Improved fan efficiency.
Standby Power Improvements:
Transformerless power supply with auto-powerdown.

DOE notes that two recently developed consumer clothes dryer technologies were not included as part of the preliminary analysis: long wavelength radio frequency (''RF'') drying and ultrasonic drying. Despite the potential benefits of RF and ultrasonic clothes drying, however, both technologies are currently under patent or have received a provisional patent. Any energy conservation standard that relied on either of these technologies would unfairly advantage the manufacturer or individual holder of the patent, and thus DOE did not consider them as technology options for the preliminary analysis. Because these technologies are technologically feasible, however, DOE proposes in this NOPR to retain these as technology options in the technology assessment, noting one of the criteria for screening technology options for use in further analyses is whether a technology represents a unique proprietary pathway (*see* section IV.B of this document and chapter 4 of the NOPR TSD). DOE notes that the current energy conservation standards for consumer clothes dryers would not prohibit the use of these technologies.

DOE received several comments in response to the technologies proposed in the preliminary analysis to be analyzed for consumer clothes dryers.

Whirlpool suggested that reduced drum seal leakage be considered as a technology option. Additionally, Whirlpool stated that approaches to reduce standby power may not be consumer-friendly solutions that manufacturers would readily implement. Whirlpool suggested that delaying the drum light turning on after opening the door or delaying the start of a cycle after powering on the unit would frustrate consumers, as they typically expect appliances to turn on when action is taken such as pressing the power button or opening the door. Whirlpool also suggested an off position on the control dial but stated that intellectual property may exist around this and may result in higher costs. (Whirlpool, No. 27 at p. 17) DOE is not aware of data at this time to characterize the impacts reduced drum seal leakage may have on efficiency and requests information on efficiency impacts of this technology. In addition, the strategies that Whirlpool suggested to reduce energy use in standby mode, including delaying the activation of the drum light after a door opening or delaying the start of the cycle after powering on the unit, would not be measured by appendix D2. Furthermore, although appendix D2 incorporates measures of energy use in both off mode and inactive (standby) mode, DOE does not have information to indicate the relative power consumption in each of these modes for any consumer clothes dryers on the market which may have an off mode position on the controls, which would provide an estimate of the reduction in combined low-power mode energy use. For these reasons, at this time, DOE is not proposing to include these technology options in its analysis.

NEEA stated that manufacturers in the current consumer clothes dryer market utilize an ''eco mode'' as a lower heat/longer drying time strategy to achieve a given efficiency. NEEA asserted that the efficiency of a consumer clothes dryer increases substantially with lower heat and longer drying time, citing laboratory testing by the California IOUs that quantified this effect by alternating periods of heat with no heat during a cycle. According to the results of this work, NEEA claimed, the average efficiency of consumer clothes dryers with these modified controls increased 30 percent compared to their default settings used for appendix D2 testing, and drying time increased 140 percent. According to NEEA, a no-heat cycle took 4 hours to complete but achieved a CEF_{D2} value of 7.0. NEEA stated that with the energy savings associated with this strategy, as well as the relatively low cost associated with the redesign of the control panel to enable additional heater/burner algorithms, manufacturers have a solid incentive to extensively utilize eco mode as the sole redesign strategy to enable their models to meet DOE's forthcoming mandatory standard. NEEA warned that the longer drying times associated with these energy saving programs are unlikely to be acceptable to many consumers in some circumstances (*e.g.,* serial dryer loads and other time-sensitive loads), which could potentially result in consumers regularly disabling these eco modes and may therefore significantly reduce the energy savings of dryers in everyday use relative to expectations created by the current appendix D2 test procedure. Therefore, NEEA requested that DOE require the sole use of appendix D2 for certification purposes as well as the required reporting of cycle times in order to mitigate against significant reductions in actual real-world energy savings associated with a low heat/long drying time eco mode strategy. According to NEEA, cycle time reporting would help moderate inordinately long cycle times during the D2 test, enable consumers and other stakeholders to consider trade-offs between the efficiency and cycle time for a given model, and provide data to possibly consider more sophisticated approaches to cycle time in subsequent standard updates. (NEEA, No. 30 at pp. 1–7) DOE recognizes that some consumer clothes dryers are currently certified using appendix D2, and their controls may include an ''eco mode'' or ''energy saver mode,'' which typically reduce the temperature used in the cycle at the expense of increasing the drying time. However, appendix D2 requires, for automatic termination control dryers, that the ''normal'' program be selected for the energy test cycle. In the event that the automatic termination control dryer does not have a ''normal'' program, the cycle recommended by the manufacturer for drying cotton or linen clothing is selected. Where the drying temperature setting can be chosen independently of the program (as would be the case if ''eco mode'' or ''energy saver mode'' were an optional setting that could be selected for the ''normal'' program), the drying temperature must be set to the maximum. Section 3.3.2, appendix D2. For timer dryers, the maximum temperature setting is selected for the energy test cycle. Section 3.3.1, appendix D2. Therefore, an available ''eco mode'' or ''energy saver mode'' would not be included in the energy test cycle, as they would not produce a measure of energy use during a representative cycle. For this reason, DOE did not consider such energy saving modes as a technology option in this NOPR.

NEEA further encouraged DOE to consider the following technology options: (1) coupled blower modulation with the multi-stage burner/heater efficiency level, (2) cabinet insulation, (3) backward curved fan blades, and (4) recuperation heat recovery in vented heat pump clothes dryers associated with a PNNL study. (NEEA, No. 30 at pp. 12–13) DOE notes that blower modulation is already coupled with the multi-stage burner/heater efficiency level for both electric and gas consumer clothes dryers, although this was not previously stated in chapter 5 of the preliminary TSD. DOE has not observed the technology option of cabinet insulation in clothes dryers used in this analysis, and therefore does not currently have sufficient information to determine the potential efficiency impacts associated with the suggested technology options, however, DOE notes that with the inherent risk of fires that may occur during operation of a consumer clothes dryer, any insulation used within the cabinet space would likely need to be fire retardant in order to satisfy the fire containment requirements according to the UL 2158 safety standard. While insulation of the dryer cabinet space would likely lead to potential energy savings, DOE expects that the insulation could lead to an increased internal cabinet temperature and may potentially lead to the degradation of other components within the clothes dryer assembly. DOE therefore requests information that would be beneficial in determining any impacts to efficiency or performance as a result of implementing each of the technology options mentioned. DOE notes that improvements to fan blades would be captured in the analyzed technology options as improved fan efficiency, however the efficiency improvements specified by NEEA refer to heating, ventilation, and air conditioning (''HVAC'') research and do not specifically refer to efficiency improvements in consumer clothes dryers. Therefore, until DOE has sufficient information on efficiency improvements associated with fan designs, the proposed incremental efficiency levels will not be associated with improved fan efficiency. Regarding the recuperation heat recovery technology option, DOE notes that this technology is already considered in this analysis referred to as the inlet-air preheat design option. Given the proposed change to the product class structure regarding the combination of vented and ventless clothes dryers in the standard and compact (120V) categories, this technology is now considered in the proposed design options for vented consumer clothes dryers, however given that DOE has not observed inlet-air preheat technology in consumer clothes dryers on the market, specifically heat pump consumer clothes dryers, this technology has not been considered at the max-tech level associated with heat pump technology.

Table IV.4 lists the technology options identified for consumer clothes dryers in this NOPR. With the inclusion of RF and ultrasonic drying technologies in the list of technology options in the NOPR, DOE has renamed the grouping for ''heat generation options'' as ''moisture removal options.'' *See* chapter 3 of the NOPR TSD for further discussion of the analyzed technologies.

TABLE IV.4—TECHNOLOGY OPTIONS FOR CONSUMER CLOTHES DRYERS

Dryer Control or Drum Upgrades:
Improved termination.
Increased insulation.
Modified operating conditions.
Improved air circulation.
Improved drum design.
Methods of Exhaust Heat Recovery (Vented Models Only):
Recycle exhaust heat.
Inlet air preheat.
Inlet air preheat, condensing mode.
Moisture Removal Options:
Heat pump, electric only.
Thermoelectric heating, electric only.
Microwave, electric only.
Modulating heat.
Indirect heating.
RF drying, electric only.

TABLE IV.4—TECHNOLOGY OPTIONS FOR CONSUMER CLOTHES DRYERS—Continued

Ultrasonic drying, electric only.
Component Improvements:
Improved motor efficiency.
Improved fan efficiency.
Standby Power Improvements:
Transformerless power supply with auto-powerdown.

B. Screening Analysis

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

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

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

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

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

(5) *Unique-Pathway Proprietary Technologies.* If a design option utilizes proprietary technology that represents a unique pathway to achieving a given efficiency level, that technology will not be considered further due to the potential for monopolistic concerns.

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

In summary, if DOE determines that a technology, or a combination of technologies, fails to meet one or more of the listed five criteria, it will be excluded from further consideration in the engineering analysis. The reasons for eliminating any technology are discussed in the following sections.

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

1. Screened-Out Technologies

AHAM requested that DOE consider the effects that different technology options may have on fabric care, specifically the impact longer drying cycles may have on fabric. (AHAM, No. 23 at p. 10) While certain technology options may be associated with an increase in cycle times (*e.g.,* modified operating conditions (reduced drying temperatures) and heat pump technology), DOE notes that AHAM did not provide, nor is DOE aware of, information correlating fabric care directly to cycle time. In addition, if longer cycle times are accompanied by lower drying temperatures, it is uncertain whether the net impact on fabric care is positive or negative, and how this result would vary based on fabric type. Therefore, DOE did not screen out any technology options solely on the basis of any fabric care considerations due to cycle time. However, DOE requests comment on any potential impacts that different technology options, including any that may impact cycle times, have on fabric care.

a. Thermoelectric Heating, Electric Only

DOE notes that Oak Ridge National Laboratory (''ORNL'') is still researching thermoelectric heating clothes dryers. While ORNL's test results of a preliminary prototype have shown the potential for improved efficiency, ORNL indicated that the initial prototype design produced longer-than-desired drying times due to direct-contact heat transfer limitations via the drum surface. ORNL has subsequently developed another prototype which added pumped secondary water loops that transferred heat from the thermoelectric modules to the process air via air-to-water heat exchangers to further improve efficiency and minimize cycle length. ORNL's testing indicated efficiency and cycle times for this prototype that are approximately equivalent to those of vapor compression heat pump clothes dryers.[21] Because the research for such a thermoelectric heating clothes dryer that produces energy savings and meets consumer expectations for drying cycle time is still in the prototype stage, DOE determined that this technology option would not be practicable to manufacture, install, and service on a scale necessary to serve the relevant market at the time of the projected compliance date of any new or amended consumer clothes dryer standards, and did not be consider it for further analysis.

b. Microwave, Electric Only

Due to the large energy savings associated with microwave drying, this technology was the subject of a multi-year development effort at the Electric Power Research Institute (''EPRI'') in the mid-1990s; [22] and at least one major manufacturer, Whirlpool Corporation (''Whirlpool''), developed a countertop-scale version of such a product as recently as 2002,[23] but to date this technology has not been successfully commercialized.

Significant technical and safety issues are introduced by the potential arcing from metallic objects in the fabric load, including zippers, buttons, or ''stray'' items such as coins. While efforts have been made to mitigate the conditions that are favorable to arcing, or to detect incipient arcing and terminate the cycle, the possibility of fabric damage cannot be completely eliminated.[24] In addition to consumer utility impacts, these conditions can also pose a safety hazard.

[21] Patel, V., Boudreaux, P., and Gluesenkamp, K. Oak Ridge National Laboratory. Validated Model of a Thermoelectric Heat Pump Clothes Dryer Using Secondary Pumped Loops. Applied Thermal Engineering, Volume 184, February 5, 2021.

[22] S. Ashley. 1998. ''Energy-Efficient Appliances'', Mechanical Engineering Magazine, March, 1998, pp. 94–97.

[23] E. Spagat. 2002. ''Whirlpool Goes Portable to Sell Dryers to Gen Y'', Wall Street Journal, June 4, 2002.

[24] J.F. Gerling. 2003. ''Microwave Clothes Drying—Technical Solutions to Fundamental Challenges'', Appliance Magazine, April, 2003, p. 120.

For these reasons, microwave drying was not considered further for analysis.

c. Indirect Heating

Indirect heating would be viable only in residences that use a hydronic heating system. Also, in order to derive clothes dryer heat energy from the home's heating system, significant plumbing work would be required to circulate heated water through a heat exchanger in the clothes dryer. Therefore, this technology option does not meet the criterion of practicability to install on a scale necessary to serve the relevant market at the time of the effective date of any new standard and will not be considered for further analysis.

d. RF Drying, Electric Only

CoolDry, LLC (''CoolDry''), developed an RF clothes dryer prototype, claiming an efficiency of 90 percent, compared to 50 percent for conventional clothes dryers.[25] CoolDry states that its RF drying technology operates at lower temperatures than do conventional clothes dryers and, because the transfer of energy to clothes is not dependent on convective heat transfer, the RF clothes dryer requires less tumbling and subsequently consumes less energy for drum rotation than a conventional clothes dryer. Because this technology was in the prototype stage at the time it was initially considered and the company is no longer in business and thus there is likely no longer research and development ongoing, DOE determined that this technology option would not be practicable to manufacture, install, and service on a scale necessary to serve the relevant market at the time of the projected compliance date of any new or amended consumer clothes dryer standards, and did not be consider it for further analysis.

e. Ultrasonic Drying, Electric Only

Researchers at ORNL have developed an ultrasonic drying prototype that uses piezoelectric transducers to separate water from clothes through water cavitation produced by ultrasonic vibrations. According to their research, the energy imparted to the water must overcome surface tension in order to break the water into droplets, but this energy is substantially less than the latent heat of vaporization of water, which is the primary thermodynamic barrier for conventional evaporation drying. The ORNL researchers anticipate that ultrasonic drying technology will result in an energy factor (''EF'')[26] of greater than 10 and a drying time of less than 20 minutes.[27] Because this technology is still in the prototype stage, DOE determined that this technology option would not be practicable to manufacture, install, and service on a scale necessary to serve the relevant market at the time of the projected compliance date of any new or amended consumer clothes dryer standards, and did not be consider it for further analysis.

2. Remaining Technologies

Through a review of each technology, DOE tentatively concludes that all of the other identified technologies listed in section IV.A.2 of this document met all five screening criteria to be examined further as design options in DOE's NOPR analysis. In summary, DOE did not screen out the following technology options listed in Table IV.5.

TABLE IV.5—RETAINED DESIGN OPTIONS FOR CONSUMER CLOTHES DRYERS

Dryer Control or Drum Upgrades:
Improved termination.
Modified operating conditions.
Improved air circulation.
Increased insulation.
Improved drum design.
Methods of Exhaust Heat Recovery (vented models only):
Recycle exhaust heat.
Inlet air preheat.
Inlet air preheat, condensing mode.
Moisture Removal Options:
Heat pump, electric only.
Modulating heat.
Component Improvements:
Improved motor efficiency.
Improved fan efficiency.
Standby Power Improvements:
Transformerless Power Supply with Auto-Powerdown.

DOE has initially determined that these technology options are technologically feasible because they are being used or have previously been used in commercially-available products or working prototypes. DOE also finds that all of the remaining technology options meet the other screening criteria (*i.e.,* practicable to manufacture, install, and service and do not result in adverse impacts on consumer utility, product availability, health, or safety, nor are unique-pathway proprietary technologies). For additional details, *see* chapter 4 of the NOPR TSD.

C. Engineering Analysis

The purpose of the engineering analysis is to establish the relationship between the efficiency and cost of consumer clothes dryers. There are two elements to consider in the engineering analysis; the selection of efficiency levels to analyze (*i.e.,* the ''efficiency analysis'') and the determination of product cost at each efficiency level (*i.e.,* the ''cost analysis''). In determining the performance of higher-efficiency products, DOE considers technologies and design option combinations not eliminated by the screening analysis. For each product class, DOE estimates the baseline cost, as well as the incremental cost for the product at efficiency levels above the baseline. The output of the engineering analysis is a

[25] CoolDry does not specify the metric or test method used to determine the efficiency of its prototype. More information is available at: *http://www.cooldryrf.com/.*

[26] EF only incorporates active mode energy use and not standby and off mode energy use.

[27] Momen, A. *Ultrasonic Clothes Dryer: 2016 Building Technologies Office Peer Review.* 2016. Prepared for the U.S. Department of Energy at Oak Ridge National Laboratory, in partnership with the University of Florida and General Electric. p. 2.

set of cost-efficiency ''curves'' that are used in downstream analyses (*i.e.,* the LCC and PBP analyses and the NIA).

1. Efficiency Analysis

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

In this proposed rulemaking, DOE relied on an efficiency-level approach, supplemented with reverse-engineering. This approach involved testing and physically disassembling a representative sample of commercially available products, reviewing publicly available cost information, and modeling equipment cost. From this information, DOE estimated the manufacturer production costs (''MPCs'') for a range of products currently available on the market, considering the design options and the steps manufacturers would likely take to reach a certain efficiency level. As part of this NOPR analysis, DOE included additional test units beyond those considered in the preliminary analysis as part of its updated test sample. The additional test units were included to represent additional baseline models, newly introduced units on the market, units with unique configurations, and units with technologies that were not available at the time of the preliminary analysis. The efficiency levels analyzed as part of this engineering analysis are attainable using commercially available clothes dryer technologies, or technologies that have been demonstrated in working prototypes.

a. Baseline Efficiency Levels

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

The baseline clothes dryer efficiency levels for this NOPR differ from the existing energy conservation standards that were established in the 2011 rulemaking analysis primarily due to the difference between the then-current appendix D1, which DOE used to evaluate products in the previous rulemaking, and the present version of appendix D2, as established by the October 2021 TP Final Rule and which DOE used as the basis for this analysis. Appendix D2 includes test methods that more accurately measure the effects of automatic cycle termination and that may result in differences in the total measured energy consumption of the test cycle as compared to the test methods in appendix D1. Specifically, for automatic termination control dryers, appendix D2 requires a lower FMC of the test load and does not rely on a field use factor to account for the over drying energy consumption, instead requiring that the automatic termination drying program run to the end of the cycle. Additionally, appendix D2 contains instructions for the testing of timer dryers, which include a lower FMC of the test load as compared to the version of appendix D1 used for the 2011 rulemaking analysis.

For the engineering analysis, DOE begins the engineering analysis by identifying the efficiency level corresponding to the Federal minimum energy conservation standards for each product class. Due to the test procedure changes adopted in the October 2021 Final Rule, DOE determined the baseline efficiency level representative of minimally compliant products when tested under appendix D2. In order to identify the appendix D2 baseline levels, DOE tested 22 models that were certified as minimally compliant with the current energy conservation standards, from across all product classes. Because certified performance data are not available for models on the market as tested in accordance with both appendix D1 and appendix D2, DOE tested each basic model in its test sample in accordance with appendix D1 and appendix D2 and used the test values for appendix D2 to determine the baseline models in support of this engineering analysis. Due to the differences in the two test procedures described above, the baseline CEF_{D2} measured using appendix D2 is numerically lower for each product class than the corresponding CEF_{D1} value in the current energy conservation standards, though that does not indicate a lower efficiency. The test procedure differences are driving the lower baseline CEF_{D2} values and do not represent a lower efficiency or backsliding.

The consumer clothes dryer baseline efficiency levels for the preliminary analysis are presented in Table IV.6.

TABLE IV.6—PRELIMINARY ANALYSIS CONSUMER CLOTHES DRYER BASELINE EFFICIENCY LEVELS

Product class	CEF_{D2} (lb/kWh)
Vented Electric, Standard (4.4 ft³ or greater capacity)	2.20
Vented Electric, Compact (120V) (less than 4.4 ft³ capacity)	2.42
Vented Electric, Compact (240V) (less than 4.4 ft³ capacity)	2.00
Vented Gas, Standard (4.4 cubic ft³ or greater capacity)	2.63
Vented Gas, Compact (less than 4.4 ft³ capacity)	1.66
Ventless Electric, Compact (240V) (less than 4.4 ft³ capacity)	2.03
Ventless Electric, Standard ((4.4 ft³ or greater capacity)	2.23
Ventless Electric, Combination Washer-Dryer	2.27

In response to the preliminary analysis, AHAM agreed that testing was appropriate to determine the baseline and incremental efficiency levels, but stated that the testing of 18 models was insufficient to establish the baseline efficiency levels. AHAM also stated that basing DOE's analysis on a few baseline units may not accurately represent the market, especially when so many baseline models have electromechanical controls. AHAM therefore requested that DOE make its test results available so that representativeness could be assessed from a shipments perspective, and so that manufacturers could evaluate the test results for their models and compare to their own results. (AHAM, No. 23 at p. 3)

Upon request, DOE provided to individual manufacturers the test data for any of their units which were included in DOE's testing sample, otherwise maintaining confidentiality of the products tested. DOE also increased the number of units included in its updated test sample to better represent consumer clothes dryers currently available on the market, as discussed in chapter 5 of the NOPR TSD.

The California IOUs recommended that DOE revise the engineering analysis and investigate lowering the baseline efficiency of the vented gas standard dryer product class. According to the California IOUs, their testing data that were presented to DOE in response to the test procedure NOPR that was published on July 23, 2019 (84 FR 35484), support the baseline efficiency level for the vented electric standard product class. However, for the vented gas standard product class, the California IOUs referred to a currently available product with a CEF_{D2} value below the baseline efficiency level presented in the preliminary TSD. NEEA asserted that DOE has historically set standard levels for gas clothes dryers lower than the standards for electric clothes dryers because some energy counted in the higher heating value of the gas consumed, which is the basis of the CEF_{D2}, is not used by the consumer clothes dryer. NEEA encouraged DOE to re-evaluate the CEF_{D2} levels of electric and gas clothes dryers in its engineering analysis, as it pointed out that the electric clothes dryer efficiency levels are lower than the efficiency levels for gas clothes dryers that incorporate similar technology options. NEEA encouraged DOE to increase the stringency of the electric clothes dryer efficiency levels. (California IOUs, No. 26 at pp. 1–3; NEEA, No. 30 at pp. 13–14)

Additionally, NEEA submitted test data for 41 standard size electric and gas clothes dryers, which suggested that the average CEF_{D2} values for the non-ENERGY STAR-qualified electric and gas clothes dryers in its sample were significantly higher than the baseline efficiency levels in the preliminary analysis. NEEA also found that the least efficient electric clothes dryer in its sample had a measured CEF_{D2} that was more than 20 percent higher than DOE's value for electromechanically controlled consumer clothes dryers. NEEA encouraged DOE to use these data in developing appropriate efficiency levels for the engineering analysis. (NEEA, No. 30 at pp. 8–10)

DOE appreciates the data provided by NEEA and observes that, in general, the data support the historical trend regarding the lower efficiency of gas clothes dryers in comparison to electric clothes dryers. These data also support the updated baseline and incremental efficiency levels for gas clothes dryers, that latter of which are discussed in more detail in section IV.C.1.b of this document. Although the results of NEEA's test sample exhibit a higher average efficiency among baseline electromechanically controlled electric clothes dryers, as stated above, DOE set the baseline efficiency levels so that they would represent a minimally compliant, basic-construction consumer clothes dryer on the market. Accordingly, DOE has updated the baseline value for each product class to be equal to the minimum CEF_{D2}, measured using appendix D2, among the corresponding consumer clothes dryers in its NOPR test sample.

Similarly, DOE notes that the baseline efficiency level for the vented electric compact (120V) product class has been updated to reflect the CEF_{D2} value using the appendix D2 test procedure based on the best available data at this time.

Finally, DOE has considered the revised product classes proposed in this NOPR analysis in updating the baseline efficiency levels, based on further analysis of results and new testing since the preliminary analysis. The baseline efficiency levels considered for this NOPR analysis are presented along with the current standards in Table IV.7 and are discussed in more detail in chapter 5 of the NOPR TSD.

TABLE IV.7—NOTICE OF PROPOSED RULEMAKING CONSUMER CLOTHES DRYER BASELINE EFFICIENCY LEVELS

Product class	CEF_{D1} (lb/kWh)	CEF_{D2} (lb/kWh) *
Electric, Standard (4.4 ft^3 or greater capacity)	3.73	2.20
Electric, Compact (120V) (less than 4.4 ft^3 capacity)	3.61	2.36
Vented Electric, Compact (240V) (less than 4.4 ft^3 capacity)	3.27	2.00
Vented Gas, Standard (4.4 cubic ft^3 or greater capacity)	3.30	2.00
Vented Gas, Compact (less than 4.4 ft^3 capacity)	3.30	** 1.66
Ventless Electric, Compact (240V) (less than 4.4 ft^3 capacity)	2.55	2.03
Ventless Electric, Combination Washer-Dryer	2.08	2.27

* As discussed above, the baseline CEF_{D2} values represent differences in test procedure between appendix D1 and appendix D2 and do not constitute backsliding.

** CEF_{D2} baseline efficiency levels as measured under the Appendix D2 account for differences in the effectiveness of automatic cycle termination. Manufacturers implement automatic termination in a variety of ways, which will impact the representations as measured under Appendix D2 resulting in a range of possible CEF_{D2} values, as compared to the same CEF_{D1} values in the existing Federal standards.

b. Incremental Efficiency Levels

DOE developed incremental efficiency levels by reviewing products currently available on the market and by testing and reverse engineering products in the DOE test sample in support of the NOPR. For each product class, DOE analyzed several efficiency levels and determined the incremental MPC at each of these levels. DOE initially reviewed data in DOE's CCD to evaluate the range of efficiencies for consumer clothes dryers currently available on the market.[28] As discussed in chapter 5 of the NOPR TSD, non-ENERGY STAR-qualified products (generally units with lower rated efficiencies) are typically

[28] DOE's Compliance Certification Database is available for review at *www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A**.

tested using appendix D1, while ENERGY STAR-qualified products are required to be tested using appendix D2. As a result, DOE conducted testing on a representative sample of non-ENERGY STAR products using appendix D2 to determine appropriate initial incremental efficiency levels for each product class. DOE observed that while electronic controls are typically implemented with other design options in this NOPR analysis, the improved automatic termination precision offered by switching to electronic controls contributed significantly to an increase in efficiency. This efficiency gain informed the first incremental efficiency levels for most product classes and was noted simply as electronic controls in the design options listed in the following tables. The design options associated with higher efficiency levels were subsequently distinguished according to specific design options DOE found manufacturers used to meet these higher efficiencies. As part of DOE's analysis, the maximum available efficiency level is defined by the highest efficiency unit currently available on the market. DOE also defines a ''max-tech'' efficiency level to represent the maximum possible efficiency for a given product.

The incremental efficiency levels developed in the preliminary analysis are presented in Table IV.8 through Table IV.15.

TABLE IV.8—PRELIMINARY ANALYSIS: VENTED ELECTRIC STANDARD EFFICIENCY LEVELS

Level	Design option	CEF_{D2} (lb/kWh)
Baseline	Baseline (Electromechanical Controls)	2.20
1	Baseline + Electronic Controls	2.68
2	EL1 + Optimized Heating System	3.04
3	EL2 + More Advanced Automatic Termination Control System	3.27
4	EL3 + Modulating (2-Stage) Heat	3.93
5	EL4 + Inlet Air Preheat	4.21
6	Heat Pump Dryer (Max-Tech)	4.30

TABLE IV.9—PRELIMINARY ANALYSIS: VENTED ELECTRIC COMPACT (120V) EFFICIENCY LEVELS

Level	Design option	CEF_{D2} (lb/kWh)
Baseline	Baseline (Electromechanical Controls)	2.42
1	Baseline + Electronic Controls	2.95
2	EL1 + Optimized Heating System	3.35
3	EL2 + More Advanced Automatic Termination Control System	4.28
4	EL3 + Modulating (2-Stage) Heat	4.33
5	EL4 + Inlet Air Preheat	4.63
6	Heat Pump Dryer (Max-Tech)	4.73

TABLE IV.10—PRELIMINARY ANALYSIS: VENTED ELECTRIC COMPACT (240V) EFFICIENCY LEVELS

Level	Design option	CEF_{D2} (lb/kWh)
Baseline	Baseline (Electromechanical Controls)	2.00
1	Baseline + Electronic Controls	2.44
2	EL1 + Optimized Heating System	2.76
3	EL2 + More Advanced Automatic Termination Control System	3.53
4	EL3 + Modulating (2-Stage) Heat	3.57
5	EL4 + Inlet Air Preheat	3.82
6	Heat Pump Dryer (Max-Tech)	2.91

TABLE IV.11—PRELIMINARY ANALYSIS: VENTED GAS STANDARD EFFICIENCY LEVELS

Level	Design option	CEF_{D2} (lb/kWh)
Baseline	Baseline (Electromechanical Controls)	2.63
1	Baseline + Electronic Controls	3.21
2	EL1 + Optimized Heating System and More Advanced Automatic Termination Control System	3.48
3	EL2 + Modulating (2-Stage) Heat	4.70
4	EL3 + Inlet Air Preheat (Max-Tech)	5.04

TABLE IV.12—PRELIMINARY ANALYSIS: VENTED GAS COMPACT EFFICIENCY LEVELS

Level	Design option	CEF_{D2} (lb/kWh)
Baseline	Baseline (Electromechanical Controls)	1.66
1	Baseline + Electronic Controls	2.02
2	EL1 + Optimized Heating System and More Advanced Automatic Termination Control System	2.19

TABLE IV.12—PRELIMINARY ANALYSIS: VENTED GAS COMPACT EFFICIENCY LEVELS—Continued

Level	Design option	CEF_{D2} (lb/kWh)
3	EL2 + Modulating (2-Stage) Heat	2.96
4	EL3 + Inlet Air Preheat (Max-Tech)	3.17

TABLE IV.13—PRELIMINARY ANALYSIS: VENTLESS ELECTRIC STANDARD EFFICIENCY LEVELS

Level	Design option	CEF_{D2} (lb/kWh)
Baseline	Baseline (Electronic Controls)	2.23
1	Baseline + More Advanced Automatic Termination Control System	2.95
2	Heat Pump Dryer (Max-Tech)	4.50

TABLE IV.14—PRELIMINARY ANALYSIS: VENTLESS ELECTRIC COMPACT (240V) EFFICIENCY LEVELS

Level	Design option	CEF_{D2} (lb/kWh)
Baseline	Baseline (Electronic Controls)	2.03
1	Baseline + More Advanced Automatic Termination Control System	2.68
2	Heat Pump Dryer (Max-Tech)	5.70

TABLE IV.15—PRELIMINARY ANALYSIS: VENTLESS ELECTRIC COMBINATION WASHER-DRYER EFFICIENCY LEVELS

Level	Design option	CEF_{D2} (lb/kWh)
Baseline	Baseline (Electronic Controls)	2.27
1	Baseline + High Speed Spin	2.55
2	Heat Pump Dryer (Max-Tech)	5.42

DOE received comments regarding the hybrid heat pump design investigated in a 2016 study by Pacific Northwest National Laboratory (''PNNL''), which utilizes a low-wattage electric resistance heater located downstream of the condenser to provide supplementary heating to minimize drying cycle time.[29] ASAP and NRDC encouraged DOE to review the max-tech level and heat pump technology design option based on current hybrid heat pump models available and the PNNL prototype hybrid heat pump clothes dryer which utilized a recuperative heat exchanger in addition to a resistive heating element and heat pump design. (ASAP, NRDC, No. 25 at p. 2)

At the time of the preliminary analysis, DOE was not aware of the efficiency impacts associated with consumer clothes dryers utilizing a hybrid heat pump design and therefore did not include this design as part of the preliminary analysis. In the time since the publishing of the preliminary analysis, DOE has identified at least two manufacturers that market consumer clothes dryers utilizing a hybrid heat pump design. DOE investigated the efficiency savings associated with hybrid heat pump clothes dryers and included in its updated test sample two hybrid heat pump clothes dryers. DOE observed that, compared to heat pump-only clothes dryer designs, the hybrid heat pump clothes dryers had lower efficiencies, albeit higher than the efficiencies of any non-heat pump clothes dryer. This analysis indicates that use of hybrid heat pump technology may provide a ''bridge'' in the market between consumer clothes dryer models utilizing conventional heating elements and models based on heat pump-only technology. Therefore, in this NOPR, DOE analyzed an intermediate efficiency level associated with the hybrid heat pump technology that would capture the efficiency savings from consumer clothes dryers implementing a conventional heating element in addition to heat pump technology. The efficiency savings associated with heat recovery are still captured in the efficiency levels modeling inlet air preheat.

