This document, concerning Room Air Conditioners is an action issued by the Department of Energy. Though it is not intended or expected, should any discrepancy occur between the document posted here and the document published in the Federal Register, the Federal Register publication controls. This document is being made available through the Internet solely as a means to facilitate the public's access to this document.

[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[EERE-2014-BT-STD-0059]

RIN: 1904-AD97

Energy Conservation Program: Energy Conservation Standards for Room Air Conditioners

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

ACTION: Notice of proposed rulemaking and announcement of a webinar.

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 room air conditioners. 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 room air conditioners, and also announces a webinar to receive comment on these proposed standards and associated analyses and results.

DATES: DOE will hold a webinar on Tuesday, May 3, 2022, from 12:30 p.m. to 4:30 p.m. See section VIII, "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 [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***].

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 [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***].

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-0059, by any of the following methods:

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

2) *Email*: *RoomAC2014STD0059@ee.doe.gov*. Include the docket number EERE-2014-BT-STD-0059 in the subject line of the message.

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

Although DOE has routinely accepted public comment submissions through a variety of mechanisms, including postal mail and hand delivery/courier, the Department has found it necessary to make temporary modifications to the comment submission process in light of the ongoing Covid-19 pandemic. DOE is currently suspending receipt of public comments via postal mail and hand delivery/courier. If a commenter finds that this change poses an undue hardship, please contact Appliance Standards Program staff at (202) 586-1445 to discuss the need for alternative arrangements. Once the COVID-19 pandemic health emergency is resolved, DOE anticipates resuming all of its regular options for public comment submission, including postal mail and hand delivery/courier.

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?D=EERE-2014-BT-STD-0059*. The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section VIII of this document 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 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. Sarah