ASAP, NRDC, the California IOUs, and NEEA requested that DOE review the consumer clothes dryers currently available on the market, asserting that at the time of publication of the preliminary analysis, there were models available with higher efficiency than the preliminary max-tech levels in the ventless electric standard and compact product classes. (ASAP, NRDC, No. 25 at pp. 1–2; California IOUs, No. 26 at pp. 3–4; NEEA, No. 30 at pp. 10–11) DOE reviewed the highest efficiency ventless clothes dryers on the market by examining DOE's Compliance Certification Management System database (''CCMS'') and ENERGY STAR databases and included a sample of them in the updated test sample to better represent the max-tech levels in the proposed electric standard, electric compact (120V), and ventless electric compact (240V) product classes.

Chapter 5 of the NOPR TSD discusses the incremental efficiency levels for each of the product classes proposed in this NOPR analysis. The revised CEF_{D2} efficiency levels for each product class are shown below in Table IV.16 through Table IV.21, along with the current energy conservation standards in CEF_{D1} for comparison. As discussed in section IV.C.1.a of this document, the baseline CEF_{D2} values estimated for the preliminary analysis are lower than the current CEF_{D1} values in the energy conservation standards due to the differences in testing using appendix D1 and appendix D2. DOE requests

[29] See: *www.pnnl.gov/main/publications/external/technical_reports/PNNL-25510.pdf.*

comment on the incremental efficiency levels used in the NOPR engineering analysis.

levels used in the NOPR engineering analysis.

TABLE IV.16—NOTICE OF PROPOSED RULEMAKING ANALYSIS: ELECTRIC STANDARD EFFICIENCY LEVELS

Efficiency level	Design option	Current standard CEF_{D1} (lb/kWh)	NOPR CEF_{D2} (lb/kWh) *
Baseline	Baseline (Electromechanical Controls)	3.73	2.20
1	Baseline + Electronic Controls		2.68
2	EL1 + Optimized Heating System		3.04
3	EL2 + More Advanced Automatic Termination Control System		3.27
4	EL3 + Modulating (2-Stage) Heat		3.93
5	EL4 + Inlet Air Preheat		4.21
6	Hybrid Heat Pump Dryer (Additional Resistance Heater)		5.20
7	Heat Pump Dryer (Max-Tech)		[30] 7.39

* As discussed above, the baseline CEF_{D2} values represent differences in test procedure between Appendix D1 and Appendix D2 and do not constitute backsliding.

TABLE IV.17—NOTICE OF PROPOSED RULEMAKING ANALYSIS: ELECTRIC COMPACT (120V) EFFICIENCY LEVELS

Efficiency level	Design option	Current standard CEF_{D1} (lb/kWh)	NOPR CEF_{D2} (lb/kWh)
Baseline	Baseline (Electromechanical Controls)	3.61	2.36
1	Baseline + Electronic Controls		3.15
2	EL1 + Optimized Heating System		3.35
3	EL2 + More Advanced Automatic Termination Control System		4.28
4	EL3 + Modulating (2-Stage) Heat		4.33
5	EL4 + Inlet Air Preheat		4.63
6	Heat Pump Dryer (Max-Tech)		6.37

TABLE IV.18—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTED ELECTRIC COMPACT (240V) EFFICIENCY LEVELS

Efficiency level	Design option	Current standard CEF_{D1} (lb/kWh)	NOPR CEF_{D2} (lb/kWh)
Baseline	Baseline (Electromechanical Controls)	3.27	2.00
1	Baseline + Electronic Controls		2.44
2	EL1 + Optimized Heating System		2.76
3	EL2 + More Advanced Automatic Termination Control System		3.30
4	EL3 + Modulating (2-Stage) Heat		3.57
5	EL4 + Inlet Air Preheat		3.82
6	Heat Pump Dryer (Max-Tech)		3.91

TABLE IV.19—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTED GAS STANDARD AND COMPACT EFFICIENCY LEVELS

Efficiency level	Design option	Current standard CEF_{D1} (lb/kWh) [31]	NOPR CEF_{D2} (lb/kWh)	
			Vented gas standard	Vented gas compact
Baseline	Baseline (Electromechanical Controls)	3.30	2.00	1.66
1	Baseline + Electronic Controls		2.44	2.02
2	EL1 + Optimized Heating System and More Advanced Automatic Termination Control System.		3.00	2.49
3	EL2 + Modulating (2-Stage) Heat		3.48	2.89
4	EL3 + Inlet Air Preheat (Max-Tech)		3.83	3.17

[30] DOE is aware of clothes dryers in the electric standard product class that perform at higher efficiencies than the proposed max-tech level, but those models are not representative of the typical capacity in the electric standard product class. Therefore, based on the certified performance of those models and additional investigative testing, DOE determined a representative max-tech efficiency for the electric standard product class that reflects an appropriate, representative unit capacity. *See* chapter 5 of the TSD for more information.

TABLE IV.20—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTLESS ELECTRIC COMPACT (240V) EFFICIENCY LEVELS

Efficiency level	Design option	Current standard CEF_{D1} (lb/kWh)	NOPR CEF_{D2} (lb/kWh)
Baseline	Baseline (Electronic Controls)	2.55	2.03
1	Baseline + More Advanced Automatic Termination Control System		2.68
2	Heat Pump Dryer (Max-Tech)		6.80

TABLE IV.21—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTLESS ELECTRIC COMBINATION WASHER-DRYER EFFICIENCY LEVELS

Efficiency level	Design option	Current standard CEF_{D1} (lb/kWh)	NOPR CEF_{D2} (lb/kWh)
Baseline	Baseline (Electronic Controls)	2.08	2.27
1	Baseline + High Speed Spin		2.55
2	Heat Pump Dryer (Max-Tech)		4.01

2. Cost Analysis

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

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

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

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

In the present case, DOE conducted the analysis using physical product teardowns to determine the baseline MPC for each product class as outlined in chapter 5 of the NOPR TSD. DOE developed the cost-efficiency relationships for each product class as discussed in section IV.C.3 of this document. DOE developed incremental MPCs based on product teardowns and manufacturing cost modeling of the expected design changes at each efficiency level. DOE observed that the basic product designs of vented electric and vented gas clothes dryers are similar except for the heating system. DOE also observed that the technology designs of standard size and compact size clothes dryers are similar as well, simply scaled in size. As a result, in the absence of models available on the market at certain efficiency levels for certain product classes, DOE estimated the incremental MPC for these based on the same design changes observed for the electric standard product class. DOE updated the cost-efficiency analysis from the preliminary analysis by updating the costs of raw materials and purchased components, as well as updating costs for manufacturing equipment, labor, and depreciation. DOE also used information from teardown of units in the updated test sample to inform updates to the cost-efficiency analysis. Not all units in the updated test sample were torn down; DOE focused on units recently introduced in the market, units with unique configuration, and units with technologies that were not available at the time of the preliminary analysis to better inform the costs associated with particular product classes and design options. The resulting BOMs provided the basis for the MPC estimates in this NOPR. The baseline MPCs for each consumer clothes dryer product class are listed in Table IV.22, with all costs presented in 2020 dollars. DOE requests comment on the baseline MPCs in the NOPR engineering analysis.

TABLE IV.22—NOTICE OF PROPOSED RULEMAKING: CONSUMER CLOTHES DRYER BASELINE MANUFACTURING PRODUCTION COSTS

Product class	Baseline MPC (2020$)
1. Electric, Standard (4.4 cubic feet (ft^3) or greater capacity)	$250.65
2. Electric, Compact (120 volts (V)) (less than 4.4 ft^3 capacity)	267.09
3. Vented Electric, Compact (240V) (less than 4.4 ft^3 capacity)	267.68
4. Gas, Standard (4.4 cubic ft^3 or greater capacity)	284.33
5. Gas, Compact (less than 4.4 ft^3 capacity)	309.82

[31] The current standard does not distinguish a separate product class for compact sized gas consumer clothes dryers. As such, the current standard may apply to all gas consumer clothes dryers.

TABLE IV.22—NOTICE OF PROPOSED RULEMAKING: CONSUMER CLOTHES DRYER BASELINE MANUFACTURING PRODUCTION COSTS—Continued

Product class	Baseline MPC (2020$)
6. Ventless Electric, Compact (240V) (less than 4.4 ft^3 capacity)	464.90
7. Electric, Combination Washer-Dryer	629.65

The following section presents the incremental MPCs for each consumer clothes dryer product class.

3. Cost-Efficiency Results

The results of the engineering analysis are presented as cost-efficiency data for each of the efficiency levels for each of the product classes that were analyzed, as well as those extrapolated from a product class with similar features. DOE developed estimates of MPCs for each unit in the teardown sample to develop a comprehensive set of incremental MPCs (*i.e.,* the additional costs manufacturers would likely incur by producing consumer clothes dryers at each efficiency level compared to the baseline).

In response to the MPCs presented in the preliminary analysis, AHAM stated that due to unprecedented supply chain issues facing home appliance manufacturers resulting from the COVID–19 pandemic and increased tariffs on raw materials, components, and finished goods, DOE must take into account these challenges if it is to consider amending energy conservation standards. AHAM stated it is working to collect data on the impact of supply chain challenges and would be willing to share that data with DOE. (AHAM, No. 23 at p. 9) DOE also received similar feedback from manufacturers during the interview process. DOE notes that increased costs associated with recent supply chain issues have been implemented in the cost analysis and are presented in the MPCs in this NOPR analysis, specifically by way of 5-year moving averages for material and purchase parts prices.

The resulting incremental MPCs from this NOPR analysis are provided in Table IV.23 through Table IV.29. See chapter 5 of the NOPR TSD for additional detail on the engineering analysis. DOE requests comment on the incremental MPCs from the NOPR engineering analysis, as well as any data on the impact of supply chain challenges that could better inform the cost analysis.

TABLE IV.23—NOTICE OF PROPOSED RULEMAKING ANALYSIS: ELECTRIC STANDARD INCREMENTAL MANUFACTURING PRODUCTION COSTS

Efficiency level	Design option	Incremental MPC (2020$)
Baseline	Baseline (Electromechanical Controls)	
1	Baseline + Electronic Controls	$11.02
2	EL1 + Optimized Heating System	13.70
3	EL2 + More Advanced Automatic Termination Control System	16.59
4	EL3 + Modulating (2-Stage) Heat	21.00
5	EL4 + Inlet Air Preheat	70.51
6	Hybrid Heat Pump Dryer (Additional Resistive Heater)	226.18
7	Heat Pump Dryer (Max-Tech)	239.46

TABLE IV.24—NOTICE OF PROPOSED RULEMAKING ANALYSIS: ELECTRIC COMPACT (120V) INCREMENTAL MANUFACTURING PRODUCTION COSTS

Efficiency level	Design option	Incremental MPC (2020$)
Baseline	Baseline (Electromechanical Controls)	
1	Baseline + Electronic Controls	$13.43
2	EL1 + Optimized Heating System	17.76
3	EL2 + More Advanced Automatic Termination Control System	21.40
4	EL3 + Modulating (2-Stage) Heat	26.32
5	EL4 + Inlet Air Preheat	83.07
6	Heat Pump Dryer (Max-Tech)	220.29

TABLE IV.25—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTED ELECTRIC COMPACT (240V) INCREMENTAL MANUFACTURING PRODUCTION COSTS

Efficiency level	Design option	Incremental MPC (2020$)
Baseline	Baseline (Electromechanical Controls)	
1	Baseline + Electronic Controls	$13.99
2	EL1 + Optimized Heating System	18.31

TABLE IV.25—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTED ELECTRIC COMPACT (240V) INCREMENTAL MANUFACTURING PRODUCTION COSTS—Continued

Efficiency level	Design option	Incremental MPC (2020$)
3	EL2 + More Advanced Automatic Termination Control System	21.97
4	EL3 + Modulating (2-Stage) Heat	26.88
5	EL4 + Inlet Air Preheat	83.63
6	Heat Pump Dryer (Max-Tech)	220.84

TABLE IV.26—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTED GAS STANDARD INCREMENTAL MANUFACTURING PRODUCTION COSTS

Efficiency level	Design option	Incremental MPC (2020$)
Baseline	Baseline (Electromechanical Controls)	
1	Baseline + Electronic Controls	$14.50
2	EL1 + Optimized Heating System and More Advanced Automatic Termination Control System	17.46
3	EL2 + Modulating (2-Stage) Heat	26.75
4	EL3 + Inlet Air Preheat (Max-Tech)	76.25

TABLE IV.27—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTED GAS COMPACT INCREMENTAL MANUFACTURING PRODUCTION COSTS

Efficiency level	Design option	Incremental MPC (2020$)
Baseline	Baseline (Electromechanical Controls)	
1	Baseline + Electronic Controls	$12.32
2	EL1 + Optimized Heating System and More Advanced Automatic Termination Control System	16.49
3	EL2 + Modulating (2-Stage) Heat	26.97
4	EL3 + Inlet Air Preheat (Max-Tech)	83.72

TABLE IV.28—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTLESS ELECTRIC COMPACT (240V) INCREMENTAL MANUFACTURING PRODUCTION COSTS

Efficiency level	Design option	Incremental MPC (2020$)
Baseline	Baseline (Electronic Controls)	
1	Baseline + More Advanced Automatic Termination Control System	$3.01
2	Heat Pump Dryer (Max-Tech)	184.11

TABLE IV.29—NOTICE OF PROPOSED RULEMAKING ANALYSIS: VENTLESS ELECTRIC COMBINATION WASHER-DRYER INCREMENTAL MANUFACTURING PRODUCTION COSTS

Efficiency level	Design option	Incremental MPC (2020$)
Baseline	Baseline (Electronic Controls)	
1	Baseline + High Speed Spin	$0.00
2	Heat Pump Dryer (Max-Tech)	383.58

D. Markups Analysis

The markups analysis develops appropriate markups (*e.g.,* retailer markups, distributor markups, contractor markups) in the distribution chain and sales taxes to convert the manufacturer selling price (''MSP'') estimates derived in the engineering analysis to consumer prices, which are then used in the LCC and PBP analysis. At each step in the distribution channel, companies mark up the price of the product to cover costs.

Before developing mark-ups, DOE defines key market participants and identifies distribution channels.

For consumer clothes dryers, the main parties in the distribution chain are retailers.

DOE developed baseline and incremental markups for each actor in the distribution chain. Baseline markups are applied to the price of products with baseline efficiency, while incremental markups are applied to the difference in price between baseline and higher-efficiency models (the incremental cost increase). The incremental markup is typically less than the baseline markup and is designed to maintain similar per-unit operating costs before and after new or amended standards.[32]

DOE relied on economic data from the U.S. Census Bureau to estimate average baseline and incremental markups. Specifically, DOE used the 2017 Annual Retail Trade Survey for the ''electronics and appliance stores'' sector to develop retailer markups; [33] and the 2017 Annual Wholesale Trade Survey for the ''household appliances, and electrical and electronic goods merchant wholesalers'' to estimate wholesaler markups.[34]

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

E. Energy Use Analysis

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

To establish a reasonable range of energy consumption in the field for consumer clothes dryers, DOE primarily used data from the EIA's *2015 Residential Energy Consumption Survey* (''*2015 RECS*'').[35] *2015 RECS* collected data on 5,686 housing units and was constructed by EIA to be a national representation of the household population in the United States. DOE developed household samples from *2015 RECS*.[36]

DOE divided the sample of households into four sub-samples to characterize the product classes being analyzed: standard or compact clothes dryer using electricity or natural gas as the clothes dryer fuel. For compact clothes dryers, DOE developed a sub-sample consisting of households with an electric or gas clothes dryer in multifamily buildings, manufactured homes, and single-family homes with less than 1,000 square feet and no garage or basement, since these products are most likely to be found in these housing types.

The energy use analysis requires DOE to establish a range of total annual usage (number of cycles) in order to estimate annual energy consumption by a clothes dryer. DOE estimated the number of clothes dryer cycles per year for each sample household using data given by *2015 RECS* on the number of laundry loads washed (clothes washer cycles) per week and the frequency of clothes dryer use.

AHAM agreed with DOE's use of the *2015 RECS* to establish the annual number of cycles for clothes dryers along with other available national, statistically significant field use data that may be available. (AHAM, No. 23 at pp. 10–11) In contrast, NEEA encouraged DOE to increase the number of annual dryer cycles in its energy analysis or conduct its own field study to more accurately determine this value. NEEA found that the *RECS* estimate of 243 dryer cycles per year was significantly lower than its own RBSA Laundry Study, which found 311 +/−42 loads per year for the same group of products, which was based on metering of dryers in the field. NEEA also indicated that the *RECS* methodology is subject to recall bias and may not be an accurate representation of consumer use. (NEEA, No. 30 at pp. 14–15; Webinar Transcript, No. 22 at pp. 41–42) ASAP and NRDC encouraged DOE to consider data from the NEEA 2014 Field Study in estimating the number of dryer loads per year. (ASAP, NRDC, No. 25 at p. 2)

The RBSA study includes sample households from three states in the U.S. Northwest. Since sample households in *2015 RECS* are nationally representative, it is more accurate to use in the analysis.

GEA stated that DOE must consider product performance to prevent consumer usage with unintended energy consumption consequences, stating that long cycle times may lead to re-washing or re-drying of clothes. (GEA, No. 28 at pp. 2–3)

For this analysis, DOE did not find any studies supporting or indicating an increased usage resulting from cycle times. DOE will consider any new information or data that points to an impact on usage due to a change in cycle times. The California IOUs suggested that updated *RECS* data be utilized for the final rule analysis. (CA IOUs, No. 26 at p. 6) Data collection for the *2020 RECS* are in progress but it is unclear if the data needed to estimate clothes dryer cycles will be available for the final rule analysis.

The California IOUs recommended DOE consider the impact of the COVID–19 pandemic has had as updates are made. The California IOUs encouraged DOE to consider carefully what portions of updated *RECS* data are representative of current and future use as the updated data may have heavy influences from the COVID–19 pandemic. (CA IOUs, No. 26 at p. 6) Energy Solutions also requested that DOE consider how consumer usage has shifted due to the COVID–19 pandemic. (Webinar Transcript, No. 22 at p. 66)

If appropriate data from the *2020 RECS* are available for the final rule analysis, DOE will evaluate the extent to which the data may have been affected by changes in dryer usage due to the pandemic.

For each considered efficiency level, DOE derived the field energy use by separately estimating the active mode and standby mode energy use and then adding them together. The per-cycle active mode energy consumption is estimated using the DOE clothes dryer test procedure at appendix D2. It can be back-calculated from the test procedure results by dividing the weight (lb) of clothes dried per cycle (8.45 lb for standard and 3 lb for compact clothes dryers) by the CEF_{D2} (lb/kWh) and subtracting standby power. DOE adjusted the test procedure energy use to reflect field conditions by making an adjustment for clothes dryer load weight and moisture removal factor. Chapter 7 of the NOPR TSD provides more detail about these calculations.

DOE also considered the impact of clothes dryer operation on home heating and cooling loads. A clothes dryer releases heat to the surrounding environment. If the clothes dryer is located indoors, its use will tend to

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

[33] US Census Bureau, *Annual Retail Trade Survey.* 2017. Available at *www.census.gov/programs-surveys/arts.html* (last accessed November 17, 2021).

[34] US Census Bureau, *Annual Wholesale Trade Survey.* 2017. Available at *www.census.gov/awts* (last accessed November 17, 2021).

[35] U.S. Department of Energy—Energy Information Administration, *Residential Energy Consumption Survey: 2015 Public Use Data Files.* Available at *www.eia.doe.gov/emeu/recs/recspubuse15/pubuse15.html* (last accessed November 18, 2021).

[36] Microdata of *2020 RECS*, which contains household samples, was released in July 2022. Hence it was not available at the time the NOPR analysis was conducted. However, DOE plans to use *2020 RECS* for the Final Rule analysis.

slightly reduce the heating load during the heating season and slightly increase the cooling load during the cooling season. To calculate this impact, DOE first estimated whether the clothes dryer in a *RECS* sample home is located in conditioned space (referred to as indoors) or in unconditioned space (such as garages, unconditioned basements, outdoor utility closets, or attics). Based on the *2015 RECS* and the 2015 *American Housing Survey* (''*AHS*''),[37] DOE assumed that 50 percent of vented standard electric and gas clothes dryers are located indoors, while 100 percent of compact and ventless clothes dryers are located indoors. For these installations, DOE utilized the results from a European Union study about the impacts of clothes dryers on home heating and cooling loads to determine the appropriate factor to apply to the total clothes dryer energy use.[38] This study reported that for vented clothes dryers there is a factor of negative 3 to 9 percent (average 6 percent), and for ventless clothes dryers there is a factor of positive 7 to 15 percent (average 11 percent).[39] This effect is likely to be approximately the same for all of the considered efficiency levels because the amount of air passing through the clothes dryer does not vary.

ASAP and NRDC requested that DOE confirm the baseline annual energy use for ventless electric standard dryers, pointing out that while baseline CEF_{D2} values for vented and ventless models are almost identical, the baseline annual energy consumption for ventless models is almost three times smaller than that for vented models. (ASAP, NRDC, No. 25 at pp. 2–3; ASAP, No. 22 at p. 40)

The difference in energy use between vented and ventless models is a function of dryer usage, efficiency, and additional impacts on heating and cooling loads from operating a dryer. DOE has since updated its product classes for electric standard dryers and the update removes the distinction between ventless and vented product classes in this NOPR. DOE proposes an ''Electric Standard'' product class containing both the vented electric standard product class and the ventless electric standard product class analyzed in the preliminary analysis. See the discussion of product classes in section IV.A.1 of this document.

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

F. Life-Cycle Cost and Payback Period Analysis

DOE conducted LCC and PBP analyses to evaluate the economic impacts on individual consumers of potential energy conservation standards for consumer clothes dryers. The effect of new or amended energy conservation standards on individual consumers usually involves a reduction in operating cost and an increase in purchase cost. DOE used the following two metrics to measure consumer impacts:

(1) The LCC is the total consumer expense of an appliance or product over the life of that product, consisting of total installed cost (manufacturer selling price, distribution chain markups, sales tax, and installation costs) plus operating costs (expenses for energy use, maintenance, and repair). To compute the operating costs, DOE discounts future operating costs to the time of purchase and sums them over the lifetime of the product.

(2) The PBP is the estimated amount of time (in years) it takes consumers to recover the increased purchase cost (including installation) of a more-efficient product through lower operating costs. DOE calculates the PBP by dividing the change in purchase cost at higher efficiency levels by the change in annual operating cost for the year that amended or new standards are assumed to take effect.

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

For each considered efficiency level in each product class, DOE calculated the LCC and PBP for a nationally representative set of housing units. As stated previously, DOE developed household samples from the *2015 RECS*.[40] For each sample household, DOE determined the energy consumption for the consumer clothes dryers and the appropriate energy price. By developing a representative sample of households, the analysis captured the variability in energy consumption and energy prices associated with the use of consumer clothes dryers.

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

The computer model DOE uses to calculate the LCC and PBP relies on a Monte Carlo simulation to incorporate uncertainty and variability into the analysis. The Monte Carlo simulations randomly sample input values from the probability distributions and consumer clothes dryers user samples. For this rulemaking, the Monte Carlo approach is implemented in MS Excel together with the Crystal Ball™ add-on.[41] The model calculated the LCC and PBP for products at each efficiency level for 10,000 housing units per simulation run. The analytical results include a distribution of 10,000 data points showing the range of LCC savings for a given efficiency level relative to the no-new-standards case efficiency distribution. In performing an iteration of the Monte Carlo simulation for a given consumer, product efficiency is chosen based on its probability. If the chosen product efficiency is greater than or equal to the efficiency of the standard level under consideration, the LCC and PBP calculation reveals that a consumer is not impacted by the standard level. By accounting for consumers who already purchase more-efficient products, DOE avoids overstating the potential benefits from increasing product efficiency.

DOE calculated the LCC and PBP for all consumers of consumer clothes dryers as if each were to purchase a new product in the expected year of required compliance with new or amended standards. Amended standards would

[37] U.S. Census Bureau: Housing and Household Economic Statistics Division, *American Housing Survey National Data. 2015,* HUD. Available at *www.census.gov/programs-surveys/ahs/data.2015.html* (last accessed November 29, 2021).

[38] Rüdenauer, I. and C.-O. Gensch, *Energy demand of tumble dryers with respect to differences in technology and ambient conditions,* January 13, 2004. European Committee of Domestic Equipment Manufacturers (CECED).

[39] For units that are located in conditioned space, a negative factor for vented consumer clothes dryers translates to a penalty in energy use whereas a positive factor for ventless consumer clothes dryers translates to a credit in energy use. For details of the calculations see the Rüdenauer, I. and C.-O. Gensch study referenced above.

[40] DOE will update all the data to *2020 RECS* if it is available prior to the final rule.

[41] Crystal Ball™ is commercially-available software tool to facilitate the creation of these types of models by generating probability distributions and summarizing results within Excel. Available at *www.oracle.com/technetwork/middleware/crystalball/overview/index.html* (last accessed November 8, 2021).

apply to consumer clothes dryers manufactured 3 years after the date on which any amended standard is published. (42 U.S.C. 6295(m)(4)(A)(i)) At this time, DOE estimates publication of a final rule in 2023. Therefore, for purposes of its analysis, DOE used 2027 as the first year of compliance with any amended standards for consumer clothes dryers.

Table IV.30 summarizes the approach and data DOE used to derive inputs to the LCC and PBP calculations. The subsections that follow provide further discussion. Details of the spreadsheet model, and of all the inputs to the LCC and PBP analyses, are contained in chapter 8 of the NOPR TSD and its appendices.

TABLE IV.30—SUMMARY OF INPUTS AND METHODS FOR THE LCC AND PBP ANALYSIS *

Inputs	Source/method
Product Cost	Derived by multiplying MPCs by manufacturer and retailer markups and sales tax, as appropriate. Used historical data to derive a price scaling index to project product costs.
Installation Costs	Baseline installation cost determined with data from RSMeans Residential Cost Data 2020. Assumed no change with efficiency level.
Annual Energy Use	The total per unit energy use multiplied by the cycles per year. Variability: Based on the *2015 RECS* (dryer usage), market data on remaining moisture content (''RMC'') and load weights.
Energy Prices	Electricity: Based on EEI 2020. Variability: Regional energy prices determined for each Census regions.
Energy Price Trends	Based on *AEO2021* price projections.
Repair and Maintenance Costs	Assumed no change with efficiency level for maintenance costs. Repair costs estimated for each product class and efficiency level.
Product Lifetime	Average: 14 years.
Discount Rates	Approach involves identifying all possible debt or asset classes that might be used to purchase the considered appliances, or might be affected indirectly. Primary data source was the Federal Reserve Board's Survey of Consumer Finances.
Compliance Date	2027.

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

1. Product Cost

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

Economic literature and historical data suggest that the real costs of many products may trend downward over time according to ''learning'' or ''experience'' curves. Experience curve analysis implicitly includes factors such as efficiencies in labor, capital investment, automation, materials prices, distribution, and economies of scale at an industry-wide level. To derive the learning rate parameter for consumer clothes dryers, DOE obtained historical Producer Price Index (''PPI'') data for ''household laundry equipment'' between 1948 and 2016 and ''major household appliance: primary products'' between 2016 and 2020 from the Bureau of Labor Statistics (''BLS'') to form a time series price index representing household laundry equipment from 1948 to 2020.[42] Inflation-adjusted price indices were calculated by dividing the PPI series by the gross domestic product index from the Bureau of Economic Analysis for the same years. Using data from 1948–2020, the estimated learning rate (defined as the fractional reduction in price from each doubling of cumulative production) is 14.8 percent.

ASAP and NRDC encouraged DOE to investigate how the analysis could reflect learning rates associated with specific technology options for clothes dryers and suggested an approach similar to that taken in the 2017 Final Rule for ceiling fans where DOE estimated a learning rate specific to brushless DC motors. (ASAP, NRDC, No. 25 at p. 4)

DOE examined data pertaining to specific technologies, such as the heat pump. However, the heat pump producer price index series starts only from 2010, and the deflated PPI for the limited data does not indicate any observable trend specific to heat pump technology during this limited time series. DOE has therefore not incorporated a learning or experience trend specific to heat pump technology in this analysis. As heat pump technology continues to mature and gain market share over time, DOE expects that ''learning'' or ''experience'' curves are likely to become relevant to heat pump technology in the future. DOE seeks comment on this approach and how product costs for heat pump technology may change over time.

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous materials and parts needed to install the product. DOE used data from RSMeans Residential Cost Data to estimate the baseline installation cost for consumer clothes dryers.[43] DOE estimated that for the new construction market it takes on average a total of one hour to install a clothes dryer, while for the replacement or new owners markets it takes a total of two-and a-half hours to install a clothes dryer (one hour for trip charge, half an hour to remove old clothes dryer, and one hour to install).

ASAP and NRDC encouraged DOE to reevaluate the increased installation costs associated with the additional labor hours DOE stated would be required for heat pumps due to their larger dimensions relative to conventional dryers. According to ASAP and NRDC, ENERGY STAR-certified heat pump dryers have total volumes of either 18.1 or 18.4 ft^3, while most non-heat pump models have total volumes between 17 and 23 ft^3, so it does not appear that heat pump dryers have larger dimensions than

[42] Household laundry equipment PPI (PCU3352203352204) is available till May 2016, and major household appliance: primary products (PCU335220335220P) is available starting from 2016. *See* more information at *www.bls.gov/ppi/* (last accessed November 29, 2021).

[43] RSMeans Online Residential Data (2020 Release). Gordian: Greenville, SC. Available at *www.rsmeansonline.com/* (last accessed November 8, 2021).

conventional dryers. (ASAP, NRDC, No. 25 at p. 3)

DOE collected and analyzed retail data of available models of both conventional dryers and dryers with heat pump technology, and found that the dimensions and weight of heat pump dryers are not significantly different from other conventional dryers. DOE has therefore revised its installation cost to not vary based on technology.

3. Annual Energy Consumption

For each sampled household, DOE determined the energy consumption for a consumer clothes dryer at different efficiency levels using the approach described previously in section IV.E of this document.

4. Energy Prices

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

DOE derived electricity prices in 2020 using data from Edison Electric Institute (''EEI'') Typical Bills and Average Rates reports.[44] Based upon comprehensive, industry-wide surveys, this semi-annual report presents typical monthly electric bills and average kilowatt-hour costs to the customer as charged by investor-owned utilities. DOE calculated residential sector electricity prices using the methodology described in Coughlin and Beraki (2018).[45]

DOE obtained data for calculating regional prices of natural gas from the EIA publication, *Natural Gas Navigator.*[46] This publication presents monthly volumes of natural gas deliveries and average prices by state for residential, commercial, and industrial customers.

DOE's methodology allows electricity and gas prices to vary by sector, region and season. In the analysis, variability in electricity and gas prices is chosen to be consistent with the way the consumer economic and energy use characteristics are defined in the LCC analysis. For consumer clothes dryers, DOE calculated weighted-average values for average and marginal electricity and gas price for the nine census divisions. See chapter 8 of the NOPR TSD for details.

To estimate energy prices in future years, DOE multiplied the 2020 energy prices by the projection of annual average price changes for each of the nine census divisions from the Reference case in *AEO2021,* which has an end year of 2050.[47] To estimate price trends after 2050, DOE used the average annual rate of change in prices from 2040 through 2050.

5. Maintenance and Repair Costs

Repair costs are associated with repairing or replacing product components that have failed in an appliance; maintenance costs are associated with maintaining the operation of the product. Past rules indicate in general that small incremental increases in product efficiency produce no, or only minor, changes in repair and maintenance costs compared to baseline efficiency products. 76 FR 22454.

For consumer clothes dryers, DOE derived annualized repair frequencies based on Consumer Reports data on repair and maintenance issues for clothes dryers during the first five years of ownership. DOE estimated that on average 2.7 percent of electric and 3.3 percent of gas clothes dryers are repaired each year. DOE estimated that an average service call and repair takes about 2.5 hours and that the average material cost is equal to one-half of the equipment cost. The values for cost per service call are then annualized by multiplying by the frequencies and dividing by the average equipment lifetime of 14 years.

AHAM suggested that repair costs may be higher with increased efficiency because repairs will likely be more complex. AHAM stated that if energy conservation standards require baseline products to have electronic controls, repair and maintenance costs will likely increase for the same reason. Additionally, AHAM stated that longer cycle times may also drive increased rate of repair and shorter product lifetimes. (AHAM, No. 23 at p. 11) Whirlpool requested that DOE account for changes to components that may be needed to accommodate longer cycle times, as well as the possibility of increased maintenance costs associated with longer cycle times. According to Whirlpool, increased cycle time leads to more wear and tear on the dryer as components could fail before the end of the estimated lifespan of the entire dryer, resulting in additional expenses. (Whirlpool, No. 27 at p. 12)

DOE based its current estimates of repair and maintenance cost on available data. As stated above, DOE estimated that an average service call and repair for a consumer clothes dryer takes about 2.5 hours and the average material cost is equal to one-half of the equipment cost. DOE will take into consideration any data on frequency of repair for higher-efficiency dryers if it becomes available.

DOE requests information and data on repair cost for replacing an electromechanical and electronic control panel.

In addition, DOE seeks input on characterizing maintenance and repair costs for more-efficient consumer clothes dryers.

6. Product Lifetime

For consumer clothes dryers, DOE developed a distribution of lifetimes from which specific values are assigned to the appliances in the samples. DOE conducted an analysis of actual lifetime in the field using a combination of historical shipments data, the stock of the considered appliances in the *American Housing Survey,* and responses in *RECS* on the age of the appliances in the homes. The data allowed DOE to estimate a survival function, which provides an average appliance lifetime. This analysis yielded a lifetime probability distribution with an average lifetime for consumer clothes dryers of approximately 14 years. See chapter 8 of the NOPR TSD for further details.

Whirlpool requested that DOE account for changes to components that may be needed to accommodate longer cycle times, as well as the possibility of shorter product lifetimes associated with longer cycle times. (Whirlpool, No. 27 at p. 12)

DOE will take into consideration any data that becomes available on changes to components to accommodate longer cycle times and the possibility of its impact on product lifetime.

[44] Edison Electric Institute. Typical Bills and Average Rates Report. 2020. Winter 2020, Summer 2020: Washington, DC.

[45] Coughlin, K. and B. Beraki.2018. Residential Electricity Prices: A Review of Data Sources and Estimation Methods. Lawrence Berkeley National Lab. Berkeley, CA. Report No. LBNL–2001169. Available at *ees.lbl.gov/publications/residential-electricity-prices-review.*

[46] U.S. Department of Energy–Energy Information Administration. *Natural Gas Navigator* 2020. Available at *www.eia.gov/naturalgas/data.php* (last accessed November 14, 2021).

[47] EIA. *Annual Energy Outlook 2021 with Projections to 2050.* Washington, DC. Available at *www.eia.gov/forecasts/aeo/* (last accessed November 8, 2021).

7. Discount Rates

In the calculation of LCC, DOE applies discount rates appropriate to households to estimate the present value of future operating cost savings. DOE estimated a distribution of discount rates for consumer clothes dryers based on the opportunity cost of consumer funds.

DOE applies weighted average discount rates calculated from consumer debt and asset data, rather than marginal or implicit discount rates.[48] The LCC analysis estimates net present value over the lifetime of the product, so the appropriate discount rate will reflect the general opportunity cost of household funds, taking this time scale into account. Given the long time horizon modeled in the LCC analysis, the application of a marginal interest rate associated with an initial source of funds is inaccurate. Regardless of the method of purchase, consumers are expected to continue to rebalance their debt and asset holdings over the LCC analysis period, based on the restrictions consumers face in their debt payment requirements and the relative size of the interest rates available on debts and assets. DOE estimates the aggregate impact of this rebalancing using the historical distribution of debts and assets.

To establish residential discount rates for the LCC analysis, DOE identified all relevant household debt or asset classes in order to approximate a consumer's opportunity cost of funds related to appliance energy cost savings. It estimated the average percentage shares of the various types of debt and equity by household income group using data from the Federal Reserve Board's Survey of Consumer Finances[49] (''SCF'') for 1995, 1998, 2001, 2004, 2007, 2010, 2013, 2016, and 2019. Using the SCF and other sources, DOE developed a distribution of rates for each type of debt and asset by income group to represent the rates that may apply in the year in which amended standards would take effect. DOE assigned each sample household a specific discount rate drawn from one of the distributions. The average rate across all types of household debt and equity and income groups, weighted by the shares of each type, is 4.3 percent. See chapter 8 of the NOPR TSD for further details on the development of consumer discount rates.

Energy Solutions questioned whether DOE expects changes to be made regarding average real effective discount rate as a function of different income groups. (Webinar Transcript, No. 22 at p. 71)

As discussed above, DOE takes different income groups into consideration for establishing discount rates.

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

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

To estimate the energy efficiency distribution of consumer clothes dryers for 2027, DOE used data from DOE's CCMS and ENEGY STAR Clothes Dryer program.[50] [51] DOE estimated an annual 0.31 percent and 0.37 percent increase in shipment-weighted efficiency beginning in 2022 for electric standard and vented gas standard clothes dryers, respectively. Annual shipment-weighted efficiency for the other product classes (which in total have less than 2.5 percent market share) is held constant. The estimated market shares for the no-new-standards case for consumer clothes dryers are shown in Table IV.31 and Table IV.32. *See* chapter 8 of the NOPR TSD for further information on the derivation of the efficiency distributions.

TABLE IV.31—NO-NEW-STANDARDS CASE EFFICIENCY DISTRIBUTION IN 2027: ELECTRIC STANDARD, ELECTRIC COMPACT (120V), VENTED ELECTRIC COMPACT (240V), AND VENTLESS ELECTRIC COMPACT (240V)

Electric standard		Electric compact (120V)		Vented electric, compact (240V)		Ventless electric, compact (240V)	
CEF_{D2} (lb/kWh)	Share (%)	CEF_{D2} (lb/kWh)	Share (%)	CEF_{D2} (lb/kWh)	Share (%)	CEF_{D2} (lb/kWh)	Share (%)
2.20	30.8	2.36	58.6	2.00	73.7	2.03	10.4
2.68	0.89	3.15	0.0	2.44	0.0	2.68	87.5
3.04	1.07	3.35	10.3	2.76	10.5	6.80	2.08
3.27	1.94	4.28	0.0	3.30	15.8		
3.93	61.0	4.33	0.0	3.57	0.0		
4.21	2.62	4.63	0.0	3.82	0.0		
5.20	0.60	6.37	31.0	3.91	0.0		
7.39	1.06						

[48] The implicit discount rate is inferred from a consumer purchase decision between two otherwise identical goods with different first cost and operating cost. It is the interest rate that equates the increment of first cost to the difference in net present value of lifetime operating cost, incorporating the influence of several factors: transaction costs; risk premiums and response to uncertainty; time preferences; interest rates at which a consumer is able to borrow or lend.

[49] U.S. Board of Governors of the Federal Reserve System. Survey of Consumer Finances. 1995, 1998, 2001, 2004, 2007, 2010, 2013, 2016, and 2019. Available at *www.federalreserve.gov/econresdata/scf/scfindex.htm* (last accessed November 8, 2021.)

[50] U.S. Department of Energy's Compliance Certification Database. Available at *www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A** (last accessed November 8, 2021).

[51] ENERGY STAR, ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2020 Summary. Available at *www.energystar.gov/partner_resources/products_partner_resources/brand_owner_resources/unit_shipment_data* (last accessed November 8, 2021).

TABLE IV.32—NO-NEW-STANDARDS CASE EFFICIENCY DISTRIBUTION IN 2027: VENTED GAS STANDARD, VENTED GAS COMPACT, AND VENTLESS ELECTRIC COMBINATION WASHER-DRYER

Vented gas standard		Vented gas compact		Ventless electric, combination washer-dryer	
CEF_{D2} (lb/kWh)	Share (%)	CEF_{D2} (lb/kWh)	Share (%)	CEF_{D2} (lb/kWh)	Share (%)
2.00	49.3	1.66	100	2.27	70.0
2.44	4.45	2.02	0.0	2.33	26.7
3.00	3.75	2.49	0.0	4.01	3.33
3.48	38.1	2.89	0.0		
3.83	4.44	3.17	0.0		

NEEA encouraged DOE to retain the market distribution of dryer efficiency levels shown in the NIA of the preliminary analysis TSD. (NEEA, No. 30 at p. 15)

DOE has revised its efficiency distribution based on more recent market data. DOE chose to not develop a consumer choice model for estimating the efficiency distribution for this round of analysis, as the only available model and price data are more than a decade old, and not as useful in capturing the current distribution. DOE will update the efficiency distribution if more recent price data becomes available.

DOE requests comments, information, and data on the no-new-standards case efficiency distribution of consumer clothes dryers.

9. Payback Period Analysis

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

The inputs to the PBP calculation for each efficiency level are the change in total installed cost of the product and the change in the first-year annual operating expenditures relative to the baseline. The PBP calculation uses the same inputs as the LCC analysis, except that discount rates are not needed.

As noted previously, EPCA establishes a rebuttable presumption that a standard is economically justified if the Secretary finds that the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the first year's energy savings resulting from the standard, as calculated under the applicable test procedure. (42 U.S.C. 6295(o)(2)(B)(iii)) For each considered efficiency level, DOE determined the value of the first year's energy savings by calculating the energy savings in accordance with the applicable DOE test procedure, and multiplying those savings by the average energy price projection for the year in which compliance with the amended standards would be required.

G. Shipments Analysis

DOE uses projections of annual product shipments to calculate the national impacts of potential amended or new energy conservation standards on energy use, NPV, and future manufacturer cash flows.[52] The shipments model takes an accounting approach, tracking market shares of each product class and the vintage of units in the stock. Stock accounting uses product shipments as inputs to estimate the age distribution of in-service product stocks for all years. The age distribution of in-service product stocks is a key input to calculations of both the NES and NPV, because operating costs for any year depend on the age distribution of the stock.

Total product shipments for consumer clothes dryers are developed by considering the demand from replacements for units in stock that fail and the demand from new installations in newly constructed homes. DOE calculated shipments due to replacements using the retirement function developed for the LCC analysis. DOE calculated shipments due to new installations using estimates for consumer clothes dryer saturation rate in newly constructed homes from 2010 to 2015 in *2015 RECS* and projections of new housing starts from *AEO2021*.

DOE disaggregated total product shipments into each product class using estimated market shares of each product class. To estimate these market shares, DOE first developed a linear time-series regression model to estimate market share between the product fuel type (gas or electric) by fitting the historical shipments of gas consumer clothes dryers. Historical shipments data shown a steady decline of market share of gas consumer clothes dryers from 23 percent in 2000 to 18 percent in 2020. The linear regression model indicates that market share of gas consumer clothes dryers is strongly correlated with its historical time-series.

After developing the market share estimation between the electric and gas consumer clothes dryers, DOE then subtracted estimated gas clothes dryer market share from total shipments and divided the electric clothes dryer market share into each electric consumer clothes dryer product class. DOE estimated that electric standard and vented gas standard consumer clothes dryers account for approximately 84 percent and 14 percent of the total shipments during the analysis period, respectively.

Whirlpool points out that the projected consumer clothes dryer market shares by product class do not show any change in the balance of sale between the product classes, aside from a loss of share from Vented Gas Standard and an increase in share of Vented Electric Standard. Whirlpool indicates that they have started to see more shipments of other product classes over the last few years, including the ventless and combination washer/dryer product classes and therefore suggests that DOE project some growth in the balance of sale of these product classes. (Whirlpool, No. 27 at pp. 17–18)

For this analysis, DOE does consider a slight growth in the market share of other product classes such as ventless and combination washer/dryers. DOE will consider any specific data that is available to project this category more accurately.

To estimate shipments under a standards case, DOE considers the impacts on shipments from changes in product purchase price and operating cost associated with higher energy efficiency levels using a price elasticity and an efficiency elasticity. As in the

[52] DOE uses data on manufacturer shipments as a proxy for national sales, as aggregate data on sales are lacking. In general, one would expect a close correspondence between shipments and sales.

April 2021 Preliminary Analysis, DOE employed a 0.2 percent efficiency elasticity rate and a price elasticity of –0.45 percent in its shipments model. These values are based on analysis of aggregated data for five residential appliances including consumer clothes washers, dishwashers, refrigerators, freezers, and room air-conditioners.[53] The market impact is defined as the difference between the product of price elasticity of demand and the change in price due to a standard level, and the product of the efficiency elasticity and the change in operating costs due to a standard level. See chapter 9 of the NOPR TSD for details.

ASAP and NRDC encouraged DOE to clarify and confirm whether the efficiency elasticity is considered in calculating the standards-case shipments. Commenters noted that the preliminary TSD described a price elasticity of –0.45 and an efficiency elasticity of +0.2 but that the equation for calculating total shipments in the standards case included only the price elasticity of –0.45. (ASAP, NRDC, No. 25 at p. 4)

As discussed earlier, DOE considers the impact of increase in purchase price as well as efficiency in estimating the shipments through the use of a price elasticity. The NOPR TSD describes both elasticities and provides an equation in chapter 9.

DOE requests comment on its methodology for estimating shipments. DOE also requests comment on its approach to estimate the market share for each consumer clothes dryer product class.

H. National Impact Analysis

The NIA assesses the NES and the NPV from a national perspective of total consumer costs and savings that would be expected to result from new or amended standards at specific efficiency levels.[54] (''Consumer'' in this context refers to consumers of the product being regulated.) DOE calculates the NES and NPV for the potential standard levels considered based on projections of annual product shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses. For the present analysis, DOE projected the energy savings, operating cost savings, product costs, and NPV of consumer benefits over the lifetime of consumer clothes dryers sold from 2027 through 2056.

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

DOE uses a spreadsheet model to calculate the energy savings and the national consumer costs and savings from each TSL. Interested parties can review DOE's analyses by changing various input quantities within the spreadsheet. The NIA spreadsheet model uses typical values (as opposed to probability distributions) as inputs.

Table IV.33 summarizes the inputs and methods DOE used for the NIA analysis for the NOPR. Discussion of these inputs and methods follows the table. See chapter 10 of the NOPR TSD for further details.

TABLE IV.33—SUMMARY OF INPUTS AND METHODS FOR THE NATIONAL IMPACT ANALYSIS

Inputs	Method
Shipments	Annual shipments from shipments model.
Compliance Date of Standard	2027.
Efficiency Trends	No-new-standards case: Annual efficiency improvement of 0.31 percent for electric standard and 0.37 for vented gas standard consumer clothes dryers. Standards cases: ''Roll up'' equipment to meet potential efficiency level.
Annual Energy Consumption per Unit.	Calculated for no-new-standards case and each TSL based on inputs from energy use analysis.
Total Installed Cost per Unit	Calculated for no-new-standards case and each TSL based on inputs from the LCC analysis. Incorporates projection of future product prices based on historical data.
Repair and Maintenance Cost per Unit.	Assumed no change with efficiency level for maintenance cost. Repair cost is calculated for each efficiency level based on inputs from the LCC analysis.
Energy Prices	Estimated average and marginal electricity and gas prices from the LCC analysis based on EEI and EIA data.
Energy Price Trends	*AEO2021* projections (to 2050) and extrapolation using a fixed annual rate of price change between 2040 and 2050 thereafter.
Energy Site-to-Primary and FFC Conversion.	A time-series conversion factor based on *AEO2021.*
Discount Rate	3 percent and 7 percent.
Present Year	2021.

1. Product Efficiency Trends

A key component of the NIA is the trend in energy efficiency projected for the no-new-standards case and each of the standards cases. Section IV.F.8 of this document describes how DOE developed an energy efficiency distribution for the no-new-standards case (which yields a shipment-weighted average efficiency) for each of the considered product classes for the year of anticipated compliance with an amended or new standard. To project the trend in efficiency absent amended standards for consumer clothes dryers over the entire shipments projection period, DOE used an annual 0.31 percent and 0.37 percent increase in shipment-weighted efficiency beginning in 2022 for electric standard and vented gas standard consumer clothes dryers,

[53] Fujita, K. (2015) Estimating Price Elasticity using Market-Level Appliance Data. Lawrence Berkeley National Laboratory, LBNL–188289.

[54] The NIA accounts for impacts in the 50 states and the District of Columbia.

respectively. The efficiency for the other product classes remains at their 2021 shipments-weighted efficiency levels. The approach is further described in chapter 10 of the NOPR TSD.

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

2. National Energy Savings

The national energy savings analysis involves a comparison of national energy consumption of the considered products between each potential standards case (''TSL'') and the case with no new or amended energy conservation standards. DOE calculated the national energy consumption by multiplying the number of units (stock) of each product (by vintage or age) by the unit energy consumption (also by vintage). DOE calculated annual NES based on the difference in national energy consumption for the no-new standards case and for each higher efficiency standard case. DOE estimated energy consumption and savings based on site energy and converted the electricity consumption and savings to primary energy (*i.e.,* the energy consumed by power plants to generate site electricity) using annual conversion factors derived from *AEO2021.* Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

Use of higher-efficiency products is sometimes associated with a direct rebound effect, which refers to an increase in utilization of the product due to the increase in efficiency. DOE did not find any data on the rebound effect specific to consumer clothes dryers, so it did not include a rebound effect in the analysis.

Whirlpool suggested that additional energy usage may result from increased cycle times and the inability to complete serial loads when consumers decide to re-wash a load if wet clothes sit in the washer while waiting for the drying cycle to terminate. Whirlpool stated that such a scenario could result in additional and unnecessary energy consumption and should be closely examined as rebound effects from increased cycle times. (Whirlpool No. 27, at p. 11)

For this analysis, DOE did not find any studies supporting or indicating an increased usage resulting from cycle times. DOE requests comment on any new information or data that points to an impact on usage due to a change in cycle times and will consider such data at the final rule stage and in the final TSD.

In 2011, in response to the recommendations of a committee on ''Point-of-Use and Full-Fuel-Cycle Measurement Approaches to Energy Efficiency Standards'' appointed by the National Academy of Sciences, DOE announced its intention to use FFC measures of energy use and greenhouse gas and other emissions in the national impact analyses and emissions analyses included in future energy conservation standards rulemakings. 76 FR 51281 (Aug. 18, 2011). After evaluating the approaches discussed in the August 18, 2011 notice, DOE published a statement of amended policy in which DOE explained its determination that EIA's National Energy Modeling System (''NEMS'') is the most appropriate tool for its FFC analysis and its intention to use NEMS for that purpose. 77 FR 49701 (Aug. 17, 2012). NEMS is a public domain, multi-sector, partial equilibrium model of the U.S. energy sector [55] that EIA uses to prepare its *Annual Energy Outlook.* The FFC factors incorporate losses in production and delivery in the case of natural gas (including fugitive emissions) and additional energy used to produce and deliver the various fuels used by power plants. The approach used for deriving FFC measures of energy use and emissions is described in appendix 10B of the NOPR TSD.

3. Net Present Value Analysis

The inputs for determining the NPV of the total costs and benefits experienced by consumers are (1) total annual installed cost, (2) total annual operating costs (energy costs and repair and maintenance costs), and (3) a discount factor to calculate the present value of costs and savings. DOE calculates net savings each year as the difference between the no-new-standards case and each standards case in terms of total savings in operating costs versus total increases in installed costs. DOE calculates operating cost savings over the lifetime of each product shipped during the projection period.

As discussed in section IV.F.1 of this document, DOE developed consumer clothes dryers price trends based on historical PPI data. DOE applied the same trends to project prices for each product class at each considered efficiency level. By 2056, which is the end date of the projection period, the average consumer clothes dryers (real) price is projected to drop 15 percent relative to 2020. DOE's projection of product prices is described in appendix 10C of the NOPR TSD.

To evaluate the effect of uncertainty regarding the price trend estimates, DOE investigated the impact of different product price projections on the consumer NPV for the considered TSLs for consumer clothes dryers. In addition to the default price trend, DOE considered two product price sensitivity cases: (1) a high price decline case based on the combined price index from 1980 to 2020 and (2) a low price decline case based on the same series from 1948 to 1979.[56] The derivation of these price trends and the results of these sensitivity cases are described in appendix 10C of the NOPR TSD.

The energy cost savings are calculated using the estimated energy savings in each year and the projected price of the appropriate form of energy. To estimate energy prices in future years, DOE used the projection of annual national-average residential energy price changes in the Reference case from *AEO2021,* which has an end year of 2050. To estimate price trends after 2050, DOE used the average annual rate of change in prices from 2040 through 2050. As part of the NIA, DOE also analyzed scenarios that used inputs from variants of the *AEO2021* Reference case that have lower and higher economic growth. Those cases have lower and higher energy price trends compared to the Reference case. NIA results based on these cases are presented in appendix 10D of the NOPR TSD.

In calculating the NPV, DOE multiplies the net savings in future years by a discount factor to determine their present value. For this NOPR, DOE estimated the NPV of consumer benefits using both a 3-percent and a 7-percent real discount rate. DOE uses these discount rates in accordance with guidance provided by the Office of Management and Budget (''OMB'') to Federal agencies on the development of regulatory analysis.[57] The discount rates

[55] For more information on NEMS, refer to *The National Energy Modeling System: An Overview 2009,* DOE/EIA–0581(2009), October 2009. Available at *www.eia.gov/forecasts/aeo/index.cfm* (last accessed November 8, 2021).

[56] DOE combined PPI data of ''household laundry equipment'' from 1948 to 2016 and PPI data of ''major household appliance: primary products'' from 2016 to 2020 into one time series price index to project future price for consumer clothes washers.

[57] United States Office of Management and Budget. *Circular A–4: Regulatory Analysis.* September 17, 2003. Section E. Available at *https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf* (last accessed November 8, 2021).

for the determination of NPV are in contrast to the discount rates used in the LCC analysis, which are designed to reflect a consumer's perspective. The 7-percent real value is an estimate of the average before-tax rate of return to private capital in the U.S. economy. The 3-percent real value represents the ''social rate of time preference,'' which is the rate at which society discounts future consumption flows to their present value.

I. Consumer Subgroup Analysis

In analyzing the potential impact of new or amended energy conservation standards on consumers, DOE evaluates the impact on identifiable subgroups of consumers that may be disproportionately affected by a new or amended national standard. The purpose of a subgroup analysis is to determine the extent of any such disproportional impacts. DOE evaluates impacts on particular subgroups of consumers by analyzing the LCC impacts and PBP for those particular consumers from alternative standard levels. For this NOPR, DOE analyzed the impacts of the considered standard levels on two subgroups: (1) low-income households and (2) senior-only households. The analysis used subsets of the *2015 RECS* sample composed of households that meet the criteria for the two subgroups. DOE used the LCC and PBP spreadsheet model to estimate the impacts of the considered efficiency levels on these subgroups. Chapter 11 in the NOPR TSD describes the consumer subgroup analysis.

Whirlpool requested that DOE examine the impact of amended standards on the increased purchase cost of dryers, particularly for low-income consumers. According to Whirlpool, the purchase cost of a dryer plays a significant, and often the leading, factor in a low-income consumer's purchase decision. Additionally, Whirlpool states that for many low-income consumers, appliance purchases are generally not planned and happen when their current appliance breaks down or is too costly or old to fix. With a high purchase cost, low-income consumers may ultimately decide to keep the old unit and repair it or purchase a used appliance, both of which would keep old, inefficient appliances on the grid, counter to DOE's mission to save energy. (Whirlpool, No. 27 at pp. 6–8) AHAM requested that DOE take special care to protect low-income consumers and to ensure energy conservation standards do not have a disproportionate impact on those consumers, stating that any proposed standard level not require product design options that price consumers, particularly low-income consumers, out of the clothes dryer market by eliminating technology options that allow manufacturers to produce ''entry level'' models. (AHAM, No. 23 at p. 5)

DOE considers the impact of increase in purchase price as well as efficiency in estimating the shipments through the use of a price elasticity. This integrated elasticity accounts for the choice of repair versus replace, which is ultimately reflected in the resulting shipments. Additionally, the impacts from design options on low-income consumers are already accounted for by definition in the screening, engineering, LCC subgroup, and manufacturer impact analyses. See chapter 9 of the NOPR TSD for details on price elasticity and chapter 11 for details on low-income consumers impacts.

J. Manufacturer Impact Analysis

1. Overview

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

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

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

DOE conducted the MIA for this rulemaking in three phases. In Phase 1 of the MIA, DOE prepared a profile of the consumer clothes dryer industry based on publicly available data and information from its market and technology assessment and engineering analysis. This included a top-down analysis of consumer clothes dryer manufacturers that DOE used to derive preliminary financial inputs for the GRIM (*e.g.,* revenues; materials, labor, overhead, and depreciation expenses; selling, general, and administrative expenses (''SG&A''); and R&D expenses). DOE also used other public sources of information to further calibrate its initial characterization of the consumer clothes dryer manufacturing industry, including company filings of form 10–K from the U.S. Securities and Exchange Commission (''SEC''),[58] corporate annual reports, and the U.S. Census Bureau's *Economic Census,*[59] as well as subscription-based market research tools *(e.g.,* reports from Dun & Bradstreet[60]).

In Phase 2 of the MIA, DOE prepared a framework industry cash-flow analysis to quantify the potential impacts of amended energy conservation standards. The GRIM uses several factors to determine a series of annual cash flows starting with the announcement of the standard and extending over a 30-year period following the compliance date of the standard. These factors include annual

[58] U.S. Securities and Exchange Commission. Company Filings. Available at *https://www.sec.gov/edgar/searchedgar/companysearch.html.*

[59] The U.S. Census Bureau. *Quarterly Survey of Plant Capacity Utilization.* Available at *www.census.gov/programs-surveys/qpc/data/tables.html.*

[60] The Dun & Bradstreet Hoovers login is available at *app.dnbhoovers.com.*

expected revenues, costs of sales, SG&A and R&D expenses, taxes, and capital expenditures. In general, energy conservation standards can affect manufacturer cash flow in three distinct ways: (1) creating a need for increased investment, (2) raising production costs per unit, and (3) altering revenue due to higher per-unit prices and changes in sales volumes.

In addition, during Phase 2, DOE developed interview guides to distribute to manufacturers of consumer clothes dryers in order to develop other key GRIM inputs, including product and capital conversion costs, and to gather additional information on the anticipated effects of energy conservation standards on revenues, direct employment, capital assets, industry competitiveness, and subgroup impacts.

In Phase 3 of the MIA, DOE conducted structured, detailed interviews with representative manufacturers. During these interviews, DOE discussed engineering, manufacturing, procurement, and financial topics to validate assumptions used in the GRIM and to identify key issues or concerns. *See* section IV.J.3 of this document for a description of the key issues raised by manufacturers during the interviews. As part of Phase 3, DOE also evaluated subgroups of manufacturers that may be disproportionately impacted by amended standards or that may not be accurately represented by the average cost assumptions used to develop the industry cash flow analysis. Such manufacturer subgroups may include small business manufacturers, low-volume manufacturers, niche players, and/or manufacturers exhibiting a cost structure that largely differs from the industry average. DOE identified one subgroup for a separate impact analysis: small business manufacturers. The small business subgroup is discussed in section VI.B of this document, ''Review under the Regulatory Flexibility Act'' and in chapter 12 of the NOPR TSD.

2. Government Regulatory Impact Model and Key Inputs

DOE uses the GRIM to quantify the changes in cash flow due to amended standards that result in a higher or lower industry value. The GRIM uses a standard, annual discounted cash-flow analysis that incorporates manufacturer costs, manufacturer markups, shipments, and industry financial information as inputs. The GRIM models changes in costs, distribution of shipments, investments, and manufacturer margins that could result from an amended energy conservation standard. The GRIM spreadsheet uses the inputs to arrive at a series of annual cash flows, beginning in 2022 (the base year of the analysis) and continuing to 2056. DOE calculated INPVs by summing the stream of annual discounted cash flows during this period. For manufacturers of consumer clothes dryers, DOE used a real discount rate of 7.5 percent, which was derived from industry financials and then modified according to feedback received during manufacturer interviews.

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

a. Manufacturer Production Costs

Manufacturing more efficient equipment is typically more expensive than manufacturing baseline equipment due to the use of more complex components, which are typically more costly than baseline components. The changes in the MPCs of covered products can affect the revenues, gross margins, and cash flow of the industry. DOE models the relationship between efficiency and MPCs as a part of its engineering analysis. For a complete description of the MPCs, see chapter 5 of the NOPR TSD or section IV.C of this document.

b. Shipments Projections

The GRIM estimates manufacturer revenues based on total unit shipment projections and the distribution of those shipments by efficiency level and by product class. Changes in sales volumes and efficiency mix over time can significantly affect manufacturer finances. For this analysis, the GRIM uses the NIA's annual shipment projections derived from the shipments analysis from 2022 (the base year) to 2056 (the end year of the analysis period). *See* chapter 9 of the NOPR TSD for additional details or section IV.G of this document.

c. Product and Capital Conversion Costs

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

DOE relied on manufacturer feedback to evaluate the level of capital and product conversion costs manufacturers would likely incur at the various TSLs. During confidential interviews, DOE asked manufacturers to estimate the capital conversion costs (*e.g.,* changes in production processes, equipment, and tooling) to meet the various efficiency levels. DOE also asked manufacturers to estimate the redesign effort and engineering resources required at various efficiency levels to quantify the product conversion costs. Based on manufacturer feedback, DOE also estimated ''re-flooring'' costs associated with replacing obsolete display models in big-box stores (*e.g.,* Lowe's, Home Depot, Best Buy) due to higher standards. Some manufacturers stated that with a new product release, big-box retailers discount outdated display models, and manufacturers share any losses associated with discounting the retail price. The estimated re-flooring costs for each efficiency level were incorporated into the product conversion cost estimates, as DOE modeled the re-flooring costs as a marketing expense.

DOE reviewed the DOE CCMS [61] database, U.S. market share estimates, and company characteristics to scale the company-specific conversion cost estimates to levels that represent the overall industry. First, DOE used its

[61] U.S. Department of Energy's Compliance Certification Database is available at *www.regulations.doe.gov/certification-data* (last accessed October 8, 2021).

CCMS database to identify original equipment manufacturers (''OEMs'') of the covered products. Next, DOE assessed each OEM's U.S. market share and product profile (*e.g.,* estimated sales by product class and efficiency) for consumer clothes dryers. Finally, DOE estimated industry-level conversion cost estimates by scaling feedback from OEMs based on a combination of product offerings and U.S. market share estimates.

DOE assumes all conversion-related investments occur between the year of publication of the final rule and the year by which manufacturers must comply with the new standard. The conversion cost figures used in the GRIM can be found in section V.B.2 of this document. For additional information on the estimated capital and product conversion costs, see chapter 12 of the NOPR TSD.

d. Manufacturer Markup Scenarios

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

Under the preservation of gross margin percentage scenario, DOE applied a single uniform ''gross margin percentage'' across all efficiency levels, which assumes that manufacturers would be able to maintain the same amount of profit as a percentage of revenues at all efficiency levels within a product class. As manufacturer production costs increase with efficiency, this scenario implies that the per-unit dollar profit will increase. DOE assumed a gross margin percentage of 21 percent for all product classes.[62]

[62] The gross margin percentage of 21 percent is based on a manufacturer markup of 1.26.

Manufacturers tend to believe it is optimistic to assume that they would be able to maintain the same gross margin percentage as their production costs increase, particularly for minimally efficient products. Therefore, this scenario represents a high bound to industry profitability under an amended energy conservation standard.

In the preservation of operating profit scenario, as the cost of production goes up under a standards case, manufacturers are generally required to reduce their manufacturer markups to a level that maintains base-case operating profit. DOE implemented this scenario in the GRIM by lowering the manufacturer markups at each TSL to yield approximately the same earnings before interest and taxes in the standards case as in the no-new-standards case in the year after the compliance date of the amended standards. The implicit assumption behind this scenario is that the industry can only maintain its operating profit in absolute dollars after the standard. A comparison of industry financial impacts under the two manufacturer markup scenarios is presented in section V.B.2.a of this document.

3. Manufacturer Interviews

DOE interviewed manufacturers representing approximately 55 percent of domestic consumer clothes dryer industry shipments. Participants included domestic-based and foreign-based OEMs with a range of different product offerings and market shares.

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

a. Heat Pump Technology

Some manufacturers expressed concerns about potential adverse impacts of a standard that could only be met using heat pump technology on product affordability, consumer satisfaction, profitability, and manufacturing capacity. Heat pump dryers currently cost more to produce than other electric dryers. In interviews, some manufacturers stated that a portion of consumers cannot afford the increased upfront cost and may forgo purchasing a new dryer or rely on alternatives such as laundromats or dryer rentals if the standard were to increase to a level that required the use of heat pump technology. Some manufacturers asserted, based on their market research and customer reviews of existing heat pump dryers, that consumers would be dissatisfied with a standard that could be achieved only by a heat pump dryer. These manufacturers cited instances of customer complaints about drying performance and longer cycle times that have been associated with certain implementations of heat pump technology.

In interviews, several manufacturers also stated that heat pump technology represents a significant departure from vented electric dryers and would require new manufacturing plants or a total renovation of existing production facilities. Those manufacturers pointed out that heat pump dryers make up less than one percent of the consumer clothes dryer sales in the United States. The same manufacturers expressed concern about a potential shortage of products given the scale of investment, redesign efforts, and time constraints.

Although some manufacturers expressed concerns about a standard that could only be met using heat pump technology, several manufacturers emphasized the benefits of heat pump technology. These manufacturers stated that heat pump dryers provide more energy savings and improved fabric care compared to conventional clothes dryers due to the lower drying temperatures associated with heat pump technology. Several manufacturers noted recent increases in domestic heat pump dryer sales and predicted that the trend would continue. These manufacturers also emphasized the increasing popularity of heat pump dryers in the European market, which they attributed to the proliferation of cost-competitive offerings, improved payback period, and shifting consumer preferences in that market.

Although heat pump technology is still in the early stages of adoption in the United States, heat pump technology is commercially available on the market and can be incorporated into standard-size electric clothes dryers without the need to increase overall product size. As discussed in the engineering analysis, recent advances have resulted in heat pump products that do not require sacrifices in either dryness level or cycle time. DOE expects that that the U.S. market will continue to benefit from further advances in heat pump technology in the European market, as manufacturers adapt those advances to products designed for the U.S. consumer. In addition, voluntary programs such as ENERGY STAR and various State incentive programs have the potential to significantly grow the market share of heat pump models. As discussed in the life-cycle cost analysis, as heat pump technology continues to gain market share over time, DOE expects that learning and experience by manufacturers will likely contribute to downward costs over time.

b. Preservation of Electromechanical Controls

Some manufacturers expressed concern that higher energy conservation standards or requiring the use of the Appendix D2 test procedure would threaten the viability of dryers with electromechanical controls. In interviews, these manufacturers noted that some consumers prefer the simplicity of electromechanical control knobs and the lower price point associated with the lower production cost. Manufacturers also noted that eliminating electromechanical control dryers may raise the cost of baseline dryers, which would disproportionately impact low-income consumers since they typically purchase low-cost dryers with electromechanical controls.

c. Cost Increases and Component Shortages

Some manufacturers noted that increases in raw material prices, escalating shipping and transportation costs, and limited component availability over the last two years all affect manufacturer production costs. As a result, cost estimates based on historic 5-year averages would underestimate current production costs.

4. Discussion of MIA Comments

In response to the preliminary analysis, AHAM commented on DOE's approach to analyzing cumulative regulatory burden. AHAM stated that the cumulative regulatory burden analysis should incorporate and quantify the costs to manufacturers associated with responding to and monitoring proposed test procedures and energy conservation standards. Additionally, AHAM urged DOE to incorporate the financial results of the cumulative regulatory burden analysis into the MIA, stating that this could be done by adding the combined cost of complying with multiple regulations into the product conversion costs in the GRIM. AHAM suggests performing a consolidated analysis of multiple regulations and notes that this approach is particularly important for related products like clothes washers and clothes dryers that are often designed, invested in, and sold together. In addition, AHAM noted other regulations impact consumer clothes dryer manufacturers such as commercial clothes washers, consumer refrigerator/freezers, dishwashers, room air conditioners, dehumidifiers, and portable air conditioners rulemakings. (AHAM, No. 23 at pp. 7–8)

AHAM requested that DOE include the cost of monitoring test procedure and energy conservation standard rulemakings in its rulemaking analyses. (AHAM, No. 23 at p. 8) DOE requests AHAM provide the costs of monitoring, which would be independent from the conversion costs required to adapt product designs and manufacturing facilities to an amended standard, for DOE to determine whether these costs would materially affect the analysis. In particular, a summary of the job titles and annual hours per job title at a prototypical company would allow DOE to construct a detailed analysis of AHAM's monitoring costs.

Additionally, AHAM encouraged DOE to incorporate product conversion costs from multiple rulemakings in the GRIM. (AHAM, No. 23 at p. 8) If DOE were to combine the conversion costs from multiple regulations, as requested, it would be appropriate to match the combined conversion costs against combined revenues of the regulated products. DOE is concerned that combined results would likely make it more difficult to discern the direct impact of the amended standard on manufacturers, particularly for rulemakings where there is only partial overlap of manufacturers. Conversion costs would be spread over a larger revenue base and result in less severe INPV impacts, when evaluated on a percent change basis.

Regarding the specific case of consumer clothes washers and clothes dryers, DOE understands that these products are often designed as sets and sold together. Additionally, DOE has received feedback from industry that aligning the compliance data for potential amended standards across the two rulemakings would reduce overall compliance costs. DOE will investigate harmonizing the timing of the two rulemakings but must work within the constraints of EPCA, which determines both the timing of when rulemakings are initiated and the selection of compliance dates when an amended standard is adopted.

Regarding the other ongoing rulemakings mentioned, DOE has not proposed amended energy conservation standards or compliance dates for most of the products identified. Table V.31 details the rulemakings and expected conversion expenses of Federal energy conservation standards, such as room air conditioners and portable air conditioners, affecting consumer clothes dryer OEMs. DOE will reassess and consider all relevant final rules contributing to cumulative regulatory burden in any subsequent analysis.

In written comment, Whirlpool asserted that requiring the use of the appendix D2 test procedure would effectively eliminate electromechanical controlled dryers since electronic controls would very likely be needed to deliver accurate sensing and end-of-cycle detection. Whirlpool expressed a variety of concerns regarding the potential phase out of electromechanical controls. First, Whirlpool stated that phasing out electromechanical control dryers will disproportionately harm manufacturers, such as Whirlpool, with significant sales of electromechanical control dryers. Whirlpool noted that a transition from electromechanical to electronic controls would require a significant amount of engineering resources and capital investment to upgrade manufacturing facilities and production lines. Second, Whirlpool noted that electromechanical control dryers are often purchased by price-sensitive customers as these dryers are typically entry-level and low-cost. Whirlpool stated that they may be forced to make significant product changes and add product costs, which would subsequently increase the upfront cost for the consumer. Third, Whirlpool expressed concerns about manufacturers' ability to move to electronic controls considering the global supply chain shortage of semiconductors. Lastly, Whirlpool requested DOE consider the negative financial impact of potential standards on timer component suppliers. Demand for timer components is largely driven by dryers, so phasing out electromechanical controls might represent a significant business risk to these companies. Whirlpool stated at least one of these suppliers is a ''small U.S.-based company.'' (Whirlpool, No. 27 at pp. 4–6)

DOE test data shows that requiring the use of the appendix D2 test procedure will not preclude the use of electromechanical controls. As discussed in section IV.C.1 of this document, DOE tested baseline models with electromechanical controls under appendix D2. The baseline efficiency levels in this NOPR represent a minimally compliant, basic-construction consumer clothes dryer on the market, such as a dryer with electromechanical controls. If tested under appendix D2, DOE does not expect dryers currently on the market to achieve a CEF_{D2} rating below the baseline efficiency levels detailed in this NOPR.

As for Whirlpool's broader concerns regarding the shift to electronic controls, DOE acknowledges that the GRIM is intended to represent the consumer clothes dryer industry as a whole. The impacts on individual manufacturers may vary from the industry average. DOE also recognizes that manufacturers with significant sales volumes of baseline efficiency dryers may experience differential impacts from amended standards relative to manufacturers specializing in high-efficiency dryers. However, as many of the GRIM inputs (*e.g.,* conversion costs, industry financials) account for U.S. market share weights, the GRIM is most reflective of large manufacturers like Whirlpool. Where possible, DOE suggests manufacturers provide company-specific information about their consumer clothes dryer business so DOE can more accurately incorporate it into its modeling of the overall industry.

Regarding the other concerns identified, DOE's analysis of conversion cost estimates is published in Table V.29 and the consumer sub-group analysis can be found in section V.B.1.b of this document. DOE appreciates the information about potential impacts to sub-component suppliers, however, analyzing the impacts of proposed standards on a timer component supplier is outside the scope of this analysis.

K. Emissions Analysis

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

The analysis of electric power sector emissions of CO_2, NO_X, SO_2, and Hg uses emissions factors intended to represent the marginal impacts of the change in electricity consumption associated with amended or new standards. The methodology is based on results published for the *AEO,* including a set of side cases that implement a variety of efficiency-related policies. The methodology is described in appendix 13A in the NOPR TSD. The analysis presented in this notice uses projections from *AEO2021.*

Power sector emissions of CH_4 and N_2O are estimated using Emission Factors for Greenhouse Gas Inventories published by the EPA.[63]

The on-site operation of gas consumer clothes dryers requires combustion of fossil fuel and results in emissions of CO_2, NO_X, SO_2, CH_4, and N_2O where these products are used. Site emissions of these gases were estimated using Emission Factors for Greenhouse Gas Inventories and, for NO_X and SO_2, emissions intensity factors from an EPA publication.[64]

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

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

1. Air Quality Regulations Incorporated in DOE's Analysis

DOE's no-new-standards case for the electric power sector reflects the *AEO,* which incorporates the projected impacts of existing air quality regulations on emissions. *AEO2021* generally represents current legislation and environmental regulations, including recent government actions, that were in place at the time of preparation of *AEO 2021,* including the emissions control programs discussed in the following paragraphs.[65]

SO_2 emissions from affected electric generating units (''EGUs'') are subject to nationwide and regional emissions cap-and-trade programs. Title IV of the Clean Air Act sets an annual emissions cap on SO_2 for affected EGUs in the 48 contiguous States and the District of Columbia (''DC''). (42 U.S.C. 7651 *et seq.*) SO_2 emissions from numerous States in the eastern half of the United States are also limited under the Cross-State Air Pollution Rule (''CSAPR''). 76 FR 48208 (Aug. 8, 2011). CSAPR requires these States to reduce certain emissions, including annual SO_2 emissions, and went into effect as of January 1, 2015.[66] *AEO2021* incorporates implementation of CSAPR, including the update to the CSAPR ozone season program emission budgets and target dates issued in 2016. 81 FR 74504 (Oct. 26, 2016). Compliance with CSAPR is flexible among EGUs and is enforced through the use of tradable emissions allowances. Under existing EPA regulations, any excess SO_2 emissions allowances resulting from the lower electricity demand caused by the adoption of an efficiency standard could be used to permit offsetting increases in SO_2 emissions by another regulated EGU.

However, beginning in 2016, SO_2 emissions began to fall as a result of implementation the Mercury and Air Toxics Standards (''MATS'') for power plants. 77 FR 9304 (Feb. 16, 2012). In the MATS final rule, EPA established a standard for hydrogen chloride as a surrogate for acid gas hazardous air pollutants (''HAP''), and also established a standard for SO_2 (a non-HAP acid gas) as an alternative equivalent surrogate standard for acid gas HAP. The same controls are used to reduce HAP and non-HAP acid gas; thus, SO_2 emissions are being reduced as a result of the control technologies installed on coal-fired power plants to comply with the MATS requirements for acid gas. *I*n order to continue operating, coal power plants must have either flue gas desulfurization or dry sorbent injection systems installed. Both technologies, which are used to reduce

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

[64] U.S. Environmental Protection Agency. External Combustion Sources. In *Compilation of Air Pollutant Emission Factors.* AP–42. Fifth Edition. Volume I: Stationary Point and Area Sources. Chapter 1. Available at *www.epa.gov/ttn/chief/ap42/index.html* (last accessed July 12, 2021).

[65] For further information, see the Assumptions to *AEO2021* report that sets forth the major assumptions used to generate the projections in the *Annual Energy Outlook.* Available at *www.eia.gov/outlooks/aeo/assumptions/* (last accessed November 8, 2021).

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

acid gas emissions, also reduce SO_2 emissions. Because of the emissions reductions under the MATS, it is unlikely that excess SO_2 emissions allowances resulting from the lower electricity demand would be needed or used to permit offsetting increases in SO_2 emissions by another regulated EGU. Therefore, energy conservation standards that decrease electricity generation would generally reduce SO_2 emissions. DOE estimated SO_2 emissions reduction using emissions factors based on *AEO2021.*

CSAPR also established limits on NO_X emissions for numerous States in the eastern half of the United States. Energy conservation standards would have little effect on NO_X emissions in those States covered by CSAPR emissions limits if excess NO_X emissions allowances resulting from the lower electricity demand could be used to permit offsetting increases in NO_X emissions from other EGUs. In such case, NOx emissions would remain near the limit even if electricity generation goes down. A different case could possibly result, depending on the configuration of the power sector in the different regions and the need for allowances, such that NO_X emissions might not remain at the limit in the case of lower electricity demand. In this case, energy conservation standards might reduce NO_X emissions in covered States. Despite this possibility, DOE has chosen to be conservative in its analysis and has maintained the assumption that standards will not reduce NO_X emissions in States covered by CSAPR. Energy conservation standards would be expected to reduce NO_X emissions in the States not covered by CSAPR. DOE used *AEO2021* data to derive NO_X emissions factors for the group of States not covered by CSAPR. DOE used *AEO2021* data to derive NO_X emissions factors for the group of States not covered by CSAPR.

The MATS limit mercury emissions from power plants, but they do not include emissions caps and, as such, DOE's energy conservation standards would be expected to slightly reduce Hg emissions. DOE estimated mercury emissions reduction using emissions factors based on *AEO2021,* which incorporates the MATS.

L. Monetizing Emissions Impacts

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

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

1. Monetization of Greenhouse Gas Emissions

DOE estimates the monetized benefits of the reductions in emissions of CO_2, CH_4, and N_2O by using a measure of the SC of each pollutant (*e.g.,* SC–CO_2). These estimates represent the monetary value of the net harm to society associated with a marginal increase in emissions of these pollutants in a given year, or the benefit of avoiding that increase. These estimates are intended to include (but are not limited to) climate-change-related changes in net agricultural productivity, human health, property damages from increased flood risk, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. DOE exercises its own judgment in presenting monetized climate benefits as recommended by applicable Executive Orders, and DOE would reach the same conclusion presented in this notice in the absence of the social cost of greenhouse gases. That is, the social costs of greenhouse gases, whether measured using the February 2021 Interim Estimates presented by the Interagency Working Group on the Social Cost of Greenhouse Gases or by another means, did not affect the rule ultimately proposed by DOE.

DOE estimated the global social benefits of CO_2, CH_4, and N_2O reductions (*i.e.,* SC–GHGs) using the estimates presented in the Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 published in February 2021 by the IWG.[67] The SC–GHGs is the monetary value of the net harm to society associated with a marginal increase in emissions in a given year, or the benefit of avoiding that increase. In principle, SC–GHGs includes the value of all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk and natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. The SC–GHGs therefore, reflects the societal value of reducing emissions of the gas in question by one metric ton. The SC–GHGs is the theoretically appropriate value to use in conducting benefit-cost analyses of policies that affect CO_2, N_2O and CH_4 emissions. As a member of the IWG involved in the development of the February 2021 SC–GHG TSD, the DOE agrees that the interim SC–GHG estimates represent the most appropriate estimate of the SC–GHG until revised estimates have been developed reflecting the latest, peer-reviewed science.

The SC–GHGs estimates presented here were developed over many years, using transparent process, peer-reviewed methodologies, the best science available at the time of that process, and with input from the public. Specifically, in 2009, the IWG, that included the DOE and other executive branch agencies and offices was established to ensure that agencies were using the best available science and to promote consistency in the social cost of carbon (SC–CO_2) values used across agencies. The IWG published SC–CO_2 estimates in 2010 that were developed from an ensemble of three widely cited integrated assessment models (''IAMs'')

[67] See Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide. Interim Estimates Under Executive Order 13990, Washington, DC, February 2021 (Available at: *www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf*) (Last accessed Jan. 18, 2022).

that estimate global climate damages using highly aggregated representations of climate processes and the global economy combined into a single modeling framework. The three IAMs were run using a common set of input assumptions in each model for future population, economic, and CO_2 emissions growth, as well as equilibrium climate sensitivity—a measure of the globally averaged temperature response to increased atmospheric CO_2 concentrations. These estimates were updated in 2013 based on new versions of each IAM. In August 2016 the IWG published estimates of the SC–CH_4 and SC–N_2O using methodologies that are consistent with the methodology underlying the SC–CO_2 estimates. The modeling approach that extends the IWG SC–CO_2 methodology to non-CO_2 GHGs has undergone multiple stages of peer review. The SC–CH_4 and SC–N_2O estimates were developed by Marten *et al.*[68] and underwent a standard double-blind peer review process prior to journal publication. In 2015, as part of the response to public comments received to a 2013 solicitation for comments on the SC–CO_2 estimates, the IWG announced a National Academies of Sciences, Engineering, and Medicine review of the SC–CO_2 estimates to offer advice on how to approach future updates to ensure that the estimates continue to reflect the best available science and methodologies. In January 2017, the National Academies released their final report, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide, and recommended specific criteria for future updates to the SC–CO_2 estimates, a modeling framework to satisfy the specified criteria, and both near-term updates and longer-term research needs pertaining to various components of the estimation process (National Academies, 2017).[69] Shortly thereafter, in March 2017, President Trump issued Executive Order 13783, which disbanded the IWG, withdrew the previous TSDs, and directed agencies to ensure SC–CO_2 estimates used in regulatory analyses are consistent with the guidance contained in OMB's Circular A–4, ''including with respect to the consideration of domestic versus international impacts and the consideration of appropriate discount rates'' (E.O. 13783, Section 5(c)). Benefit-cost analyses following E.O. 13783 used SC–GHG estimates that attempted to focus on the U.S.-specific share of climate change damages as estimated by the models and were calculated using two discount rates recommended by Circular A–4, 3 percent and 7 percent. All other methodological decisions and model versions used in SC–GHG calculations remained the same as those used by the IWG in 2010 and 2013, respectively.

On January 20, 2021, President Biden issued Executive Order 13990, which re-established the IWG and directed it to ensure that the U.S. Government's estimates of the social cost of carbon and other greenhouse gases reflect the best available science and the recommendations of the National Academies (2017). The IWG was tasked with first reviewing the SC–GHG estimates currently used in Federal analyses and publishing interim estimates within 30 days of the E.O. that reflect the full impact of GHG emissions, including by taking global damages into account. The interim SC–GHG estimates published in February 2021 are used here to estimate the climate benefits for this proposed rulemaking. The E.O. instructs the IWG to undertake a fuller update of the SC–GHG estimates by January 2022 that takes into consideration the advice of the National Academies (2017) and other recent scientific literature.

The February 2021 SC–GHG TSD provides a complete discussion of the IWG's initial review conducted under E.O. 13990. In particular, the IWG found that the SC–GHG estimates used under E.O. 13783 fail to reflect the full impact of GHG emissions in multiple ways. First, the IWG found that the SC–GHG estimates used under E.O. 13783 fail to fully capture many climate impacts that affect the welfare of U.S. citizens and residents, and those impacts are better reflected by global measures of the SC–GHG. Examples of effects omitted from the E.O. 13783 estimates include direct effects on U.S. citizens, assets, and investments located abroad, supply chains, U.S. military assets and interests abroad, and tourism, and spillover pathways such as economic and political destabilization and global migration that can lead to adverse impacts on U.S. national security, public health, and humanitarian concerns. In addition, assessing the benefits of U.S. GHG mitigation activities requires consideration of how those actions may affect mitigation activities by other countries, as those international mitigation actions will provide a benefit to U.S. citizens and residents by mitigating climate impacts that affect U.S. citizens and residents. A wide range of scientific and economic experts have emphasized the issue of reciprocity as support for considering global damages of GHG emissions. If the United States does not consider impacts on other countries, it is difficult to convince other countries to consider the impacts of their emissions on the United States. The only way to achieve an efficient allocation of resources for emissions reduction on a global basis—and so benefit the U.S. and its citizens—is for all countries to base their policies on global estimates of damages. As a member of the IWG involved in the development of the February 2021 SC–GHG TSD, DOE agrees with this assessment and, therefore, in this proposed rule DOE centers attention on a global measure of SC–GHG. This approach is the same as that taken in DOE regulatory analyses from 2012 through 2016. A robust estimate of climate damages that accrue only to U.S. citizens and residents does not currently exist in the literature. As explained in the February 2021 TSD, existing estimates are both incomplete and an underestimate of total damages that accrue to the citizens and residents of the U.S. because they do not fully capture the regional interactions and spillovers discussed above, nor do they include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature. As noted in the February 2021 SC–GHG TSD, the IWG will continue to review developments in the literature, including more robust methodologies for estimating a U.S.-specific SC–GHG value, and explore ways to better inform the public of the full range of carbon impacts. As a member of the IWG, DOE will continue to follow developments in the literature pertaining to this issue.

Second, the IWG found that the use of the social rate of return on capital (7 percent under current OMB Circular A–4 guidance) to discount the future benefits of reducing GHG emissions inappropriately underestimates the impacts of climate change for the purposes of estimating the SC–GHG. Consistent with the findings of the National Academies (2017) and the economic literature, the IWG continued to conclude that the consumption rate of interest is the theoretically appropriate discount rate in an intergenerational context (IWG 2010, 2013, 2016a,

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

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

2016b),[70] and recommended that discount rate uncertainty and relevant aspects of intergenerational ethical considerations be accounted for in selecting future discount rates.

Furthermore, the damage estimates developed for use in the SC–GHG are estimated in consumption-equivalent terms, and so an application of OMB Circular A–4's guidance for regulatory analysis would then use the consumption discount rate to calculate the SC–GHG. DOE agrees with this assessment and will continue to follow developments in the literature pertaining to this issue. DOE also notes that while OMB Circular A–4, as published in 2003, recommends using 3 percent and 7 percent discount rates as ''default'' values, Circular A–4 also reminds agencies that ''different regulations may call for different emphases in the analysis, depending on the nature and complexity of the regulatory issues and the sensitivity of the benefit and cost estimates to the key assumptions.'' On discounting, Circular A–4 recognizes that ''special ethical considerations arise when comparing benefits and costs across generations,'' and Circular A–4 acknowledges that analyses may appropriately ''discount future costs and consumption benefits . . . at a lower rate than for intragenerational analysis.'' In the 2015 Response to Comments on the Social Cost of Carbon for Regulatory Impact Analysis, OMB, DOE, and the other IWG members recognized that ''Circular A–4 is a living document'' and ''the use of 7 percent is not considered appropriate for intergenerational discounting. There is wide support for this view in the academic literature, and it is recognized in Circular A–4 itself.'' Thus, DOE concludes that a 7-percent discount rate is not appropriate to apply to value the social cost of greenhouse gases in the analysis presented herein. In this analysis, to calculate the present and annualized values of climate benefits, DOE uses the same discount rate as the rate used to discount the value of damages from future GHG emissions, for internal consistency. That approach to discounting follows the same approach that the February 2021 TSD recommends ''to ensure internal consistency—*i.e.,* future damages from climate change using the SC–GHG at 2.5 percent should be discounted to the base year of the analysis using the same 2.5-percent rate.'' DOE has also consulted the National Academies' 2017 recommendations on how SC–GHG estimates can ''be combined in RIAs with other cost and benefits estimates that may use different discount rates.'' The National Academies reviewed ''several options,'' including ''presenting all discount rate combinations of other costs and benefits with [SC–GHG] estimates.''

As a member of the IWG involved in the development of the February 2021 SC–GHG TSD, DOE agrees with this assessment and will continue to follow developments in the literature pertaining to this issue.

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

There are a number of limitations and uncertainties associated with the SC–GHG estimates. First, the current scientific and economic understanding of discounting approaches suggests discount rates appropriate for intergenerational analysis in the context of climate change are likely to be less than 3 percent, near 2 percent or lower.[71] Second, the IAMs used to produce these interim estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature and the science underlying their ''damage functions''—*i.e.,* the core parts of the IAMs that map global mean temperature changes and other physical impacts of climate change into economic (both market and nonmarket) damages—lags behind the most recent research. For example, limitations include the incomplete treatment of catastrophic and non-catastrophic impacts in the integrated assessment models, their incomplete treatment of adaptation and technological change, the incomplete way in which inter-regional and intersectoral linkages are modeled, uncertainty in the extrapolation of damages to high temperatures, and inadequate representation of the relationship between the discount rate and uncertainty in economic growth over long time horizons. Likewise, the socioeconomic and emissions scenarios used as inputs to the models do not reflect new information from the last decade of scenario generation or the full range of projections. The modeling limitations do not all work in the same direction in terms of their influence on the SC–CO_2 estimates. However, as discussed in the February 2021 TSD, the IWG has concluded that, taken together,

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

[71] Interagency Working Group on Social Cost of Greenhouse Gases (IWG). 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990. February. United States Government. (Available at: *www.whitehouse.gov/briefing-room/blog/2021/02/26/a-return-to-science-evidence-based-estimates-of-the-benefits-of-reducing-climate-pollution/*) (Last accessed Jan. 18, 2022).

the limitations suggest that the interim SC–GHG estimates used in this proposed rule likely underestimate the damages from GHG emissions. DOE concurs with this assessment.

DOE's derivations of the SC–GHG (*i.e.,* SC–CO_2, SC–N_2O, and SC–CH_4) values used for this NOPR are discussed in the following sections, and the results of DOE's analyses estimating the benefits of the reductions in emissions of these pollutants are presented in section V.B.6 of this document.

a. Social Cost of Carbon

The SC–CO_2 values used for this NOPR were based on the values presented in the 2021 update from the IWG's February 2021 TSD. Table IV.34 shows the updated sets of SC–CO_2 estimates from the latest interagency update in 5-year increments from 2020 to 2050. The full set of annual values used is presented in appendix 14A of the NOPR TSD. For purposes of capturing the uncertainties involved in regulatory impact analysis, DOE has determined it is appropriate to include all four sets of SC–CO_2 values, as recommended by the IWG.[72]

TABLE IV.34—ANNUAL SC–CO_2 VALUES FROM 2021 INTERAGENCY UPDATE, 2020–2050 (2020$ PER METRIC TON CO_2)

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

In calculating the potential global benefits resulting from reduced CO_2 emissions, DOE used the values from the 2021 interagency report, adjusted to 2020$ using the implicit price deflator for gross domestic product (''GDP'') from the Bureau of Economic Analysis. For 2051 to 2070, DOE used estimates published by EPA, adjusted to 2020$. These estimates are based on methods, assumptions, and parameters identical to the 2020–2050 estimates published by the IWG. DOE expects additional climate benefits to accrue for any longer-life consumer clothes dryers post 2070, but a lack of available SC–CO_2 estimates for emissions years beyond 2070 prevents DOE from monetizing these potential benefits in this analysis. If further analysis of monetized climate benefits beyond 2070 becomes available prior to the publication of the final rule, DOE will include that analysis in the final rule.

DOE multiplied the CO_2 emissions reduction estimated for each year by the SC–CO_2 value for that year in each of the four cases. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the four cases using the specific discount rate that had been used to obtain the SC–CO_2 values in each case. See chapter 13 for the annual emissions reduction. See appendix 14A for the annual SC–CO_2 values.

b. Social Cost of Methane and Nitrous Oxide

The SC–CH_4 and SC–N_2O values used for this NOPR were generated using the values presented in the 2021 update from the IWG.[73] Table IV.35 shows the updated sets of SC–CH_4 and SC–N_2O estimates from the latest interagency update in 5-year increments from 2020 to 2050. The full set of annual values used is presented in appendix 14A of the NOPR TSD. To capture the uncertainties involved in regulatory impact analysis, DOE has determined it is appropriate to include all four sets of SC–CH_4 and SC–N_2O values, as recommended by the IWG. DOE used the same approach described above for the SC–CO_2 for values after 2050.

TABLE IV.35—ANNUAL SC–CH_4 AND SC–N_2O VALUES FROM 2021 INTERAGENCY UPDATE, 2020–2050
[2020$ per metric ton]

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

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

[73] See Interagency Working Group on Social Cost of Greenhouse Gases, *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide. Interim Estimates Under Executive Order 13990,* Washington, DC (February 2021) (Available at: *www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf*) (Last accessed Jan. 18, 2022).

DOE multiplied the CH_4 and N_2O emissions reduction estimated for each year by the SC–CH_4 and SC–N_2O estimates for that year in each of the cases. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the cases using the specific discount rate that had been used to obtain the SC–CH_4 and SC–N_2O estimates in each case. See chapter 13 for the annual emissions reduction. See appendix 14A for the annual SC–CH_4 and SC–N_2O values.

2. Monetization of Other Air Pollutants

DOE estimated the monetized value of NO_X and SO_2 emissions reductions from electricity generation using the latest benefit-per-ton estimates for that sector from the EPA's Benefits Mapping and Analysis Program.[74] DOE used EPA's values for $PM_{2.5}$-related benefits associated with NO_X and SO_2 and for ozone-related benefits associated with NO_X for 2025, 2030, 2035 and 2040, calculated with discount rates of 3 percent and 7 percent. DOE used linear interpolation to define values for the years not given in the 2025 to 2040 period; for years beyond 2040 the values are held constant. DOE derived values specific to the sector for consumer clothes dryers using a method described in appendix 14A of the NOPR TSD.

DOE also estimated the monetized value of NO_X and SO_2 emissions reductions from site use of natural gas in consumer clothes dryers using benefit-per-ton estimates from the EPA's Benefits Mapping and Analysis Program. Although none of the sectors covered by EPA refers specifically to residential and commercial buildings, the sector called ''area sources'' would be a reasonable proxy for residential and commercial buildings.[75] The EPA document provides high and low estimates for 2025 and 2030 at 3- and 7-percent discount rates.[76] DOE used the same linear interpolation and extrapolation as it did with the values for electricity generation.

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

M. Utility Impact Analysis

The utility impact analysis estimates several effects on the electric power generation industry that would result from the adoption of new or amended energy conservation standards. The utility impact analysis estimates the changes in installed electrical capacity and generation that would result for each TSL. The analysis is based on published output from the NEMS associated with *AEO2021*. NEMS produces the *AEO* Reference case, as well as a number of side cases that estimate the economy-wide impacts of changes to energy supply and demand. For the current analysis, impacts are quantified by comparing the levels of electricity sector generation, installed capacity, fuel consumption and emissions in the *AEO2020* Reference case and various side cases. Details of the methodology are provided in the appendices to chapters 13 and 15 of the NOPR TSD.

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

N. Employment Impact Analysis

DOE considers employment impacts in the domestic economy as one factor in selecting a proposed standard. Employment impacts from new or amended energy conservation standards include both direct and indirect impacts. Direct employment impacts are any changes in the number of production and non-production employees of manufacturers of the products subject to standards.[77] The MIA addresses those impacts. Indirect employment impacts are changes in national employment that occur due to the shift in expenditures and capital investment caused by the purchase and operation of more-efficient appliances. Indirect employment impacts from standards consist of the net jobs created or eliminated in the national economy, other than in the manufacturing sector being regulated, caused by (1) reduced spending by consumers on energy, (2) reduced spending on new energy supply by the utility industry, (3) increased consumer spending on the products to which the new standards apply and other goods and services, and (4) the effects of those three factors throughout the economy.

One method for assessing the possible effects on the demand for labor of such shifts in economic activity is to compare sector employment statistics developed by BLS. BLS regularly publishes its estimates of the number of jobs per million dollars of economic activity in different sectors of the economy, as well as the jobs created elsewhere in the economy by this same economic activity. Data from BLS indicate that expenditures in the utility sector generally create fewer jobs (both directly and indirectly) than expenditures in other sectors of the economy.[78] There are many reasons for these differences, including wage differences and the fact that the utility sector is more capital-intensive and less labor-intensive than other sectors. Energy conservation standards have the effect of reducing consumer utility bills. Because reduced consumer expenditures for energy likely lead to increased expenditures in other sectors of the economy, the general effect of efficiency standards is to shift economic activity from a less labor-intensive sector (*i.e.,* the utility sector) to more labor-intensive sectors (*e.g.,* the retail and service sectors). Thus, the BLS data suggest that net national employment may increase due to shifts in economic activity resulting from energy conservation standards.

DOE estimated indirect national employment impacts for the standard levels considered in this NOPR using an input/output model of the U.S. economy called Impact of Sector Energy

[74] U.S. Environmental Protection Agency, *Estimating the Benefit per Ton of Reducing $PM_{2.5}$ Precursors from 21 Sectors.* Available at: *www.epa.gov/benmap/estimating-benefit-ton-reducing-pm25-precursors-21-sectors.*

[75] ''Area sources'' represents all emission sources for which states do not have exact (point) locations in their emissions inventories. Because exact locations would tend to be associated with larger sources, ''area sources'' would be fairly representative of small dispersed sources like homes and businesses.

[76] ''Area sources'' are a category in the 2018 document from EPA, but are not used in the 2021 document cited above. Available at: *www.epa.gov/sites/default/files/2018-02/documents/sourceapportionmentbpttsd_2018.pdf.*

[77] As defined in the U.S. Census Bureau's 2016 *Annual Survey of Manufactures,* production workers include ''Workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial, guard services, product development, auxiliary production for plant's own use (*e.g.,* power plant), record keeping, and other closely associated services (including truck drivers delivering ready-mixed concrete)'' Non-production workers are defined as ''Supervision above line-supervisor level, sales (including a driver salesperson), sales delivery (truck drivers and helpers), advertising, credit, collection, installation, and servicing of own products, clerical and routine office functions, executive, purchasing, finance, legal, personnel (including cafeteria, *etc.*), professional and technical.''

[78] *See* U.S. Department of Commerce–Bureau of Economic Analysis. *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II).* 1997. U.S. Government Printing Office: Washington, DC. Available at *www.bea.gov/scb/pdf/regional/perinc/meth/rims2.pdf* (last accessed November 9, 2021).

Technologies version 4 (''ImSET'').[79] ImSET is a special-purpose version of the ''U.S. Benchmark National Input-Output'' (''I–O'') model, which was designed to estimate the national employment and income effects of energy-saving technologies. The ImSET software includes a computer-based I–O model having structural coefficients that characterize economic flows among 187 sectors most relevant to industrial, commercial, and residential building energy use.

DOE notes that ImSET is not a general equilibrium forecasting model, and that the uncertainties involved in projecting employment impacts, especially changes in the later years of the analysis. Because ImSET does not incorporate price changes, the employment effects predicted by ImSET may over-estimate actual job impacts over the long run for this rule. Therefore, DOE used ImSET only to generate results for near-term timeframes (2027–2033), where these uncertainties are reduced. For more details on the employment impact analysis, see chapter 16 of the NOPR TSD.

V. Analytical Results and Conclusions

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

A. Trial Standard Levels

In general, DOE typically evaluates potential amended standards for products and equipment at the product class level and by grouping select individual efficiency levels for each class into TSLs. Use of TSLs allows DOE to identify and consider manufacturer cost interactions between the equipment classes, to the extent that there are such interactions, and market cross elasticity from consumer purchasing decisions that may change when different standard levels are set. In addition, the use of TSLs allows DOE to account for shifts in manufacturing practices, such as consolidation or expansion of manufacturing lines that may occur as a result of differential efficiency levels set for different product classes. In the case of consumer clothes dryers, DOE did not find any cross elasticities in the marketplace and DOE does not believe consumers would modify their purchasing decisions to change to different categories of consumer clothes dryers due to the imposition of standards. DOE also believes that manufacturers will continue producing compact and standard size clothes dryers on different product lines due to their significantly different platforms and production quantities. DOE presents the results for the TSLs in this document, while the results for all efficiency levels that DOE analyzed are in the NOPR TSD. Table V.1 presents the TSLs and the corresponding efficiency levels that DOE has identified for potential amended energy conservation standards for consumer clothes dryers. TSL 6 represents the maximum technologically feasible (''max-tech'') energy efficiency for all product classes. TSL 5 represents the maximum national energy savings with positive NPV. TSL 4 represents the maximum national energy savings with simple PBP less than 4 years. TSL 3 represents the intermediate efficiency level between TSL 2 and TSL 4. TSL 2 corresponds to efficiency level with automatic termination control system for product class (''PC'')1 to PC6 and high-speed spin for PC7. TSL 1 corresponds to efficiency level with electronic controls for all product classes. DOE constructed the TSLs for this NOPR to include ELs representative of ELs with similar characteristics (*i.e.,* using similar technologies and/or efficiencies, and having roughly comparable equipment availability). The use of representative ELs provided for greater distinction between the TSLs. While representative ELs were included in the TSLs, DOE considered all efficiency levels as part of its analysis but did not include all efficiency levels in the TSLs.[80]

TABLE V.1—TRIAL STANDARD LEVELS FOR CONSUMER CLOTHES DRYER

Product class	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5	TSL 6
	Efficiency level and representative CEF_{D2} (lb/kWh)					
Electric Standard	1 (2.68)	3 (3.27)	4 (3.93)	5 (4.21)	7 (7.39)	7 (7.39)
Electric Compact (120V)	1 (3.15)	3 (4.28)	4 (4.33)	4 (4.33)	5 (4.63)	6 (6.37)
Vented Electric Compact (240V)	1 (2.44)	3 (3.30)	4 (3.57)	4 (3.57)	5 (3.82)	6 (3.91)
Vented Gas Standard	1 (2.44)	2 (3.00)	3 (3.48)	3 (3.48)	3 (3.48)	4 (3.83)
Vented Gas Compact	1 (2.02)	2 (2.49)	1 (2.02)	Baseline (1.66)	3 (2.89)	4 (3.17)
Ventless Electric Compact (240V)	Baseline (2.03)	1 (2.68)	1 (2.68)	1 (2.68)	1 (2.68)	2 (6.80)
Ventless Electric Combination Washer-Dryer.	Baseline (2.27)	1 (2.33)	1 (2.33)	1 (2.33)	1 (2.33)	2 (4.01)

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

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

a. Life-Cycle Cost and Payback Period

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

[79] Livingston, O.V., S.R. Bender, M.J. Scott, and R.W. Schultz. *ImSET 4.0: Impact of Sector Energy Technologies Model Description and User Guide.* 2015. Pacific Northwest National Laboratory: Richland, WA. PNNL–24563.

[80] Efficiency levels that were analyzed for this NOPR are discussed in section IV.C.3 of this document. Results by efficiency level are presented in the NOPR TSD chapters 8 and 12.

and a discount rate. Chapter 8 of the NOPR TSD provides detailed information on the LCC and PBP analyses.

Table V.2 through Table V.15 show the LCC and PBP results for the TSLs considered for each product class. In the first of each pair of tables, the simple payback is measured relative to the baseline product. In the second table, impacts are measured relative to the efficiency distribution in the no-new-standards case in the compliance year (see section IV.F.8 of this document). Because some consumers purchase products with higher efficiency in the no-new-standards case, the average savings are less than the difference between the average LCC of the baseline product and the average LCC at each TSL. The savings refer only to consumers who are affected by a standard at a given TSL. Those who already purchase a product with efficiency at or above a given TSL are not affected. Consumers for whom the LCC increases at a given TSL experience a net cost.

TABLE V.2—AVERAGE LCC AND PBP RESULTS FOR ELECTRIC STANDARD CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Average costs (2020$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
	2.20	Baseline	$607	$147	$1,567	$2,174		14.0
1	2.68	1	625	122	1,301	1,926	0.7	14.0
2	3.27	3	634	101	1,085	1,719	0.6	14.0
3	3.93	4	641	85.3	919	1,560	0.6	14.0
4	4.21	5	721	80.3	865	1,587	1.7	14.0
5, 6	7.39	7	996	50.0	537	1,533	4.0	14.0

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

TABLE V.3—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR ELECTRIC STANDARD CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings * (2020$)	Percent of consumers that experience net cost (%)
1	2.68	1	$252	0.32
2	3.27	3	439	0.16
3	3.93	4	578	0.11
4	4.21	5	182	53.5
5, 6	7.39	7	230	53.1

* The savings represent the average LCC for affected consumers.

TABLE V.4—AVERAGE LCC AND PBP RESULTS FOR ELECTRIC COMPACT (120V) CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Average costs (2020$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
	2.36	Baseline	$635	$54.1	$383	$1,206		14.0
1	3.15	1	657	41.0	297	1,090	1. 7	14.0
2	4.28	3	670	30.7	228	995	1.5	14.0
3, 4	4.33	4	678	30.4	226	999	1.8	14.0
5	4.63	5	770	28.6	215	1,073	5.3	14.0
6	6.37	6	993	21.6	169	1,222	11.0	14.0

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

TABLE V.5—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR ELECTRIC COMPACT (120V) CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings * (2020$)	Percent of consumers that experience net cost (%)
1	3.15	1	$115	5.66
2	4.28	3	194	4.46
3, 4	4.33	4	160	21.6
5	4.63	5	86.3	53.0

TABLE V.5—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR ELECTRIC COMPACT (120V) CONSUMER CLOTHES DRYERS—Continued

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings* (2020$)	Percent of consumers that experience net cost (%)
6	6.37	6	(62.6)	76.3

*The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.

TABLE V.6—AVERAGE LCC AND PBP RESULTS FOR VENTED ELECTRIC COMPACT (240V) CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Average costs (2020$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
	2.00	Baseline	$636	$64.4	$682	$1,318		14.0
1	2.44	1	659	53.3	565	1,223	2.0	14.0
2	3.30	3	672	40.2	426	1,098	1.5	14.0
3, 4	3.57	4	680	37.4	396	1,076	1.6	14.0
5	3.82	5	772	35.2	373	1,145	4.7	14.0
6	3.91	6	995	34.8	368	1,363	12.1	14.0

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

TABLE V.7—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR VENTED ELECTRIC COMPACT (240V) CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings* (2020$)	Percent of consumers that experience net cost (%)
1	2.44	1	$94.1	8.63
2	3.30	3	201	4.35
3, 4	3.57	4	192	8.37
5	3.82	5	123	47.0
6	3.91	6	(94.8)	79.6

*The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.

TABLE V.8—AVERAGE LCC AND PBP RESULTS FOR VENTED GAS STANDARD CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Average costs (2020$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
	2.00	Baseline	$740	$60.0	$689	$1,429	—	14.0
1	2.44	1	763	51.5	586	1,350	2.8	14.0
2	3.00	2	768	42.1	478	1,246	1.6	14.0
3, 4, 5	3.48	3	783	37.7	426	1,209	1.9	14.0
6	3.83	4	863	37.5	421	1,284	5.5	14.0

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

TABLE V.9—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR VENTED GAS STANDARD CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings* (2020$)	Percent of consumers that experience net cost (%)
1	2.44	1	$77.7	6.04
2	3.00	2	174	1.66
3, 4, 5	3.48	3	198	3.74

TABLE V.9—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR VENTED GAS STANDARD CONSUMER CLOTHES DRYERS—Continued

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings * (2020$)	Percent of consumers that experience net cost (%)
6	3.83	4	43.0	59.3

* The savings represent the average LCC for affected consumers.

TABLE V.10—AVERAGE LCC AND PBP RESULTS FOR VENTED GAS COMPACT CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Average costs (2020$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
	1.66	Baseline	$790	$27.4	$308	$1,098		14.0
1, 3	2.02	1	810	23.4	263	1,073	5.1	14.0
2	2.49	2	817	23.2	258	1,075	6.4	14.0
4	1.66	Baseline	790	27.4	308	1,098		14.0
5	2.89	3	834	21.2	235	1,069	7.1	14.0
6	3.17	4	926	19.0	211	1,137	16.3	14.0

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

TABLE V.11—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR VENTED GAS COMPACT CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings * (2020$)	Percent of consumers that experience net cost (%)
1, 3	2.02	1	$25.2	32.7
2	2.49	2	23.5	50.2
4	1.66	Baseline		
5	2.89	3	29.4	51.9
6	3.17	4	(38.8)	78.8

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.

TABLE V.12—AVERAGE LCC AND PBP RESULTS FOR VENTLESS ELECTRIC STANDARD (240V) CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Average costs (2020$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
	2.03	Baseline	$1,020	$53.8	$567	$1,588		14.0
1	2.03	Baseline	1,020	53.8	567	1,588		14.0
2, 3, 4, 5	2.68	1	1,025	38.8	412	1,438	0.3	14.0
6	6.80	2	1,319	11.7	123	1,442	7.1	14.0

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

TABLE V.13—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR VENTLESS ELECTRIC STANDARD (240V) CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings * (2020$)	Percent of consumers that experience net cost (%)
1	2.03	Baseline		
2, 3, 4, 5	2.68	1	$145	0.0
6	6.80	2	11.0	66.4

* The savings represent the average LCC for affected consumers.

TABLE V.14—AVERAGE LCC AND PBP RESULTS FOR VENTLESS ELECTRIC COMBINATION WASHER-DRYER CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Average costs (2020$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
	2.27	Baseline	$1,342	$48.3	$513	$1,855		14.0
1	2.27	Baseline	1,342	48.3	513	1,855		14.0
2, 3, 4, 5	2.33	1	1,342	46.9	498	1,840	0.0	14.0
6	4.01	2	1,965	25.7	272	2,237	27.5	14.0

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

TABLE V.15—AVERAGE LCC SAVINGS RELATIVE TO THE NO-NEW-STANDARDS CASE FOR VENTLESS ELECTRIC COMBINATION WASHER-DRYER CONSUMER CLOTHES DRYERS

TSL	CEF_{D2} (lb/kWh)	Efficiency level	Life-cycle cost savings	
			Average LCC savings * (2020$)	Percent of consumers that experience net cost (%)
1	2.27	Baseline		
2, 3, 4, 5	2.33	1	15.1	0.0
6	4.01	2	(387)	89.8

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.

b. Consumer Subgroup Analysis

In the consumer subgroup analysis, DOE estimated the impact of the considered TSLs on low-income households and senior-only households for product classes with a sufficient sample size in *RECS* to perform a Monte Carlo analysis. DOE was unable to conduct a consumer subgroup analysis for product class—vented gas compact for either low-income households or senior-only households due to insufficient sample size and therefore does not report results for that product class. Table V.16 through Table V.27 compare the average LCC savings, PBP, percent of consumers negatively impacted, and percent of consumers positively impacted at each efficiency level for the consumer subgroups, along with corresponding values for the entire residential consumer sample for product classes with a sufficient sample size. In most cases, the values for low-income households and senior-only households at the considered efficiency levels are not substantially different from the average for all households. Chapter 11 of the NOPR TSD presents the complete LCC and PBP results for the subgroups.

TABLE V.16—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: ELECTRIC STANDARD CONSUMER CLOTHES DRYERS

EL	TSL	Average life-cycle cost savings * (2020$)			Simple payback period (years)		
		Low-income households	Senior-only households	All households	Low-income households	Senior-only households	All households
1	1	$246	$172	$252	0.6	1.0	0.7
3	2	430	302	439	0.5	0.8	0.6
4	3	566	398	578	0.4	0.8	0.6
5	4	196	101	182	1.4	2.4	1.7
7	5, 6	306	57.7	230	3.2	5.5	4.00

* The savings represent the average LCC for affected consumers.

TABLE V.17—COMPARISON OF PERCENT OF IMPACTED CONSUMERS * FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: ELECTRIC STANDARD CONSUMER CLOTHES DRYERS

EL	TSL	Low-income households (%)	Senior-only households (%)	All households (%)
1	1	0.27	0.45	0.32
3	2	0.17	0.25	0.16
4	3	0.15	0.22	0.11
5	4	43.7	60.0	53.5
7	5, 6	42.7	65.2	53.1

* Percent of impacted consumers indicates households with net cost.

TABLE V.18—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: ELECTRIC COMPACT (120V) CONSUMER CLOTHES DRYERS

EL	TSL	Average life-cycle cost savings* (2020$)			Simple payback period (years)		
		Low-income households	Senior-only households	All households	Low-income households	Senior-only households	All households
1	1	$139	$86.8	$115	1.1	2.1	1. 7
3	2	232	147	194	1.0	1.9	1.5
4	3, 4	195	119	160	1.2	2.3	1.8
5	5	151	41.9	86.3	3.6	6.6	5.3
6	6	77.4	(123)	(62.6)	7.6	13.8	11.0

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.

TABLE V.19—COMPARISON OF PERCENT OF IMPACTED CONSUMERS* FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: ELECTRIC COMPACT (120V) CONSUMER CLOTHES DRYERS

EL	TSL	Low-income households (%)	Senior-only households (%)	All households (%)
1	1	2.43	7.56	5.66
3	2	1.92	6.15	4.46
4	3, 4	14.3	24.6	21.6
5	5	35.5	59.4	53.0
6	6	53.0	81.5	76.3

* Percent of impacted consumers indicates households with net cost.

TABLE V.20—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: VENTED ELECTRIC COMPACT (240V) CONSUMER CLOTHES DRYERS

EL	TSL	Average life-cycle cost savings* (2020$)			Simple payback period (years)		
		Low-income households	Senior-only households	All households	Low-income households	Senior-only households	All households
1	1	$116	$70.0	$94.1	1.4	2.6	2.0
3	2	241	153	201	1.0	1.9	1.5
4	3, 4	232	145	192	1.1	2.0	1.6
5	5	193	70.8	123	3.2	5.9	4.7
6	6	41.2	(148)	(94.8)	8.3	15.3	12.1

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.

TABLE V.21—COMPARISON OF PERCENT OF IMPACTED CONSUMERS* FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: VENTED ELECTRIC COMPACT (240V) CONSUMER CLOTHES DRYERS

EL	TSL	Low-income households (%)	Senior-only households (%)	All households (%)
1	1	3.71	11.2	8.63
3	2	1.89	5.96	4.35
4	3, 4	3.79	11.7	8.37
5	5	29.0	53.2	47.0
6	6	57.0	84.5	79.6

* Percent of impacted consumers indicates households with net cost.

TABLE V.22—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: VENTED GAS STANDARD CONSUMER CLOTHES DRYERS

EL	TSL	Average life-cycle cost savings* (2020$)			Simple payback period (years)		
		Low-income households	Senior-only households	All households	Low-income households	Senior-only households	All households
1	1	$85.1	$52.5	$77.7	2.2	3.6	2.8
2	2	$182	122	174	1.3	2.1	1.6
3	3, 4, 5	209	137	198	1.5	2.6	1.9
4	6	66.5	6.97	43.0	4.4	7.3	5.5

* The savings represent the average LCC for affected consumers.

TABLE V.23—COMPARISON OF PERCENT OF IMPACTED CONSUMERS* FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: VENTED GAS STANDARD CONSUMER CLOTHES DRYERS

EL	TSL	Low-income households (%)	Senior-only households (%)	All households (%)
1	1	3.97	9.45	6.04
2	2	0.94	2.70	1.66
3	3, 4, 5	2.16	5.71	3.74
4	6	52.2	67.7	59.3

* Percent of impacted consumers indicates households with net cost.

TABLE V.24—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: VENTLESS ELECTRIC STANDARD (240V) CONSUMER CLOTHES DRYERS

EL	TSL	Average life-cycle cost savings* (2020$)			Simple payback period (years)		
		Low-income households	Senior-only households	All households	Low-income households	Senior-only households	All households
0	1						
1	2, 3, 4, 5	$174	$116	$145	0.2	0.4	0.3
2	6	136	(53.1)	11.0	4.9	8.9	7.1

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.

TABLE V.25—COMPARISON OF PERCENT OF IMPACTED CONSUMERS* FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: VENTLESS ELECTRIC STANDARD (240V) CONSUMER CLOTHES DRYERS

EL	TSL	Low-income households (%)	Senior-only households (%)	All households (%)
0	1			
1	2, 3, 4, 5	0.0	0.01	0.0
2	6	43.3	72.5	66.4

* Percent of impacted consumers indicates households with net cost.

TABLE V.26—COMPARISON OF LCC SAVINGS AND PBP FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: VENTLESS ELECTRIC COMBINATION WASHER-DRYER CONSUMER CLOTHES DRYERS

EL	TSL	Average life-cycle cost savings* (2020$)			Simple payback period (years)		
		Low-income households	Senior-only households	All households	Low-income households	Senior-only households	All households
0	1						
1	2, 3, 4, 5	$17.2	$12.0	$15.1	0.0	0.0	0.0
2	6	(174)	(435)	(387)	18.8	34.9	27.5

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.

TABLE V.27—COMPARISON OF PERCENT OF IMPACTED CONSUMERS* FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS: VENTLESS ELECTRIC COMBINATION WASHER-DRYER CONSUMER CLOTHES DRYERS

EL	TSL	Low-income households (%)	Senior-only households (%)	All households (%)
0	1			
1	2, 3, 4, 5	0.0	0.0	0.0
2	6	71.5	92.8	89.8

* Percent of impacted consumers indicates households with net cost.

c. Rebuttable Presumption Payback

As discussed in section II.A of this document, EPCA establishes a rebuttable presumption that an energy conservation standard is economically justified if the increased purchase cost for a product that meets the standard is less than three times the value of the first-year energy savings resulting from the standard. (42 U.S.C. 6295(o)(2)(B)(iii)) In calculating a rebuttable presumption payback period for each of the considered TSLs, DOE used discrete values, and, as required by EPCA, based the energy use calculation on the DOE test procedure for consumer clothes dryers. In contrast, the PBPs presented in section V.B.1.a of this document were calculated using distributions that reflect the range of energy use in the field.

Table V.28 presents the rebuttable-presumption payback periods for the considered TSLs for consumer clothes dryers. The results show that the estimated rebuttable payback period ranges broadly between the product classes. While DOE examined the rebuttable-presumption criterion, it considered whether the standard levels considered for the NOPR are economically justified through a more detailed analysis of the economic impacts of those levels, pursuant to 42 U.S.C. 6295(o)(2)(B)(i), that considers the full range of impacts to the consumer, manufacturer, Nation, and environment. The results of that analysis serve as the basis for DOE to definitively evaluate the economic justification for a potential standard level, thereby supporting or rebutting the results of any preliminary determination of economic justification.

TABLE V.28—REBUTTABLE-PRESUMPTION PAYBACK PERIODS

Product class	Trial standard level					
	1	2	3	4	5	6
	(Years)					
Electric Standard	0.67	0.56	0.52	1.62	3.75	3.75
Electric Compact (120 V)	1.78	1.59	1.93	1.93	5.64	11.7
Vented Electric Compact (240 V)	2.18	1.57	1.72	1.72	4.93	12.7
Vented Gas Standard	4.28	2.80	3.26	3.26	3.26	8.29
Vented Gas Compact	8.48	6.15	8.48	....	7.35	20.5
Ventless Electric Compact (240 V)	....	0.35	0.35	0.35	0.35	7.52
Ventless Electric Combination Washer-Dryer	....	0.00	0.00	0.00	0.00	28.3

2. Economic Impacts on Manufacturers

DOE performed an MIA to estimate the impact of amended energy conservation standards on manufacturers of consumer clothes dryers. The following section describes the expected impacts on manufacturers at each considered TSL. Chapter 12 of the NOPR TSD explains the analysis in further detail.

a. Industry Cash Flow Analysis Results

In this section, DOE provides GRIM results from the analysis, which examines changes in the industry that would result from a standard. Table V.29 illustrates the estimated financial impacts (represented by changes in INPV) of potential amended energy conservation standards on manufacturers of consumer clothes dryers, as well as the conversion costs that DOE estimates manufacturers of consumer clothes dryers would incur at each TSL.

The impact of potential amended energy conservation standards were analyzed under two scenarios: (1) the preservation of gross margin percentage; and (2) the preservation of operating profit, as discussed in section IV.J.2.d of this document. In the preservation of gross margin percentage scenario, DOE applied a gross margin percentage of 21 percent for all product classes and all efficiency levels in the standards case. This scenario assumes that a manufacturer's per-unit dollar profit would increase as MPCs increase in the standards cases. DOE understand this scenario to be an upper bound to industry profitability under an energy conservation standard.

In the preservation of operating profit scenario manufacturers do not earn additional operating profit when compared to the no-standards case scenario. While manufacturers make the necessary upfront investments required to produce compliant products, per-unit operating profit does not change in absolute dollars. The preservation of operating profit scenario results in the lower (or more severe) bound to impacts of potential amended standards on industry.

Each of the modeled scenarios results in a unique set of cash flows and corresponding INPV for each TSL. INPV is the sum of the discounted cash flows to the industry from the base year through the end of the analysis period (2022–2056). The ''change in INPV'' results refer to the difference in industry value between the no-new-standards case and standards case at each TSL. To provide perspective on the short-run cash flow impact, DOE includes a comparison of free cash flow between the no-new-standards case and the standards case at each TSL in the year before amended standards would take effect. This figure provides an understanding of the magnitude of the required conversion costs relative to the cash flow generated by the industry in the no-new-standards case.

Conversion costs are one-time investments for manufacturers to bring their manufacturing facilities and product designs into compliance with potential amended standards. As described in section IV.J.2.c of this document, conversion cost investments occur between the year of publication of the final rule and the year by which manufacturers must comply with the new standard. The conversion costs can have a significant impact on the short-term cash flow on the industry and generally result in lower free cash flow in the period between the publication of the final rule and the compliance date of potential amended standards. Conversion costs are independent of the manufacturer markup scenarios and are not presented as a range in this analysis.

TABLE V.29—MANUFACTURER IMPACT ANALYSIS RESULTS FOR CONSUMER CLOTHES DRYERS

	Units	No-new-standards case	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5	TSL 6
INPV	*2020$ millions.*	1,810.1	1,785.0 to 1,798.5.	1,766.8 to 1,789.8.	1,694.5 to 1,728.5.	1,368.8 to 1,582.5.	830.1 to 1,675.5.	732.4 to 1,632.0.
Change in INPV *	%	....	(1.4) to (0.6)	(2.4) to (1.1)	(6.4) to (4.5)	(24.4) to (12.6)	(54.1) to (7.4).	(59.5) to (9.8).
Free Cash Flow (2026) *	*2020$ millions.*	120.5	107.2	98.8	57.7	(124.1)	(392.3)	(443.3).

TABLE V.29—MANUFACTURER IMPACT ANALYSIS RESULTS FOR CONSUMER CLOTHES DRYERS—Continued

	Units	No-new-standards case	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5	TSL 6
Change in Free Cash Flow (2026) *.	%		(11.0)	(18.0)	(52.1)	(203.0)	(425.7)	(468.0).
Conversion Costs	*2020$ millions.*		34.1	55.3	149.7	561.7	1,164.2	1,280.0.

* Parentheses denote negative values.

The cash flow results discussion below refers to product classes as defined in Table IV.2 in section IV.A.1 of this proposed rule. It also refers to the efficiency levels (''ELs'') and associated design options designated in the Table IV.16 through Table IV.21 in section IV.C.1.b of this document.

At TSL 1, the standard reflects efficiency levels with electronic controls for all product classes. The change in INPV is expected to range from −1.4 to −0.6 percent. At this level, free cash flow is estimated to decrease by 11.0 percent compared to the no-new-standards case value of $120.5 million in the year 2026, the year before the standards year. DOE's shipments analysis estimates approximately 61 percent of current shipments meet this level.

The design options DOE analyzed for Product Classes 1 through 5 include implementing electronic controls. For Product Classes 1 through 5, TSL 1 corresponds to EL 1. For Product Classes 6 and 7, TSL 1 corresponds to the baseline CEF_{D2}. Capital conversion costs may be necessary for additional tooling for timers and electronics. Product conversion costs may be necessary for developing, sourcing, and testing electronics (*e.g.,* safety, performance, and durability tests). DOE does not expect industry to incur re-flooring costs at this level since the necessary enhancements could be done ''behind the hinge,'' incorporating the design changes in a manner that does not impact product appearance. DOE does not expect industry to incur conversion costs related to Product Classes 6 and 7, as the efficiency levels would remain at baseline. DOE estimates capital conversion costs of $15.7 million and product conversion of costs of $18.4 million. Conversion costs total $34.1 million.

At TSL 1, the shipment-weighted average MPC for all consumer clothes dryers is expected to increase by 1 percent relative to the no-new-standards case shipment-weighted average MPC for all consumer clothes dryers in 2027. Given this relatively small increase in production costs, DOE does not project a notable drop in shipments in the year the standard takes effect. In the preservation of gross margin percentage scenario, the slight increase in MSP is outweighed by the $34.1 million in conversion costs, causing a slightly negative change in INPV at TSL 1 under this scenario. Under the preservation of operating profit scenario, manufacturers earn the same per-unit operating profit as would be earned in the no-new-standards case, but manufacturers do not earn additional profit from their investments. In this scenario, the manufacturer markup decreases in 2028, the year after the analyzed compliance year. This reduction in the manufacturer markup and the $34.1 million in conversion costs incurred by manufacturers cause a slightly negative change in INPV at TSL 1 under the preservation of operating profit scenario.

At TSL 2, the standard reflects efficiency levels with more advanced automatic termination controls for Product Classes 1 through 6, and high-speed spin for product class 7. The change in INPV is expected to range from −2.4 to −1.1 percent. At this level, free cash flow is estimated to decrease 18.0 percent compared to the no-new-standards case value of $120.5 million in the year 2026, the year before the standards year. DOE's shipments analysis estimates approximately 60 percent of current shipments meet this level.

The design options for Product Classes 1 through 6 include implementing electronic controls, optimized heating systems, and more advanced automatic termination controls. For Product Class 7, the design option analyzed includes high-speed spin cycles. For Product Classes 1 through 3, TSL 2 corresponds to EL 3. For Product Classes 4 and 5, TSL 2 corresponds to EL 2. For Product Classes 6 and 7, TSL 2 corresponds to EL 1. Capital conversion costs may be necessary for incremental updates in tooling. Product conversion costs may be necessary for software optimization, prototyping, and testing. DOE expects industry to incur some re-flooring costs as manufacturers redesign product lines to meet the efficiency levels required by TSL 2. DOE estimates capital conversion costs of $26.9 million and product conversion of costs of $28.4 million. Conversion costs total $55.3 million.

At TSL 2, the shipment-weighted average MPC for all consumer clothes dryers is expected to increase by 2 percent relative to the no-new-standards case shipment-weighted average MPC for all consumer clothes dryers in 2027. Given the relatively small increase in production costs, DOE does not project a notable drop in shipments in the year the standard takes effect. In the preservation of gross margin percentage scenario, the slight increase in MSP is outweighed by the $55.3 million in conversion costs, causing a slightly negative change in INPV at TSL 2 under this scenario. Under the preservation of operating profit scenario, the manufacturer markup decreases in 2028, the year after the analyzed compliance year. This reduction in the manufacturer markup and the $55.3 million in conversion costs incurred by manufacturers cause a negative change in INPV at TSL 2 under the preservation of operating profit scenario.

At TSL 3, the standard reflects a set of efficiency levels between the levels designated in TSL 2 and TSL 4 and corresponds to the current ENERGY STAR efficiency level for vented electric standard dryers, which represent over 80 percent of the market. The change in INPV is expected to range from −6.4 to −4.5 percent. At this level, free cash flow is estimated to decrease 52.1 percent compared to the no-new-standards case value of $120.5 million in the year 2026, the year before the standards year. DOE's shipments analysis estimates approximately 59 percent of current shipments meet this level.

The design options analyzed for Product Classes 1 through 4 include implementing electronic controls, optimized heating systems, more advanced automatic termination controls, and modulating heat. The design option for Product Class 5 includes implementing electronic controls. For Product Classes 6 and 7, the design options analyzed are the same as with TSL 2. For Product Classes

1 through 3, TSL 3 corresponds to EL 4. For Product Class 4, TSL 3 corresponds to EL 3. For Product Classes 5 through 7, TSL 3 corresponds to EL 1. The incremental increase in industry conversion costs from the prior TSL are due to the higher efficiency level requirements for Product Classes 1 through 4. Capital conversion costs may be necessary as manufacturers increase tooling for two-stage heating systems. Product conversion costs may be necessary for prototyping and testing. DOE expects industry to incur similar re-flooring costs as with TSL 2. DOE estimates capital conversion costs of $108.8 million and product conversion of costs of $40.9 million. Conversion costs total $149.7 million.

At TSL 3, the shipment-weighted average MPC for all consumer clothes dryers is expected to increase by 3 percent relative to the no-new-standards case shipment-weighted average MPC for all consumer clothes dryers in 2027. Given the relatively small increase in production costs, DOE does not project a notable drop in shipments in the year the standard takes effect. In the preservation of gross margin percentage scenario, the increase in MSP is outweighed by the $149.7 million in conversion costs, causing a negative change in INPV at TSL 3 under this scenario. Under the preservation of operating profit scenario, the manufacturer markup decreases in 2028, the year after the analyzed compliance year. This reduction in the manufacturer markup and the $149.7 million in conversion costs incurred by manufacturers cause a negative change in INPV at TSL 3 under the preservation of operating profit scenario.

At TSL 4, the standard reflects the maximum national energy savings with simple PBP of less than 4 years. The change in INPV is expected to range from −24.4 to −12.6 percent. At this level, free cash flow is estimated to decrease by 203.0 percent compared to the no-new-standards case value of $120.5 million in the year 2026, the year before the standards year. DOE's shipments analysis estimates approximately 11 percent of current shipments meet this level.

The design options analyzed for Product Class 1 include implementing electronic controls, optimized heating systems, more advanced automatic termination controls, modulating heat, and inlet air preheat. For Product Classes 2 through 7, the efficiency levels required for TSL 4 are the same as the efficiency levels required by TSL 3, except for Product Class 5, which corresponds to the baseline CEF_{D2}. The incremental increase in industry conversion costs from the prior TSL are due to the efficiency level requirements for Product Class 1. There is very little industry experience with inlet air preheat designs. Currently, DOE is not aware of any consumer clothes dryers on the market utilizing this design option. Electric standard dryers (Product Class 1) account for an estimated 81 percent of domestic consumer clothes dryer shipments. Of these standard electric dryer shipments, DOE estimates only 4 percent meet or exceed the efficiency level required by TSL 4. Implementing inlet air preheat represents a major overhaul of existing product lines and manufacturing facilities. For capital conversion costs, this change might necessitate significant new equipment and tooling. Product conversion costs may be necessary for designing, prototyping, and testing new or updated platforms. DOE expects industry to incur more re-flooring costs compared to prior TSLs as more display units would need to be replaced with high-efficiency models. DOE estimates capital conversion costs of $489.2 million and product conversion of costs of $72.5 million. Conversion costs total $561.7 million.

At TSL 4, the large conversion costs result in a free cash flow dropping below zero in the years before the standards year. The negative free cash flow calculation indicates manufacturers may need to access cash reserves or outside capital to finance conversion efforts.

At this level, the shipment-weighted average MPC for all consumer clothes dryers is expected to increase by 17 percent relative to the no-new-standards case shipment-weighted average MPC for all consumer clothes dryers in 2027. Given the projected increase in production costs, DOE expects an estimated 1 percent drop in shipments in the year the standard takes effect. In the preservation of gross margin percentage scenario, the increase in MSP is outweighed by the $561.7 million in conversion costs, causing a negative change in INPV at TSL 4 under this scenario. Under the preservation of operating profit scenario, the manufacturer markup decreases in 2028, the year after the analyzed compliance year. This reduction in the manufacturer markup and the $561.7 million in conversion costs incurred by manufacturers cause a negative change in INPV at TSL 4 under the preservation of operating profit scenario.

At TSL 5, the standard reflects the maximum national energy savings with positive NPV. The change in INPV is expected to range from –54.1 to –7.4 percent. At this level, free cash flow is estimated to decrease by 425.7 percent compared to the no-new-standards case value of $120.5 million in the year 2026, the year before the standards year. DOE's shipments analysis estimates approximately 9 percent of current shipments meet this level.

The design option analyzed for Product Class 1 includes implementing heat pump technology. The design options analyzed for Product Classes 2 and 3 include implementing electronic controls, optimized heating systems, more advanced automatic termination controls, modulating heat, and inlet air preheat. For Product Classes 4, 6, and 7, the design options analyzed are the same as prior TSL. At TSL 5, the design option for Product Class 5 includes implementing electronic controls, optimized heating systems, more advanced automatic termination controls, and modulating heat. For Product Class 1, TSL 5 corresponds to EL 7. For Product Class 2 and 3, TSL 5 corresponds to EL 5. For Product Class 4 and 5, TSL 5 corresponds to EL 3. For Product Class 6 and 7, TSL 5 corresponds to EL 1.

At TSL 5, conversion costs are largely driven by the max-tech efficiency level required for Product Class 1. As previously discussed, electric standard dryers account for 81 percent of domestic consumer clothes dryer shipments. Currently, there are few electric standard models on the U.S. market that meet the max-tech efficiency level required by TSL 5. Of the 15 OEMs identified, seven OEMs do not offer any U.S. dryers utilizing heat pump technology. Of the eight OEMs with heat pump dryers, only three have electric standard dryers that meet max-tech efficiencies. Most manufacturers would need to significantly update facilities to meet a heat pump efficiency level for Product Class 1. Mandating a heat pump efficiency level for Product Class 1 would require many manufacturers to design completely new clothes dryer platforms or adapt heat pump designs from other markets (*i.e.,* redesign European heat pump models to adhere to U.S. safety standards and consumer preferences). DOE expects industry to incur more re-flooring costs compared to prior TSLs as nearly all display units would need to be replaced with high-efficiency models. DOE estimates capital conversion costs of $1,066.0 million and product conversion of costs of $98.2 million. Conversion costs total $1,164.2 million.

As with TSL 4, the large conversion costs result in a free cash flow dropping below zero in the years before the standard year. The negative free cash flow calculation indicates manufacturers may need to access cash reserves or outside capital to finance conversion efforts.

At this level, the shipment-weighted average MPC for all consumer clothes dryers is expected to increase by 64 percent relative to the no-new-standards case shipment-weighted average MPC for all consumer clothes dryers in 2027. Given the projected increase in production costs, DOE expects an estimated 12 percent drop in shipments in the year the standard takes effect. In the preservation of gross margin percentage scenario, the increase in MSP is outweighed by the $1,164.2 million in conversion costs and the drop in annual shipments, causing a negative change in INPV at TSL 5 under this scenario. Under the preservation of operating profit scenario, the manufacturer markup decreases in 2028, the year after the analyzed compliance year. This large reduction in manufacturer markup, the $1,164.2 million in conversion costs incurred by manufacturers, and the drop in annual shipments cause a significantly negative change in INPV at TSL 5 under the preservation of operating profit scenario.

At TSL 6, the standard reflects max-tech efficiency for all product classes. The change in INPV is expected to range from –59.5 to –9.8 percent. At this level, free cash flow is estimated to decrease by 468.0 percent compared to the no-new-standards case value of $120.5 million in the year 2026, the year before the standards year. DOE's shipments analysis estimates approximately 1 percent of current shipments meet this level.

The design option analyzed for TSL 6 incorporates heat pump technology for Product Classes 1, 2, 3, 6, and 7. For Product Classes 4 and 5, the design options analyzed include implementing electronic controls, optimized heating systems, more advanced automatic termination controls, modulating heat, and inlet air preheat. Seven out of 15 manufacturers identified do not offer any models for the domestic market that utilize heat pump technology. Of the eight OEMs that offer domestic heat pump models, only four of them offer an electric dryer at or above the efficiencies required by TSL 6. A standard that could only be met using heat pump technology could require a total renovation of existing facilities and completely new clothes dryer platforms for manufacturers that do not offer heat pump clothes dryers today. In interviews, two OEMs with significant market shares stated that they would require additional facilities to handle dryer manufacturing under a standard that could only be met using heat pump technology. As previously discussed, implementing inlet air preheat also represents a major overhaul of existing vented gas product lines. DOE expects industry to incur slightly more re-flooring costs compared to TSL 5 as all display models below max-tech efficiency would need to be replaced due to the higher standard. At TSL 6, reaching max-tech efficiency levels is a billion-dollar investment for industry. DOE estimates capital conversion costs of $1,172.0 million and product conversion of costs of $108.0 million. Conversion costs total $1,280.0 million.

As with TSLs 4 and 5, the large conversion costs result in a free cash flow dropping below zero in the years before the standard year. The negative free cash flow calculation indicates manufacturers may need to access cash reserves or outside capital to finance conversion efforts.

At this level, the shipment-weighted average MPC for all consumer clothes dryers is expected to increase by 69 percent relative to the no-new-standards case shipment-weighted average MPC for all consumer clothes dryers in 2027. Given the projected increase in production costs, DOE expects an estimated 13 percent drop in shipments in the year the standard takes effect. In the preservation of gross margin percentage scenario, the large increase in MSP is still outweighed by the $1,280.0 million in conversion costs and drop in annual shipments, causing a moderately negative change in INPV at TSL 6 under this scenario. Under the preservation of operating profit scenario, the manufacturer markup decreases in 2028, the year after the analyzed compliance year. This large reduction in manufacturer markup, the $1,280.0 million in conversion costs incurred by manufacturers, and the drop in annual shipments cause a significantly negative change in INPV at TSL 6 under the preservation of operating profit scenario.

b. Direct Impacts on Employment

To quantitatively assess the potential impacts of amended energy conservation standards on direct employment in the consumer clothes dryer industry, DOE used the GRIM to estimate the domestic labor expenditures and number of direct employees in the no-new-standards case and in each of the standards cases during the analysis period. DOE calculated these values using statistical data from the U.S. Census Bureau's 2020 Annual Survey of Manufactures (''ASM''),[81] the U.S. Bureau of Labor Statistics' employee compensation data,[82] results of the engineering analysis, and manufacturer interviews.

Labor expenditures related to product manufacturing depend on the labor intensity of the product, the sales volume, and an assumption that wages remain fixed in real terms over time. The total labor expenditures in each year are calculated by multiplying the total MPCs by the labor percentage of MPCs. The total labor expenditures in the GRIM were then converted to total production employment levels by dividing production labor expenditures by the average fully burdened wage multiplied by the average number of hours worked per year per production worker. To do this, DOE relied on the ASM inputs: Production Workers Annual Wages, Production Workers Annual Hours, Production Workers for Pay Period, and Number of Employees. DOE also relied on the BLS employee compensation data to determine the fully burdened wage ratio. The fully burdened wage ratio factors in paid leave, supplemental pay, insurance, retirement and savings, and legally required benefits.

The number of production employees is then multiplied by the U.S. labor percentage to convert total production employment to total domestic production employment. The U.S. labor percentage represents the industry fraction of domestic manufacturing production capacity for the covered product. This value is derived from manufacturer interviews, product database analysis, and publicly available information. DOE estimates that 58 percent of consumer clothes dryers are produced domestically.

The domestic production employees estimate covers production line workers, including line supervisors, who are directly involved in fabricating and assembling products within the OEM facility. Workers performing services that are closely associated with production operations, such as materials handling tasks using forklifts, are also included as production labor. DOE's estimates only account for production workers who manufacture the specific equipment covered by this proposed rulemaking.

[81] U.S. Census Bureau, *Annual Survey of Manufacturers: Summary Statistics for Industry Groups and Industries in the U.S.: 2018–2020.* Available at *www.census.gov/data/tables/time-series/econ/asm/2018-2020-asm.html* (Last Accessed December 10, 2021).

[82] U.S. Bureau of Labor Statistics. *Employer Costs for Employee Compensation.* June 17, 2021. Available at: *www.bls.gov/news.release/pdf/ecec.pdf.*

Non-production workers account for the remainder of the direct employment figure. The non-production employees estimate covers domestic workers who are not directly involved in the production process, such as sales, engineering, human resources, and management. Using the amount of domestic production workers calculated above, non-production domestic employees are extrapolated by multiplying the ratio of non-production workers in the industry compared to production employees. DOE assumes that this employee distribution ratio remains constant between the no-standards case and standards cases.

Using the GRIM, DOE estimates in the absence of new energy conservation standards there would be 2,460 domestic workers for consumer clothes dryers in 2027. Table V.30 shows the range of the impacts of energy conservation standards on U.S. manufacturing employment in the consumer clothes dryer industry. The following discussion provides a qualitative evaluation of the range of potential impacts presented in Table V.30.

TABLE V.30—DOMESTIC DIRECT EMPLOYMENT IMPACTS FOR CONSUMER CLOTHES DRYER MANUFACTURERS IN 2027

	No-new-standards case	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5	TSL 6
Direct Employment in 2027 (Production Workers + Non-Production Workers).	2,460	2,468	2,489	2,495	2,809	5,101	5,209.
Potential Changes in Direct Employment Workers in 2027 *.		(2,166) to 8	(2,166) to 29	(2,166) to 35	(2,166) to 349	(2,166) to 2,641	(2,166) to 2,749.

* DOE presents a range of potential employment impacts. Numbers in parentheses indicate negative numbers.

The direct employment impacts shown in Table V.30 represent the potential domestic employment changes that could result following the compliance date for the consumer clothes dryer product classes in this proposal. The upper bound estimate corresponds to an increase in the number of domestic workers that would result from amended energy conservation standards if manufacturers continue to produce the same scope of covered equipment within the United States after compliance takes effect. The lower bound estimate represents the maximum decrease in production workers if manufacturing moved to lower labor-cost countries. Most manufacturers currently produce at least a portion of their consumer clothes dryers in countries with lower labor costs, and an amended standard that necessitates large increases in labor content or large expenditures to re-tool facilities could cause manufacturers to re-evaluate domestic production siting options.

Additional detail on the analysis of direct employment can be found in chapter 12 of the NOPR TSD. Additionally, the employment impacts discussed in this section are independent of the employment impacts from the broader U.S. economy, which are documented in chapter 16 of the NOPR TSD.

c. Impacts on Manufacturing Capacity

As discussed in section V.B.2.a of this document, implementing the different design options analyzed for this NOPR would require varying levels of resources and investment. A standard level that would require the use of heat pump technology for electric dryers and combination washer-dryers would represent the biggest shift in technology for clothes dryer manufacturing among all the design options considered for this analysis. Adopting efficiency levels that require heat pump technology would necessitate very large investments to both redesign products and update production facilities. Currently, DOE estimates that approximately 1 percent of consumer clothes dryer shipments meet heat pump efficiency levels. In interviews, several manufacturers expressed concerns that the 3-year time period between the announcement of the final rule and the compliance date of the amended energy conservation standard might be insufficient to design, test, and manufacture the necessary number of products to meet demand.

In interviews, some manufacturers raised concerns about implementing inlet air preheat designs. Unlike the discussions about heat pump technology, there is very little industry experience with inlet air preheat designs. Currently, no models on the U.S. market incorporate this design option. Several manufacturers speculated that implementing inlet air preheat would require a major overhaul of existing production facilities and a significant amount of engineering time.

For the remaining dryer design options associated with lower efficiency levels (*e.g.,* implementing electronic controls, optimized heating systems, more advanced automatic termination controls, and modulating heat), manufacturers could likely maintain manufacturing capacity levels and continue to meet market demand under amended energy conservation standards. A significant portion of consumer clothes dryers already incorporate these design options. For instance, approximately 64 percent of standard electric dryer shipments meet or exceed the efficiencies associated with implementing modulating heat (EL 4). However, industry did note concerns about the ongoing supply constraints related to the COVID–19 pandemic, particularly around sourcing microprocessors and electronics. Any shift away from electromechanical controls would require that industry source more electronic components, which are already difficult to secure. If these supply constraints continue through the end of the conversion period, industry could face production capacity constraints.

d. Impacts on Subgroups of Manufacturers

Using average cost assumptions to develop industry cash-flow estimates may not capture the differential impacts among subgroups of manufacturers. Small manufacturers, niche players, or manufacturers exhibiting a cost structure that differs substantially from the industry average could be affected disproportionately. DOE investigated small businesses as a manufacturer subgroup that could be disproportionally impacted by energy conservation standards and could merit additional analysis. DOE did not identify any other adversely impacted manufacturer subgroups for this rulemaking based on the results of the industry characterization.

DOE analyzes the impacts on small businesses in a separate analysis in section VI.B of this document as part of the Regulatory Flexibility Analysis. For a discussion of the impacts on the small business manufacturer subgroup, see the Regulatory Flexibility Analysis in section VI.B of this document and chapter 12 of the NOPR TSD.

e. Cumulative Regulatory Burden

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

For the cumulative regulatory burden analysis, DOE examines Federal, product-specific regulations that could affect consumer clothes dryer manufacturers that take effect approximately three years before or after the 2027 compliance date.

TABLE V.31—COMPLIANCE DATES AND EXPECTED CONVERSION EXPENSES OF FEDERAL ENERGY CONSERVATION STANDARDS AFFECTING CONSUMER CLOTHES DRYER ORIGINAL EQUIPMENT MANUFACTURERS

Federal energy conservation standard	Number of OEMs *	Number of OEMs affected from today's rule **	Approx. standards year	Industry conversion costs (millions $)	Industry conversion costs/product revenue *** (%)
Portable Air Conditioners 85 FR 1378 (January 10, 2020)	11	2	2025	$320.9 (2015$)	6.7
Room Air Conditioners † 87 FR 20608 (April 7, 2022)	8	4	2026	22.8 (2020$)	0.5
Commercial Water Heating Equipment † 87 FR 30610 (May 19, 2022)	15	1	2026	34.6 (2020$)	4.7
Consumer Furnaces † 87 FR 40590 (July 7, 2022)	15	1	2029	150.6 (2020$)	1.4

* This column presents the total number of OEMs identified in the energy conservation standard rule contributing to cumulative regulatory burden.

** This column presents the number of OEMs producing consumer clothes dryers that are also listed as OEMs in the identified energy conservation standard contributing to cumulative regulatory burden.

*** This column presents industry conversion costs as a percentage of product revenue during the conversion period. Industry conversion costs are the upfront investments manufacturers must make to sell compliant products/equipment. The revenue used for this calculation is the revenue from just the covered product/equipment associated with each row. The conversion period is the time frame over which conversion costs are made and lasts from the publication year of the final rule to the compliance year of the final rule. The conversion period typically ranges from 3 to 5 years, depending on the energy conservation standard.

† The Room Air Conditioners, Consumer Furnaces, and Commercial Water Heating Equipment rulemakings are in the NOPR stage and all values are subject to change until finalized.

3. National Impact Analysis

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

a. Significance of Energy Savings

To estimate the energy savings attributable to potential amended standards for consumer clothes dryers, DOE compared their energy consumption under the no-new-standards case to their anticipated energy consumption under each TSL. The savings are measured over the entire lifetime of products purchased in the 30-year period that begins in the year of anticipated compliance with amended standards (2027–2056). Table V.32 presents DOE's projections of the national energy savings for each TSL considered for consumer clothes dryers. The savings were calculated using the approach described in section IV.H.2 of this document.

TABLE V.32—CUMULATIVE NATIONAL ENERGY SAVINGS FOR CONSUMER CLOTHES DRYERS; 30 YEARS OF SHIPMENTS

[2027–2056]

	Trial standard level					
	1	2	3	4	5	6
	(quads)					
Primary energy	0.97	1.98	2.97	3.90	9.59	9.68
FFC energy	1.01	2.07	3.11	4.06	9.97	10.1

OMB Circular A–4 [83] requires agencies to present analytical results, including separate schedules of the monetized benefits and costs that show the type and timing of benefits and costs. Circular A–4 also directs agencies to consider the variability of key elements underlying the estimates of benefits and costs. For this rulemaking, DOE undertook a sensitivity analysis

[83] U.S. Office of Management and Budget. *Circular A–4: Regulatory Analysis.* September 17, 2003. Available at *obamawhitehouse.archives.gov/omb/circulars_a004_a-4/* (last accessed December 16, 2021).

using 9 years, rather than 30 years, of product shipments. The choice of a 9-year period is a proxy for the timeline in EPCA for the review of certain energy conservation standards and potential revision of and compliance with such revised standards.[84] The review timeframe established in EPCA is generally not synchronized with the product lifetime, product manufacturing cycles, or other factors specific to consumer clothes dryers. Thus, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology. The NES sensitivity analysis results based on a 9-year analytical period are presented in Table V.33. The impacts are counted over the lifetime of consumer clothes dryers purchased in 2027–2035.

TABLE V.33—CUMULATIVE NATIONAL ENERGY SAVINGS FOR CONSUMER CLOTHES DRYERS; 9 YEARS OF SHIPMENTS

[2027–2035]

	Trial standard level					
	1	2	3	4	5	6
	(quads)					
Primary energy	0.41	0.78	1.09	1.35	2.92	2.95
FFC energy	0.43	0.82	1.14	1.41	3.04	3.07

b. Net Present Value of Consumer Costs and Benefits

DOE estimated the cumulative NPV of the total costs and savings for consumers that would result from the TSLs considered for consumer clothes dryers. In accordance with OMB's guidelines on regulatory analysis,[85] DOE calculated NPV using both a 7-percent and a 3-percent real discount rate. Table V.34 shows the consumer NPV results with impacts counted over the lifetime of products purchased in 2027–2056.

TABLE V.34—CUMULATIVE NET PRESENT VALUE OF CONSUMER BENEFITS FOR CONSUMER CLOTHES DRYERS; 30 YEARS OF SHIPMENTS

[2027–2056]

Discount rate	Trial standard level					
	1	2	3	4	5	6
	(billion 2020$)					
3 percent	6.90	14.1	20.8	18.4	27.8	25.7
7 percent	3.10	6.28	9.07	7.13	7.76	6.60

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.35. The impacts are counted over the lifetime of products purchased in 2027–2035. As mentioned previously, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology or decision criteria.

TABLE V.35—CUMULATIVE NET PRESENT VALUE OF CONSUMER BENEFITS FOR CONSUMER CLOTHES DRYERS; 9 YEARS OF SHIPMENTS

[2027–2035]

Discount rate	Trial standard level					
	1	2	3	4	5	6
	(billion 2020$)					
3 percent	3.61	7.02	9.78	8.90	12.8	11.9
7 percent	1.96	3.84	5.34	4.38	4.91	4.27

The previous results in Table V.34 reflect the use of a default trend to estimate the change in price for consumer clothes dryers over the analysis period (*see* section IV.F.1 of this document). DOE also conducted a sensitivity analysis that considered one scenario with a lower rate of price decline than the reference case and one

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

[85] U.S. Office of Management and Budget. *Circular A–4: Regulatory Analysis.* September 17, 2003. Available at *obamawhitehouse.archives.gov/omb/circulars_a004_a-4/* (last accessed December 16, 2021).

scenario with a higher rate of price decline than the reference case. The results of these alternative cases are presented in appendix 10C of the NOPR TSD. In the high-price-decline case, the NPV of consumer benefits is higher than in the default case. In the low-price-decline case, the NPV of consumer benefits is lower than in the default case.

c. Indirect Impacts on Employment

It is estimated that that amended energy conservation standards for consumer clothes dryers would reduce energy expenditures for consumers of those products, with the resulting net savings being redirected to other forms of economic activity. These expected shifts in spending and economic activity could affect the demand for labor. As described in section IV.N of this document, DOE used an input/output model of the U.S. economy to estimate indirect employment impacts of the TSLs that DOE considered. There are uncertainties involved in projecting employment impacts, especially changes in the later years of the analysis. Therefore, DOE generated results for near-term timeframes (2027–2033), where these uncertainties are reduced.

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

4. Impact on Utility or Performance of Products

As discussed in section III.E.1.d of this document, DOE has tentatively concluded that the standards proposed in this NOPR would not lessen the utility or performance of the consumer clothes dryers under consideration in this rulemaking. Manufacturers of these products currently offer units that meet or exceed the proposed standards.

5. Impact of Any Lessening of Competition

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

6. Need of the Nation To Conserve Energy

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

Energy conservation resulting from potential energy conservation standards for consumer clothes dryers is expected to yield environmental benefits in the form of reduced emissions of certain air pollutants and greenhouse gases. Table V.36 provides DOE's estimate of cumulative emissions reductions expected to result from the TSLs considered in this proposed rulemaking. The emissions were calculated using the multipliers discussed in section IV.K of this document. DOE reports annual emissions reductions for each TSL in chapter 13 of the NOPR TSD.

TABLE V.36—CUMULATIVE EMISSIONS REDUCTION FOR CONSUMER CLOTHES DRYERS SHIPPED IN 2027–2056

	Trial standard level					
	1	2	3	4	5	6
Power Sector Emissions						
CO_2 (million metric tons)	35.1	71.5	107	138	329	334
SO_2 (thousand tons)	13.7	27.9	42.1	56.5	145	145
NO_X (thousand tons)	17.2	35.1	52.1	65.0	144	149
Hg (tons)	0.08	0.17	0.25	0.34	0.88	0.88
CH_4 (thousand tons)	2.48	5.05	7.58	10.0	25.2	25.3
N_2O (thousand tons)	0.34	0.70	1.05	1.39	3.51	3.52
Upstream Emissions						
CO_2 (million metric tons)	2.82	5.77	8.60	10.9	25.0	25.6
SO_2 (thousand tons)	0.16	0.33	0.49	0.66	1.67	1.67
NO_X (thousand tons)	42.1	86.3	129	163	372	382
Hg (tons)	0.000	0.001	0.001	0.001	0.003	0.003
CH_4 (thousand tons)	287	587	875	1,101	2,494	2,567
N_2O (thousand tons)	0.01	0.03	0.04	0.05	0.12	0.12
Total FFC Emissions						
CO_2 (million metric tons)	37.9	77.3	116	149	354	360
SO_2 (thousand tons)	13.9	28.3	42.6	57.2	147	147
NO_X (thousand tons)	59.4	121	181	228	516	531
Hg (tons)	0.08	0.17	0.26	0.34	0.88	0.88

TABLE V.36—CUMULATIVE EMISSIONS REDUCTION FOR CONSUMER CLOTHES DRYERS SHIPPED IN 2027–2056—Continued

	Trial standard level					
	1	2	3	4	5	6
CH_4 (thousand tons)	289	592	883	1,111	2,519	2,592
N_2O (thousand tons)	0.36	0.72	1.09	1.44	3.64	3.64

As part of the analysis for this rulemaking, DOE estimated monetary benefits likely to result from the reduced emissions of CO_2 that DOE estimated for each of the considered TSLs for consumer clothes dryers. Section IV.L.1.a of this document discusses the SC–CO_2 values used.

Table V.37 presents the present value of the CO_2 emissions reduction at each TSL.

TABLE V.37—POTENTIAL STANDARDS: PRESENT VALUE OF CO_2 EMISSIONS REDUCTION FOR CONSUMER CLOTHES DRYERS SHIPPED IN 2027–2056

TSL	SC–CO_2 case discount rate and statistics			
	5%, Average	3%, Average	2.5%, Average	3%, 95th percentile
	(million 2020$)			
1	337	1,459	2,284	4,445
2	677	2,945	4,617	8,963
3	993	4,351	6,834	13,236
4	1,263	5,558	8,742	16,899
5	2,918	12,977	20,475	39,423
6	2,966	13,187	20,807	40,061

As discussed in section IV.L.1.b of this document, DOE estimated monetary benefits likely to result from the reduced emissions of methane and N_2O that DOE estimated for each of the considered TSLs for consumer clothes dryers. Table V.38 presents the value of the CH_4 emissions reduction at each TSL, and Table V.39 presents the value of the N_2O emissions reduction at each TSL.

TABLE V.38—POTENTIAL STANDARDS: PRESENT VALUE OF METHANE EMISSIONS REDUCTION FOR CONSUMER CLOTHES DRYERS SHIPPED IN 2027–2056

TSL	SC–CH_4 case discount rate and statistics			
	5%, Average	3%, Average	2.5%, Average	3%, 95th percentile
	(million 2020$)			
1	118	350	489	929
2	237	711	994	1,886
3	348	1,052	1,474	2,789
4	432	1,317	1,848	3,489
5	955	2,949	4,151	7,805
6	983	3,035	4,272	8,032

TABLE V.39—POTENTIAL STANDARDS: PRESENT VALUE OF NITROUS OXIDE EMISSIONS REDUCTION FOR CONSUMER CLOTHES DRYERS SHIPPED IN 2027–2056

TSL	SC–N_2O case discount rate and statistics			
	5%, Average	3%, Average	2.5%, Average	3%, 95th percentile
	(million 2020$)			
1	1.20	4.81	7.47	12.8
2	2.40	9.71	15.1	25.9
3	3.54	14.4	22.5	38.4
4	4.64	19.0	29.7	50.6
5	11.4	47.2	73.8	126
6	11.4	47.3	74.0	126

DOE is well aware that scientific and economic knowledge about the contribution of CO_2 and other GHG emissions to changes in the future global climate and the potential resulting damages to the world economy continues to evolve rapidly. Thus, any value placed on reduced GHG emissions in this rulemaking is subject to change. That said, because of omitted damages, DOE agrees with the IWG that these estimates most likely underestimate the climate benefits of greenhouse gas reductions. DOE, together with other Federal agencies, will continue to review various methodologies for estimating the monetary value of reductions in CO_2 and other GHG emissions. This ongoing review will consider the comments on this subject that are part of the public record for this and other rulemakings, as well as other methodological assumptions and issues. DOE notes that the proposed standards would be economically justified even without inclusion of monetized benefits of reduced GHG emissions.

DOE also estimated the monetary value of the economic impacts associated with changes in SO_2 emissions anticipated to result from the considered TSLs for consumer clothes dryers. The dollar-per-ton values that DOE used are discussed in section IV.L.2 of this document. Table V.40 presents the present value SO_2 emission changes for each TSL calculated using 7-percent and 3-percent discount rates. This table presents results that use the low benefit-per-ton values, which reflect DOE's primary estimate.

TABLE V.40—POTENTIAL STANDARDS: PRESENT VALUE OF SO_2 EMISSION REDUCTION FOR CONSUMER CLOTHES DRYERS SHIPPED IN 2027–2056

TSL	3% Discount rate	7% Discount rate
	(million 2020$)	
1	773	318
2	1,552	628
3	2,298	911
4	3,039	1,184
5	7,592	2,850
6	7,581	2,845

As part of the analysis for this rulemaking, DOE also estimated the monetary value of the economic benefits associated with NO_X emissions reductions anticipated to result from the considered TSLs for consumer clothes dryers. The dollar-per-ton values that DOE used are discussed in section IV.L of this document. Table V.41 presents the present value for NO_X emissions reduction for each TSL calculated using 7-percent and 3-percent discount rates. The results in this table reflect application of the low dollar-per-ton values, which DOE used to be conservative. Results that reflect high dollar-per-ton values are presented in chapter 14 of the NOPR TSD.

TABLE V.41—POTENTIAL STANDARDS: PRESENT VALUE OF NO_X EMISSIONS REDUCTION FOR CONSUMER CLOTHES DRYERS SHIPPED IN 2027–2056

TSL	3% Discount rate	7% Discount rate
	(million 2020$)	
1	2,317	943
2	4,656	1,858
3	6,842	2,678
4	8,640	3,335
5	19,688	7,339
6	20,094	7,490

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

The benefits of reduced CO_2, CH_4, and N_2O emissions are collectively referred to as climate benefits. The benefits of reduced SO_2 and NO_X emissions changes are collectively referred to as health benefits. For the time series of estimated monetary values of reduced emissions, see chapter 14 of the NOPR TSD.

7. Other Factors

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

8. Summary of Economic Impacts

Table V.42 presents the NPV values that result from adding the estimates of the potential monetized estimates of the potential economic, climate, and health benefits resulting from reduced GHG, NO_X, and SO_2 emissions to the NPV of consumer benefits calculated for each TSL considered in this rulemaking. The consumer benefits are domestic U.S. monetary savings that occur as a result of purchasing the covered consumer clothes dryers and are measured for the lifetime of products shipped in 2027–2056. The climate benefits associated with reduced GHG emissions resulting from the adopted standards are global benefits and are also calculated based on the lifetime of consumer clothes dryers shipped in 2027–2056. The climate benefits associated with four SC–GHG estimates are shown. DOE does not have a single central SC–GHG point estimate and it emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates.

TABLE V.42—POTENTIAL STANDARDS: NPV OF CONSUMER BENEFITS COMBINED WITH MONETIZED CLIMATE AND HEALTH BENEFITS FROM EMISSIONS REDUCTIONS

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5	TSL 6
3% discount rate for NPV of Consumer and Health Benefits (billion 2020$)						
5% d.r., Average SC–GHG case	10.4	21.3	31.3	31.8	59.0	57.3
3% d.r., Average SC–GHG case	11.8	24.0	35.4	37.0	71.1	69.7
2.5% d.r., Average SC–GHG case	12.8	26.0	38.3	40.7	79.8	78.5
3% d.r., 95th percentile SC–GHG case	15.4	31.2	46.0	50.5	102	102
7% discount rate for NPV of Consumer and Health Benefits (billion 2020$)						
5% d.r., Average SC–GHG case	4.82	9.68	14.0	13.3	21.8	20.9
3% d.r., Average SC–GHG case	6.18	12.4	18.1	18.5	33.9	33.2
2.5% d.r., Average SC–GHG case	7.14	14.4	21.0	22.3	42.7	42.1
3% d.r., 95th percentile SC–GHG case	9.75	19.6	28.7	32.1	65.3	65.2

C. Conclusion

When considering new or amended energy conservation standards, the standards that DOE adopts for any type (or class) of covered product must be designed to achieve the maximum improvement in energy efficiency that the Secretary determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) In determining whether a standard is economically justified, the Secretary must determine whether the benefits of the standard exceed its burdens by, to the greatest extent practicable, considering the seven statutory factors discussed previously. (42 U.S.C. 6295(o)(2)(B)(i)) The new or amended standard must also result in significant conservation of energy. (42 U.S.C. 6295(o)(3)(B))

For this NOPR, DOE considered the impacts of amended standards for consumer clothes dryers at each TSL, beginning with the maximum technologically feasible level, to determine whether that level was economically justified. Where the max-tech level was not justified, DOE then considered the next most efficient level and undertook the same evaluation until it reached the highest efficiency level that is both technologically feasible and economically justified and saves a significant amount of energy. DOE refers to this process as the ''walk-down'' analysis.

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

DOE also notes that the economics literature provides a wide-ranging discussion of how consumers trade off upfront costs and energy savings in the absence of government intervention. Much of this literature attempts to explain why consumers appear to undervalue energy efficiency improvements. There is evidence that consumers undervalue future energy savings as a result of (1) a lack of information, (2) a lack of sufficient salience of the long-term or aggregate benefits, (3) a lack of sufficient savings to warrant delaying or altering purchases, (4) excessive focus on the short term, in the form of inconsistent weighting of future energy cost savings relative to available returns on other investments, (5) computational or other difficulties associated with the evaluation of relevant tradeoffs, and (6) a divergence in incentives (for example, between renters and owners, or builders and purchasers). Having less than perfect foresight and a high degree of uncertainty about the future, consumers may trade off these types of investments at a higher-than-expected rate between current consumption and uncertain future energy cost savings.

In DOE's current regulatory analysis, potential changes in the benefits and costs of a regulation due to changes in consumer purchase decisions are included in two ways. First, if consumers forgo the purchase of a product in the standards case, this decreases sales for product manufacturers, and the impact on manufacturers attributed to lost revenue is included in the MIA. Second, DOE accounts for energy savings attributable only to products actually used by consumers in the standards case; if a standard decreases the number of products purchased by consumers, this decreases the potential energy savings from an energy conservation standard. DOE provides estimates of shipments and changes in the volume of product purchases in chapter 9 of the NOPR TSD. However, DOE's current analysis does not explicitly control for heterogeneity in consumer preferences, preferences across subcategories of products or specific features, or consumer price sensitivity variation according to household income.[86]

While DOE is not prepared at present to provide a fuller quantifiable framework for estimating the benefits and costs of changes in consumer purchase decisions due to an energy conservation standard, DOE is committed to developing a framework that can support empirical quantitative tools for improved assessment of the consumer welfare impacts of appliance standards. DOE has posted a paper that discusses the issue of consumer welfare impacts of appliance energy conservation standards, and potential enhancements to the methodology by which these impacts are defined and estimated in the regulatory process.[87] DOE welcomes comments on how to more fully assess the potential impact of energy conservation standards on consumer choice and how to quantify this impact in its regulatory analysis in future rulemakings.

1. Benefits and Burdens of TSLs Considered for Consumer Clothes Dryers Standards

Table V.43 and Table V.44 summarize the quantitative impacts estimated for each TSL for consumer clothes dryers.

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

[87] Sanstad, A.H. *Notes on the Economics of Household Energy Consumption and Technology Choice.* 2010. Lawrence Berkeley National Laboratory. Available at *www1.eere.energy.gov/buildings/appliance_standards/pdfs/consumer_ee_theory.pdf* (last accessed November 12, 2021).

The national impacts are measured over the lifetime of consumer clothes dryers purchased in the 30-year period that begins in the anticipated year of compliance with amended standards (2027–2056). The energy savings, emissions reductions, and value of emissions reductions refer to full-fuel-cycle results. The efficiency levels contained in each TSL are described in section V.A of this document. In addition, as DOE noted in section V.A of this document, DOE is evaluating proposed energy conservation standards by looking at the maximum improvement that is technologically feasible and cost justified under bundled policy scenarios referred to as TSLs. Since there are not cross elasticities modeled in this proposed rulemaking for consumer clothes dryers, the cost analysis and associated justification would be the same if DOE evaluated at the individual product class level.

TABLE V.43—SUMMARY OF ANALYTICAL RESULTS FOR CONSUMER CLOTHES DRYERS TSLS: NATIONAL IMPACTS

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5	TSL 6
Cumulative FFC National Energy Savings (quads)						
Quads	1.01	2.07	3.11	4.06	9.97	10.1
Cumulative FFC Emissions Reduction (Total FFC Emissions)						
CO_2 (million metric tons)	37.9	77.3	116	149	354	360
SO_2 (thousand tons)	13.9	28.3	42.6	57.2	147	147
NO_X (thousand tons)	59.4	121	181	228	516	531
Hg (tons)	0.08	0.17	0.26	0.34	0.88	0.88
CH_4 (thousand tons)	289	592	883	1,111	2,519	2,592
N_2O (thousand tons)	0.36	0.72	1.09	1.44	3.64	3.64
Present Value of Monetized Benefits and Costs (3% discount rate, billion 2020$)						
Consumer Operating Cost Savings	7.50	15.1	22.2	28.8	69.5	69.8
Climate Benefits *	1.81	3.67	5.42	6.89	16.0	16.3
Health Benefits **	3.09	6.21	9.14	11.7	27.3	27.7
Total Benefits †	12.4	24.9	36.8	47.4	113	114
Consumer Incremental Product Costs ‡	0.61	0.92	1.36	10.4	41.7	44.1
Consumer Net Benefits	6.90	14.1	20.8	18.4	27.8	25.7
Total Net Benefits	11.8	24.0	35.4	37.0	71.1	69.7
Present Value of Monetized Benefits and Costs (7% discount rate, billions 2020$)						
Consumer Operating Cost Savings	3.45	6.80	9.83	12.6	29.2	29.3
Climate Benefits *	1.81	3.67	5.42	6.89	16.0	16.3
Health Benefits **	1.26	2.49	3.59	4.52	10.2	10.3
Total Benefits †	6.53	13.0	18.8	24.0	55.4	55.9
Consumer Incremental Product Costs ‡	0.35	0.52	0.76	5.42	21.4	44.1
Consumer Net Benefits	3.10	6.28	9.07	7.13	7.76	6.60
Total Net Benefits	6.18	12.4	18.1	18.5	33.9	33.2

Note: This table presents the costs and benefits associated with consumer clothes dryers shipped in 2027–2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027–2056.

* Climate benefits are calculated using four different estimates of the social cost of carbon (SC–CO_2), methane (SC–CH_4), and nitrous oxide (SC–N_2O) (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate). Together these represent the global social cost of greenhouse gases (SC–GHG). For presentational purposes of this table, the climate benefits associated with the average SC–GHG at a 3 percent discount rate are shown, but the Department does not have a single central SC–GHG point estimate. See section. IV.L of this document for more details. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the Federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the Federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. As reflected in this rule, DOE has reverted to its approach prior to the injunction and presents monetized greenhouse gas abatement benefits where appropriate and permissible under law.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. *See* section IV.L of this document for more details.

† Total and net benefits include those consumer, climate, and health benefits that can be monetized. For presentation purposes, total and net benefits for both the 3-percent and 7-percent cases are presented using the average SC–GHG with 3-percent discount rate, but the Department does not have a single central SC–GHG point estimate. DOE emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates.

‡ Costs include incremental equipment costs as well as installation costs.

TABLE V.44—SUMMARY OF ANALYTICAL RESULTS FOR CONSUMER CLOTHES DRYERS TSLs: MANUFACTURER AND CONSUMER IMPACTS

Category	TSL 1 *	TSL 2 *	TSL 3 *	TSL 4 *	TSL 5 *	TSL 6 *
Manufacturer Impacts						
Industry NPV (million 2020$) (No-new-standards case INPV = 1,810.1).	1,785.0 to 1,798.5.	1,766.8 to 1,789.8.	1,694.5 to 1,728.5.	1,368.8 to 1,582.5.	830.1 to 1,675.5	732.4 to 1,632.0.
Industry NPV (% change)	(1.4) to (0.6)	(2.4) to (1.1)	(6.4) to (4.5)	(24.4) to (12.6)	(54.1) to (7.4)	(59.5) to (9.8).
Consumer Average LCC Savings (2020$)						
Electric Standard	$252	$439	$578	$182	$230	$230.
Electric Compact (120 V)	$115	$194	$160	$160	$86.3	($62.6).
Vented Electric Compact (240 V).	$94.1	$201	$192	$192	$123	($94.8).
Vented Gas Standard	$77.7	$174	$198	$198	$198	$43.0.
Vented Gas Compact	$25.2	$23.5	$25.2		$29.4	($38.8).
Ventless Electric Compact (240 V).		$145	$145	$145	$145	$11.0.
Ventless Electric Combination Washer/Dryer.		$15.1	$15.1	$15.1	$15.1	($387).
Shipment-Weighted Average *	$219	$390	$507	$184	$222	$191.
Consumer Simple PBP (years)						
Electric Standard	0.7	0.6	0.6	1.7	4.0	4.0.
Electric Compact (120 V)	1.7	1.5	1.8	1.8	5.3	11.0.
Vented Electric Compact (240 V).	2.0	1.5	1.6	1.6	4.7	12.1.
Vented Gas Standard	2.8	1.6	1.9	1.9	1.9	5.5.
Vented Gas Compact	5.1	6.4	5.1	0.0	7.1	16.3.
Ventless Electric Compact (240 V).		0.3	0.3	0.3	0.3	7.1.
Ventless Electric Combination Washer-Dryer.		0	0	0	0	27.5.
Shipment-Weighted Average *	1.0	0.8	0.8	1.7	3.6	4.5.
Percent of Consumers that Experience a Net Cost						
Electric Standard	0.32%	0.16%	0.11%	53.5%	53.1%	53.1%.
Electric Compact (120 V)	5.66%	4.46%	21.6%	21.6%	53.0%	76.3%.
Vented Electric Compact (240 V).	8.63%	4.35%	8.37%	8.37%	47.0%	79.6%.
Vented Gas Standard	6.04%	1.66%	3.74%	3.74%	3.74%	59.3%.
Vented Gas Compact	32.7%	50.2%	32.7%		51.9%	78.8%.
Ventless Electric Compact (240 V).		0%	0%	0%	0%	66.4%.
Ventless Electric Combination Washer-Dryer.		0%	0%	0%	0%	89.8%.
Shipment-Weighted Average *	1.33%	0.45%	0.81%	44.4%	44.5%	54.7%.

Parentheses indicate negative (−) values.
* Weighted by shares of each product class in total projected shipments in 2027.

DOE first considered TSL 6, which represents the max-tech efficiency levels, which includes the design parameters of the most efficient products available on the market or in working prototypes for all product classes. The max-tech design options include heat pump technology for electric consumer clothes dryers and inlet air preheat technology for gas consumer clothes dryers. DOE's shipments analysis estimates approximately 1 percent of annual consumer clothes dryer shipments currently meet this level. TSL 6 would save an estimated 10.1 quads of energy, an amount DOE considers significant. Under TSL 6, the NPV of consumer benefit would be $6.60 billion using a discount rate of 7 percent, and $25.7 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 6 are 360 Mt of CO_2, 147 thousand tons of SO_2, 531 thousand tons of NO_X, 0.88 ton of Hg, 2,592 thousand tons of CH_4, and 3.64 thousand tons of N_2O. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC–GHG at a 3-percent discount rate) at TSL 6 is $16.3 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 6 is $10.3 billion using a 7-percent discount rate and $27.7 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 6 is $33.2 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 6 is $69.7 billion.

At TSL 6, the average LCC impact on affected consumers is a savings of $230 for electric standard (PC1), ($62.6) for electric compact (120V) (PC2), ($94.8) for vented electric compact (240V) (PC3), $43.0 for vented gas standard (PC4), ($38.8) for vented gas compact (PC5), $11.0 for ventless electric compact (240V) (PC6), and ($387) for ventless electric combination washer-dryer (PC7). The simple payback period is 4.0 years for PC1, 11.0 years for PC2, 12.1 years for PC3, 5.5 years for PC4, 16.3 years for PC5, 7.1years for PC6, and 27.5 years for PC7. The fraction of consumers experiencing a net LCC cost is 53.1 percent for PC1, 76.3 percent for PC2, 79.6 percent for PC3, 59.3 percent for PC4, 78.8 percent for PC5, 66.4 percent for PC6, and 89.8 percent for PC7. Overall, across the product classes a majority of consumers will experience a net LCC cost, especially for senior households. DOE estimated that more 65 percent of senior consumers will experience a net LCC cost at TSL 6.

At TSL 6, the projected change in INPV ranges from a decrease of $1,077.6 million to a decrease of $178.0 million, which correspond to decreases of 59.5 percent and 9.8 percent, respectively. The loss in INPV is largely driven by industry conversion costs as manufacturer work to redesign their portfolio of model offerings and re-tool entire factories to comply with amended standards at this level. Industry conversion costs could reach $1,280.0 million at this TSL.

Conversion costs at TSL 6 are significant as nearly all existing consumer clothes dryer models would need to be redesigned to meet the max-tech efficiencies. For the electric clothes dryer product classes, manufacturers would need to implement the most efficient heat pump technology to meet max-tech levels. Of the eight OEMs that offer domestic heat pump models, four of them already offer models that meet the efficiencies required by TSL 6. These four OEMs specialize in high-efficiency clothes dryers, but currently produce low volumes of products for the U.S. market. For the other four manufacturers of heat pump models, which have the most domestic sales and account for an estimated 72 percent of total annual clothes dryer shipments, TSL 6 would require substantial additional investments to their current heat pump product lines to produce cost-optimized models at the max-tech efficiency level. Seven out of 15 OEMs identified do not offer any models for the domestic market that utilize heat pump technology. A standard that could only be met using heat pump technology would require a total renovation of existing production facilities and would require most manufacturers to design completely new clothes dryer platforms, as they would not be able to maintain the resistive heating designs that currently dominate the U.S. electric clothes dryer market. In interviews, several manufacturers expressed concern about a potential shortage of products given the required scale of investment, redesign efforts, and compliance timeline.

For gas clothes dryers, manufacturers would need to implement inlet air preheat technology along with other design options to meet the efficiency levels required by TSL 6. Thus far, dryers with this technology and performance have not been observed in clothes dryers available on the consumer market. Clothes dryers with inlet air preheat designs have been observed only in laboratory settings. In interviews, some manufacturers raised concerns about implementing a relatively untested technology for the consumer market. There is very little industry experience with inlet air preheat designs. Several manufacturers speculated that implementing inlet air preheat would require a major overhaul of existing production facilities and a significant amount of engineering time.

At this level, DOE estimated a 13-percent drop in shipments in the year the standard takes effect, as price-sensitive consumers may forgo purchasing a new clothes dryer or rely on alternatives such as laundromats or clothes dryer rentals due to the increased upfront cost of baseline models.

The Secretary tentatively concludes that at TSL 6 for consumer clothes dryers, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the economic burden on many consumers, especially senior consumers, as well as the impacts on manufacturers, including the potential for large conversion costs and reduction in INPV.

TSL 6, representing the most efficient heat pump technology on the market, would provide significant energy savings potential, as discussed.

Despite the current and potential future benefits of heat pump technology, at TSL 6, the analysis indicates that a significant fraction of electric and vented gas standard clothes dryer consumers, including low-income and senior consumers, would experience a net cost given the current relatively high incremental cost of electric and vented gas standard clothes dryers at the max-tech efficiency level. This is particularly pronounced for electric standard clothes dryers, where the incremental production cost at the max-tech efficiency level is comparable to the manufacturer production cost for the baseline efficiency level. Consumers with existing electric standard clothes dryers below EL 4 (about 34 percent) and consumers with existing vented gas standard clothes dryers below EL 3 (about 58 percent) are more likely to experience a net cost at TSL 6, given the relatively modest decrease in operating costs compared to the high incremental installed costs. Few products currently meet the efficiency levels required by TSL 6. DOE estimates that approximately 1 percent of current shipments meet the max-tech efficiencies. At max-tech, limited industry experience by certain manufacturers with the high-efficiency design options, the large conversion costs to update facilities and product designs, and expected drop in industry shipments would result in a reduction of INPV and a potential shortage of products given the required scale of investment, redesign efforts, and time constraints. Consequently, the Secretary has tentatively concluded that TSL 6 is not economically justified.

DOE then considered TSL 5, which represents the maximum energy savings with positive NPV. TSL 5 corresponds to the max-tech level, which represents heat pump technology, for the electric standard product class, and the ELs corresponding to inlet air preheat technology in the electric compact (120V) and vented electric compact (240V) product classes considered in this analysis. For gas consumer clothes dryer product classes, TSL 5 corresponds to EL 3, which represents modulating (2-stage) heating technology. TSL 5 would save an estimated 9.97 quads of energy, an amount DOE considers significant. Under TSL 5, the NPV of consumer benefit would be $7.76 billion using a discount rate of 7 percent, and $27.8 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 5 are 354 Mt of CO_2, 147 thousand tons of SO_2, 516 thousand tons of NO_X, 0.88 ton of Hg, 2,519 thousand tons of CH_4, and 3.64 thousand tons of N_2O. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC–GHG at a 3-percent discount rate) at TSL 5 is $16.0 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 5 is $ 10.2 billion using a 7-percent discount rate and $27.3 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 5 is $33.9 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 5 is $71.1 billion.

At TSL 5, the average LCC impact on affected consumers is a savings of $230 for electric standard (PC1), $86.3 for electric compact (120V) (PC2), $123 for vented electric compact (240V) (PC3), $198 for vented gas standard (PC4), $29.4 for vented gas compact (PC5), $145 for ventless electric compact (240V) (PC6), and $15.1 for ventless electric combination washer-dryer (PC7). The simple payback period is 4.0 years for PC1, 5.3 years for PC2, 4.7 years for PC3, 1.9 years for PC4, 7.1 years for PC5, 0.3 years for PC6, and 0 years for PC7. The fraction of consumers experiencing a net LCC cost is 53.1 percent for PC1, 53.0 percent for PC2, 47.0 percent for PC3, 3.74 percent for PC4, 51.9 percent for PC5, zero percent for PC6 and PC 7. Overall, across the product classes, more than 40 percent of the consumers will experience a net LCC cost, especially for senior households. DOE estimated that more 55 percent of senior consumers will experience a net LCC cost at TSL 5.

At TSL 5, the projected change in INPV ranges from a decrease of $980.0 million to a decrease of $134.5 million, which correspond to decreases of 54.1 percent and 7.4 percent, respectively. Industry conversion costs could reach $1,164.2 million at this TSL.

DOE's shipments analysis estimates approximately 9 percent of annual shipments currently meet this level. The efficiency level for electric standard dryers, which account for 81 percent of annual shipments, is the same as at max-tech, and would be associated with the same current and potential future benefits as the market share of clothes dryers with heat pump technology continues to grow over time. Nonetheless, requiring heat pump technology for electric standard dryers at this time would result in similar conversion costs, reduction in INPV, and drop in shipments as TSL 6. For the electric compact (120V) and vented electric compact (240V) dryers, the design options include implementing inlet air preheat. In its review of the compact electric models commercially available on the U.S. market at this time, DOE did not identify any that incorporate the inlet air preheat technology option.

For the vented gas product classes, which account for approximately 17 percent of total annual shipments, the design options include implementing modulating (2-stage) heating technology along with other features. DOE's shipments analysis estimates that approximately 43 percent of gas clothes dryer shipments currently meet the efficiencies required by TSL 5. All seven manufacturers of gas clothes dryers offer products that meet or exceed the efficiencies required at TSL 5. DOE does not believe that there are any substantive barriers to modulating (2-stage) heating technology. Capital conversion costs would be necessary as manufacturers increase tooling for 2-stage heating systems. Product conversion costs would be necessary for cost-optimizing and testing new designs for a market with amended standards.

At this level, DOE expects an estimated 12-percent drop in shipments in the year the standard takes effect, as price-sensitive consumers may forgo purchasing a new clothes dryer or rely on alternatives such as laundromats or clothes dryer rentals due to the increased upfront cost of baseline models.

The Secretary tentatively concludes that at TSL 5 for consumer clothes dryers, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the economic burden on many consumers, especially senior consumers, as well as the impacts on manufacturers, including the significant conversion costs and large potential reduction in INPV. A significant fraction of electric standard clothes dryer consumers, including low-income and senior consumers, would experience a net cost. This is due to the high incremental cost of electric standard clothes dryers at the max-tech efficiency level. Consumers with existing electric standard clothes dryers below EL 4 are more likely to experience a net cost at TSL 5, given the relatively modest decrease in operating costs compared to the high incremental installed costs. DOE estimates that approximately 9 percent of shipments currently meet the efficiencies required by this TSL. At TSL 5, the limited industry experience with the high-efficiency design options, particularly for electric standard dryers which account for 81 percent of total shipments, the substantial conversion costs required to update facilities and product designs, and expected drop in industry shipments would result in a reduction in INPV and a potential shortage of electric standard dryers given the scale of required investment, redesign efforts, and time constraints. Consequently, the Secretary has tentatively concluded that TSL 5 is not economically justified.

DOE then considered TSL 4, which represents the maximum national energy savings with simple PBP less than 4 years for each product class. TSL 4 corresponds to the EL that represents inlet air preheat technology for the electric standard product class considered in this analysis. For the electric compact (120V) and vented electric compact (240V) product classes, TSL 4 corresponds to EL 4, which represents modulating (2-stage) heating technology. For the vented gas standard product class, TSL 4 corresponds to EL 3 which also represents modulating (2-stage) heating technology. TSL 4 would save an estimated 4.06 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be $7.13 billion using a discount rate of 7 percent, and $18.4 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 149 Mt of CO_2, 57.2 thousand tons of SO_2, 228 thousand tons of NO_X, 0.34 ton of Hg, 1,111 thousand tons of CH_4, and 1.44 thousand tons of N_2O. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC–GHG at a 3-percent discount rate) at TSL 4 is $6.89 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 4 is $4.52 billion using a 7-percent discount rate and $11.7 million using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 4 is $18.5 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 4 is $37.0 billion.

At TSL 4, the average LCC impact on affected consumers is a savings of $182 for electric standard (PC1), $160 for electric compact (120V) (PC2), $192 for vented electric compact (240V) (PC3), $198 for vented gas standard (PC4), $145 for ventless electric compact (PC6), and $15.1 for ventless electric combination washer-dryer (PC7). The simple payback period is 1.7 years for PC1, 1.8 years for PC2, 1.6 years for PC3, 1.9 years for PC4, 0.3 years for PC6, and 0 years for PC7. The fraction of consumers experiencing a net LCC cost is 53.5 percent for PC1, 21.6 percent for

PC2, 8.37 percent for PC3, 3.74 percent for PC4, zero percent for PC6 and PC 7.[88] Overall, across the product classes, more than 40 percent of the consumers will experience a net LCC cost, especially for senior households. DOE estimated that about 50 percent of senior consumers will experience a net LCC cost at TSL 4.

At TSL 4, the projected change in INPV ranges from a decrease of $441.3 million to a decrease of $227.6 million, which correspond to decreases of 24.4 percent and 12.6 percent, respectively. Industry conversion costs could reach $561.7 million at this TSL.

At TSL 4, the majority of consumer clothes dryer models would need to be redesigned to meet the efficiency levels required. DOE's shipments analysis estimates approximately 11 percent of current shipments meet this level. For electric standard dryers, the design options include implementing inlet air preheat and other features. As previously noted, electric standard dryers account for approximately 81 percent of total shipments. There is very little industry experience with inlet air preheat designs. Currently, DOE is not aware of any consumer clothes dryers on the market utilizing this design option. DOE's shipments analysis estimates that approximately 4 percent of electric standard shipments currently meet the efficiency required by TSL 4. Implementing inlet air preheat for electric standard dryers would represent a major overhaul of existing product lines and manufacturing facilities. This change would necessitate significant investments in new equipment and tooling. Product conversion costs would be necessary for designing, prototyping, and testing new or updated platforms.

For vented gas standard clothes dryers, the design options at TSL 4 are the same as at TSL 5. DOE does not believe that there are any substantive barriers to modulating (2-stage) heating technology. Capital conversion costs may be necessary as manufacturers increase tooling for 2-stage heating systems. Product conversion costs may be necessary for cost-optimizing and testing new designs for a market with amended standards.

At this level, DOE does not expect a notable drop in shipments in the year the standard takes effect.

The Secretary tentatively concludes that at TSL 4 for consumer clothes dryers, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the economic burden on many consumers, especially senior consumers, as well as the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV. A significant fraction of electric standard clothes dryer consumers, including senior consumers, would experience a net cost. This is due to the high incremental cost of electric standard clothes dryers at the inlet air preheat technology efficiency level. Consumers with existing electric standard clothes dryers below EL 4 are more likely to experience a net cost at TSL 4, given the relatively modest decrease in operating costs compared to the high incremental installed costs. Consequently, the Secretary has tentatively concluded that TSL 4 is not economically justified.

DOE then considered TSL 3, which represents a set of intermediate efficiency levels between those designated in TSL 2 and TSL 4 and corresponds to the current ENERGY STAR efficiency level for vented electric standard dryers, which represent over 80 percent of the market. TSL 3 corresponds to the EL that represents modulating (2-stage) heating technology for the electric standard, electric compact (120V), and vented electric compact (240V) product classes. For the vented gas standard product class, TSL 3 corresponds to EL 3, which also represents modulating (2-stage) heating technology. For the vented gas compact product class, TSL 3 corresponds to EL 1, which represents a baseline model with electronic controls. For the ventless electric (240V) product class, TSL 3 corresponds to EL 1, which represents a baseline model with a more advanced automatic termination control system. For the ventless electric combination washer-dryer product class, TSL 3 corresponds to EL 1, which represents a baseline model with high-speed spin technology. TSL 3 would save an estimated 3.11 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be $9.07 billion using a discount rate of 7 percent, and $20.8 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 116 Mt of CO_2, 42.6 thousand tons of SO_2, 181 thousand tons of NO_X, 0.26 ton of Hg, 883 thousand tons of CH_4, and 1.09 thousand tons of N_2O. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC–GHG at a 3-percent discount rate) at TSL 3 is $5.42 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 3 is $3.59 billion using a 7-percent discount rate and $9.14 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 3 is $18.1 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 3 is $35.4 billion.

At TSL 3, the average LCC impact on affected consumers is a savings of $578 for electric standard (PC1), $160 for electric compact (120V) (PC2), $192 for vented electric compact (240V) (PC3), $198 for vented gas standard (PC4), $25.2 for PC5, $145 for ventless electric compact (PC6), and $15.1 for ventless electric combination washer-dryer (PC7). The simple payback period is 0.6 years for the largest product class (PC1), 1.8 years for PC2, 1.6 years for PC3, 1.9 years for PC4, 5.1 years for PC5, 0.3 years for PC6, and 0 years for PC7. The fraction of consumers experiencing a net LCC cost is 0.11 percent for PC1, 21.6 percent for PC2, 8.37 percent for PC3, 3.74 percent for PC4, 32.7 percent for PC5, and zero percent for PC6 and PC7. Overall, across the product classes, less than 1 percent of the consumers, including low-income consumers, will experience a net LCC cost. For senior consumers, DOE estimated that 1 percent will experience a net LCC cost at TSL 3.

At TSL 3, the projected change in INPV ranges from a decrease of $115.6 million to a decrease of $81.6 million, which correspond to decreases of 6.4 percent and 4.5 percent, respectively. Industry conversion costs could reach $149.7 million at this TSL.

DOE expects that some existing consumer clothes dryer models would need to be redesigned to meet TSL 3 efficiencies, but there are a wide range of available models for vented electric standard dryers due to participation in the ENERGY STAR program. DOE's shipments analysis estimates approximately 59 percent of annual shipments currently meet this level. For electric standard, compact electric (120V), vented electric compact (240V), and vented gas standard clothes dryers, which account for over 98 percent of total annual shipments, the design options include implementing electronic controls, optimized heating systems, more advanced automatic termination controls, and modulating (2-stage) heat. Of the 15 electric dryer

[88] No economic impact values are reported for product class 5 under TSL4 because energy efficiency level for the product class is at baseline.

OEMs, 13 offer products at or above the efficiencies required for the electric dryer product classes at TSL 3. As previously noted, all seven OEMs of vented gas standard dryers offer products at or above the efficiency required at TSL 3. Capital conversion costs may be necessary as manufacturers increase tooling for 2-stage heating systems. Manufacturers may choose to further cost-optimize and test new designs as a result of the standards, but DOE believes some of this has already occurred in response to ENERGY STAR for vented electric standard dryers. DOE does not expect any drop in shipments in the year the standard takes effect.

After considering the analysis and weighing the benefits and burdens, the Secretary has tentatively concluded that a standard set at TSL 3 for consumer clothes dryers would result in the maximum improvement in energy efficiency that is technologically feasible and economically justified and would result in the significant conservation of energy. At this TSL, the average LCC savings for all consumer clothes dryer product classes are positive. An estimated weighted average of less than 1 percent of consumer clothes dryer consumers would experience a net cost. The FFC national energy savings are significant and the NPV of consumer benefits is positive using both a 3-percent and 7-percent discount rate. Notably, the benefits to consumers vastly outweigh the cost to manufacturers. At TSL 3, the NPV of consumer benefits, even measured at the more conservative discount rate of 7 percent, is over 78 times higher than the maximum estimated manufacturers' loss in INPV. The positive LCC savings—a different way of quantifying consumer benefits—reinforces this conclusion. The standard levels at TSL 3 are economically justified even without weighing the estimated monetary value of emissions reductions. When those emissions reductions are included—representing $5.42 billion in climate benefits (associated with the average SC–GHG at a 3-percent discount rate), and $9.14 billion (using a 3-percent discount rate) or $3.59 billion (using a 7-percent discount rate) in health benefits—the rationale becomes stronger still.

As stated, DOE conducts a ''walk-down'' analysis to determine the TSL that represents the maximum improvement in energy efficiency that is technologically feasible and economically justified as required under EPCA. The walk-down is not a comparative analysis, as a comparative analysis would result in the maximization of net benefits instead of energy savings that are technologically feasible and economically justified, and would be contrary to the statute. 86 FR 70892, 70908. Although DOE has not conducted a comparative analysis to select the proposed energy conservation standards, DOE notes that as compared to TSL 6, TSL 5, and TSL 4—TSL 3 has higher average LCC savings, smaller percentages of consumer experiencing a net cost, a lower maximum decrease in INPV, and lower manufacturer conversion costs.

Accordingly, the Secretary has tentatively concluded that TSL 3 would offer the maximum improvement in efficiency that is technologically feasible and economically justified and would result in the significant conservation of energy. For electric standard and vented gas standard consumer clothes dryers, which account for approximately 98 percent of U.S. shipments, requiring efficiency levels above the levels required by TSL 3 result in a large percentage of consumers experiencing a net LCC cost, in addition to significant manufacturer impacts and reductions in INPV. Additionally, for consumer clothes dryers, nearly all manufacturers offer products that can meet TSL 3 across both electric and gas consumer clothes dryers. In addition, DOE is proposing to adopt TSL 3, which corresponds to the current ENERGY STAR levels for electric standard and ventless compact electric (240V), which have significant market share and manufacturer support due to their promotion over the past couple of years as a voluntary energy-efficiency program. The adoption of standards, if finalized as proposed, at this TSL may encourage ENERGY STAR to further consider more-efficient levels for dryers in the year leadings up to the compliance of date of the standard, which would in turn likely spur additional market introductions of consumer clothes dryers with heat pump technology, foster maturation of the technology and downward price trends, and further support differentiation within the dryer market for energy efficient products. For electric and vented gas standard consumer clothes dryers, TSL 3 is comprised of EL 4 and EL 3, respectively, resulting in higher LCC savings, a significant reduction in the number of consumers experiencing a net cost, a lower maximum decrease in INPV, and lower conversion costs to the point where DOE has tentatively concluded they are economically justified, as discussed for TSL 3 in the preceding paragraphs.

Therefore, based on the previous considerations, DOE proposes to adopt the energy conservation standards for consumer clothes dryers at TSL 3. The proposed amended energy conservation standards for consumer clothes dryers, which are expressed as CEF_{D2}, are shown in Table V.45.

TABLE V.45—PROPOSED AMENDED ENERGY CONSERVATION STANDARDS FOR CONSUMER CLOTHES DRYERS

Product class	CEF_{D2} (lb/kWh)
Electric, Standard (4.4 cubic feet (''ft³'') or greater capacity)	3.93
Electric, Compact (120 volts (''V'')) (less than 4.4 ft³ capacity)	4.33
Vented Electric, Compact (240V) (less than 4.4 ft³ capacity)	3.57
Ventless Electric, Compact (240V) (less than 4.4 ft³ capacity)	2.68
Ventless Electric, Combination Washer-Dryer	2.33
Vented Gas, Standard (4.4 ft³ or greater capacity)	3.48
Vented Gas, Compact (less than 4.4 ft³ capacity)	2.02

2. Annualized Benefits and Costs of the Proposed Standards

The benefits and costs of the proposed standards can also be expressed in terms of annualized values. The annualized net benefit is (1) the annualized national economic value (expressed in 2020$) of the benefits from operating products that meet the proposed standards (consisting primarily of operating cost savings from using less energy, minus increases in product purchase costs, and (2) the annualized monetary value of the benefits of GHG and NO_X emission reductions.

Table V.46 shows the annualized values for consumer clothes dryers under TSL 3, expressed in 2020$. The results under the primary estimate are as follows.

Using a 7-percent discount rate for consumer benefits and costs and NO_X and SO_2 reduction benefits, and a 3-percent discount rate case for GHG social costs, the estimated cost of the proposed standards for consumer clothes dryers is $85.7 million per year in increased equipment costs, while the estimated annual benefits are $1,111 million from reduced equipment operating costs, $320 million from GHG reductions, and $406 million from reduced NO_X and SO_2 emissions. In this case, the net benefit amounts to $1,752 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards for consumer clothes dryers is $80.7 million per year in increased equipment costs, while the estimated annual benefits are $1,313 million in reduced operating costs, $320 million from GHG reductions, and $541 million from reduced NO_X and SO_2 emissions. In this case, the net benefit amounts to $2,094 million per year.

TABLE V.46—ANNUALIZED MONETIZED BENEFITS AND COSTS OF PROPOSED ENERGY CONSERVATION STANDARDS FOR CONSUMER CLOTHES DRYERS

[TSL 3]

	Million 2020$/year		
	Primary estimate	Low-net-benefits estimate	High-net-benefits estimate
3% discount rate			
Consumer Operating Cost Savings	1,313	1,227	1,403
Climate Benefits *	320	311	327
Health Benefits **	541	526	551
Total Benefits †	2,174	2,065	2,280
Consumer Incremental Product Costs ‡	80.7	80.5	76.6
Net Benefits	2,094	1,984	2,204
7% discount rate			
Consumer Operating Cost Savings	1,111	1,050	1,178
Climate Benefits *	320	311	327
Health Benefits **	406	395	413
Total Benefits †	1,837	1,757	1,917
Consumer Incremental Product Costs ‡	85.7	85.3	82.4
Net Benefits	1,752	1,671	1,835

Note: This table presents the costs and benefits associated with consumer clothes dryers shipped in 2027–2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027–2056.

* Climate benefits are calculated using four different estimates of the social cost of carbon (SC–CO_2), methane (SC–CH_4), and nitrous oxide (SC–N_2O) (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate). Together these represent the global social cost of greenhouse gases (SC–GHG). For presentational purposes of this table, the climate benefits associated with the average SC–GHG at a 3 percent discount rate are shown, but the Department does not have a single central SC–GHG point estimate. See section. IV.L of this document for more details. On March 16, 2022, the Fifth Circuit Court of Appeals (No. 22–30087) granted the Federal government's emergency motion for stay pending appeal of the February 11, 2022, preliminary injunction issued in *Louisiana* v. *Biden,* No. 21–cv–1074–JDC–KK (W.D. La.). As a result of the Fifth Circuit's order, the preliminary injunction is no longer in effect, pending resolution of the Federal government's appeal of that injunction or a further court order. Among other things, the preliminary injunction enjoined the defendants in that case from ''adopting, employing, treating as binding, or relying upon'' the interim estimates of the social cost of greenhouse gases—which were issued by the Interagency Working Group on the Social Cost of Greenhouse Gases on February 26, 2021—to monetize the benefits of reducing greenhouse gas emissions. As reflected in this rule, DOE has reverted to its approach prior to the injunction and presents monetized greenhouse gas abatement benefits where appropriate and permissible under law.

** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits, but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. The health benefits are presented at real discount rates of 3 and 7 percent. *See* section IV.L of this document for more details.

† Total benefits for both the 3-percent and 7-percent cases are presented using the average SC–GHG with 3-percent discount rate, but the Department does not have a single central SC–GHG point estimate. DOE emphasizes the importance and value of considering the benefits calculated using all four SC–GHG estimates.

‡ Costs include incremental equipment costs as well as installation costs.

D. Reporting, Certification, and Sampling Plan

In addition to reporting cycle time, the California IOUs also encouraged DOE to incorporate refrigerant type and charge quantity into the reporting requirement for any products that use heat pump technology, stating that the regulatory landscape around refrigerant types and charge quantity has been changing rapidly and disclosure of these two parameters would be useful for compliance with those requirements. The California IOUs also stated that ENERGY STAR currently allows manufacturers to voluntarily disclose the refrigerant type. (California IOUs, No. 26 at p. 6)

DOE will continue to monitor the regulatory landscape around refrigerants in the consumer clothes dryer industry, and if DOE determines that the additional reporting information would be useful, DOE may consider requiring that information in a future separate rulemaking that would address any necessary amendments to reporting requirements for all covered products and equipment.

Manufacturers, including importers, must use product-specific certification templates to certify compliance to DOE. For consumer clothes dryers, the certification template reflects the general certification requirements specified at 10 CFR 429.12 and the product-specific requirements specified at 10 CFR 429.21. As discussed in the previous paragraphs, DOE is not proposing to amend the product-specific certification requirements for consumer clothes dryers.

VI. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

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

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

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis (''IRFA'') for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by E.O. 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (Aug. 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website (*energy.gov/gc/office-general-counsel*). DOE has not prepared an IRFA for the products that are the subject of this proposed rulemaking.

DOE reviewed this proposed rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE certifies that the proposed rule, if adopted, would not have significant economic impact on a substantial number of small entities. The factual basis of this certification is set forth in the following paragraphs.

In accordance with EPCA, DOE is publishing this NOPR as part of the legislated 6-year review of energy conservation standards for consumer clothes dryers. (42 U.S.C. 6295(m)) The most recent standards rulemaking for consumer clothes dryers was promulgated on April 21, 2011. Specifically, DOE published a direct final rule (the ''2011 Direct Final Rule'') amending the energy conservation standard for consumer clothes dryers manufactured on and after January 1, 2015. 76 FR 22454 (Apr. 21, 2011). Pursuant to EPCA, any new or amended energy conservation standard must be designed to achieve the maximum improvement in energy efficiency that DOE determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) Furthermore, the new or amended standard must result in a significant conservation of energy. (42 U.S.C. 6295(o)(3)(B)) EPCA also provides that not later than 6 years after issuance of any final rule establishing or amending a standard, DOE must publish either a notice of determination that standards for the product do not need to be amended, or a NOPR including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6295(m))

For manufacturers of consumer clothes dryers, the SBA has set a size threshold, which defines those entities classified as ''small businesses'' for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. (*See* 13 CFR part 121.) The size standards are listed by North American Industry Classification System (''NAICS'') code and industry description and are available at *www.sba.gov/document/support-table-size-standards.* Manufacturing of consumer clothes dryers is classified under NAICS 335220, ''Major Household Appliance Manufacturing.'' The SBA sets a threshold of 1,500 employees or fewer for an entity to be considered as a small business for this category.

To estimate the number of companies that could be small business manufacturers of products covered by this rulemaking, DOE conducted a market survey using public information and subscription-based company reports to identify potential small business manufacturers. DOE reviewed the CCMS database,[89] California Energy Commission's Modernized Appliance Efficiency Database System (''MAEDbS''),[90] the ENERGY STAR Product Finder dataset,[91] individual company websites, import/export logs, and product specifications to create a list of companies that manufacture, produce, import, or private label the products covered by this rulemaking.

[89] U.S. Department of Energy's Compliance Certification Database is available at *regulations.doe.gov/certification-data* (last accessed October 8, 2021).

[90] California Energy Commission's Modernized Appliance Efficiency Database System is available at *cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx* (last accessed October 8, 2021).

[91] ENERGY STAR Product Finder is available at *energystar.gov/productfinder/* (last accessed October 8, 2021).

DOE relied on public information and market research tools (*e.g.,* reports from Dun and Bradstreet [92]) to determine company structure, location, headcount, and annual revenue. DOE screened out companies that do not manufacture the products covered by this rulemaking, do not meet the SBA's definition of a ''small business,'' or are foreign-owned and operated. DOE also asked stakeholders and industry representatives if they were aware of any small manufacturers during manufacturer interviews and through requests for comment.

DOE identified 15 OEMs of the covered product. Of these 15 OEMs, DOE determined none of them qualify as a domestic ''small business manufacturer'' of consumer clothes dryers. Given the lack of small domestic OEMs with a direct compliance burden, DOE concludes that the proposed rule would not have ''a significant impact on a substantial number of small entities.'' DOE requests comment on this certification conclusion.

DOE will transmit the certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act

Manufacturers of consumer clothes dryers must certify to DOE that their products comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their products according to the DOE test procedures for consumer clothes dryers, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including consumer clothes dryers. 76 FR 12422 (Mar. 7, 2011); 80 FR 5099 (Jan. 30, 2015). The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (''PRA''). This requirement has been approved by OMB under OMB control number 1910–1400.

In this rulemaking, DOE proposes standards expressed as the combined energy factor, determined in accordance with the appendix D2 test procedure (CEF_{D2}). Were this NOPR to be finalized as proposed, manufacturers of consumer clothes dryers would certify to DOE using the certification template associated with appendix D2 once the standard goes into effect. The public reporting burden under appendix D2 is not substantially different than the public reporting burden under appendix D1 and is already required for ENERGY STAR certification. Adopting standards based on the CEF_{D2} metric would not cause any measurable change in reporting burden or hours to manufacturers of consumer clothes dryers. Thus, DOE is not proposing any changes to its information collection requirements as these are already accounted for by DOE's existing regulations. DOE seeks comment on DOE's estimated burden for certifying compliance under appendix D2 should amended standards be finalized.

Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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

D. Review Under the National Environmental Policy Act of 1969

DOE is analyzing this proposed regulation in accordance with the National Environmental Policy Act of 1969 (''NEPA'') and DOE's NEPA implementing regulations (10 CFR part 1021). DOE's regulations include a categorical exclusion for rulemakings that establish energy conservation standards for consumer products or industrial equipment. 10 CFR part 1021, subpart D, appendix B5.1. DOE anticipates that this rulemaking qualifies for categorical exclusion B5.1 because it is a rulemaking that establishes energy conservation standards for consumer products or industrial equipment, none of the exceptions identified in categorical exclusion B5.1(b) apply, no extraordinary circumstances exist that require further environmental analysis, and it otherwise meets the requirements for application of a categorical exclusion. *See* 10 CFR 1021.410. DOE will complete its NEPA review before issuing the final rule.

E. Review Under Executive Order 13132

E.O. 13132, ''Federalism,'' 64 FR 43255 (Aug. 10, 1999), imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. The Executive order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE has examined this proposed rule and has tentatively determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this proposed rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297) Therefore, no further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of E.O. 12988, ''Civil Justice Reform,'' imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity, (2) write regulations to minimize litigation, (3) provide a clear legal standard for affected conduct rather than a general standard, and (4) promote simplification and burden reduction. 61 FR 4729 (Feb. 7, 1996). Regarding the review required by section 3(a), section 3(b) of E.O. 12988 specifically requires that executive agencies make every reasonable effort to ensure that the regulation: (1) clearly specifies the preemptive effect, if any, (2) clearly specifies any effect on existing Federal law or regulation, (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction, (4) specifies the retroactive effect, if any, (5) adequately defines key terms, and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section

[92] The Dun & Bradstreet subscription login is available at *app.dnbhoovers.com.*

3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this proposed rule meets the relevant standards of E.O. 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (''UMRA'') requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Public Law 104–4, section 201 (codified at 2 U.S.C. 1531). For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect them. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820. DOE's policy statement is also available at *energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf.*

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

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

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

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

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

Pursuant to E.O. 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 53 FR 8859 (Mar. 15, 1988), DOE has determined that this proposed rule would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

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

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

K. Review Under Executive Order 13211

E.O. 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,'' 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OIRA at OMB, a Statement of Energy Effects for any proposed significant energy action. A ''significant energy action'' is defined as any action by an agency that promulgates or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy, or (3) is designated by the Administrator of OIRA as a significant energy action. For any proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

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

L. Information Quality

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

In response to OMB's Bulletin, DOE conducted formal peer reviews of the energy conservation standards development process and the analyses that are typically used and has prepared a report describing that peer review.[93] Generation of this report involved a rigorous, formal, and documented evaluation using objective criteria and qualified and independent reviewers to make a judgment as to the technical/scientific/business merit, the actual or anticipated results, and the productivity and management effectiveness of programs and/or projects. DOE has determined that the peer-reviewed analytical process continues to reflect current practice, and the Department followed that process for developing energy conservation standards in the case of the present rulemaking.

VII. Public Participation

A. Participation in the Webinar

The time and date of the webinar are listed in the DATES section at the beginning of this document. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website: *www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=50&action=viewlive.* Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has plans to present a prepared general statement may request that copies of his or her statement be made available at the webinar. Such persons may submit requests, along with an advance electronic copy of their statement in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format, to the appropriate address shown in the ADDRESSES section at the beginning of this document. The request and advance copy of statements must be received at least one week before the public meeting and are to be emailed. Please include a telephone number to enable DOE staff to make follow-up contact, if needed.

C. Conduct of the Public Meeting

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

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

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

A transcript of the public meeting will be included in the docket, which can be viewed as described in the *Docket* section at the beginning of this document and will be accessible on the DOE website. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule before or after the public meeting, but no later than the date provided in the DATES section at the beginning of this proposed rule. Interested parties may submit comments, data, and other information using any of the methods described in the ADDRESSES section at the beginning of this document.

Submitting comments via www.regulations.gov. The *www.regulations.gov* web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment itself or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Otherwise, persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as

[93] The 2007 ''Energy Conservation Standards Rulemaking Peer Review Report'' is available at the following website: *energy.gov/eere/buildings/downloads/energy-conservation-standards-rulemaking-peer-review-report-0* (last accessed November 2021).

Confidential Business Information (''CBI'')). Comments submitted through *www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

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

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

Include contact information each time you submit comments, data, documents, and other information to DOE. No telefacsimiles (''faxes'') will be accepted.

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

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

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

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

E. Issues on Which DOE Seeks Comment

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

(1) DOE seeks comment on the method for estimating manufacturing production costs.

(2) DOE seeks comment on additional information regarding potential classification errors within the CCMS database. See section IV.A.1 of this document.

(3) DOE requests comment on any potential impacts that different technology options, including any that may impact cycle times, have on fabric care. See section IV.B.1 of this document.

(4) DOE seeks comment on the baseline and incremental efficiency levels used in the NOPR engineering analysis. See section IV.C.1 of this document.

(5) DOE seeks comment on the baseline and incremental MPCs from the NOPR engineering analysis, as well as any data on the impact of supply chain challenges that could better inform the cost analysis. See section IV.C.3 of this document.

(6) DOE seeks comment on product cost trends over time of heat pump technology. See section IV.F.1 of this document.

(7) DOE requests information and data on repair cost for replacing an electromechanical and electronic control panel. See section IV.F.5 of this document.

(8) DOE seeks input from interested parties on characterizing maintenance and repair costs for more-efficient consumer clothes dryers. See section IV.F.5 of this document.

(9) DOE requests comments, information, and data on the no-new-standards case efficiency distribution of consumer clothes dryers. See section IV.F.8 of this document.

(10) DOE requests comment on its methodology for estimating shipments. DOE also requests comment on its approach to estimate the market share for each consumer clothes dryer product class. See section IV.G of this document.

(11) DOE requests comment on any new information or data that points to an impact on usage due to a change in cycle times (See section IV.H.2 of this document) or changes to cycle times as a result of the proposed standard.

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

VIII. Approval of the Office of the Secretary

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

List of Subjects in 10 CFR Part 430

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

Signing Authority

This document of the Department of Energy was signed on August 14, 2022, by Kelly J. Speakes-Backman, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the **Federal Register**.

Signed in Washington, DC, on August 16, 2022.

Treena V. Garrett,

Federal Register Liaison Officer, U.S. Department of Energy.

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

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

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

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

■ 2. Amend § 430.32 by revising the introductory text to paragraph (h)(3) and adding paragraph (h)(4) to read as follows:

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

* * * * *

(h) * * *

(3) Clothes dryers manufactured on or after January 1, 2015 and before [*date 3*

years after publication of a final rule], shall have a combined energy factor no less than:

* * * * *

(4) Clothes dryers manufactured on or after [*date 3 years after publication of a final rule*], shall have a combined energy factor, determined in accordance with Appendix D2 of this subpart, no less than:

Product class	CEF_{D2} (lb/kWh)
Electric, Standard (4.4 ft^3 or greater capacity)	3.93
Electric, Compact (120V) (less than 4.4 ft^3 capacity)	4.33
Vented Electric, Compact (240V) (less than 4.4 ft^3 capacity)	3.57
Vented Gas, Standard (4.4 ft^3 or greater capacity)	3.48
Vented Gas, Compact (less than 4.4 ft^3 capacity)	2.02
Ventless Electric, Compact (240V) (less than 4.4 ft^3 capacity)	2.68
Ventless Electric, Combination Washer-Dryer	2.33

* * * * *

[FR Doc. 2022–17900 Filed 8–22–22; 8:45 am]

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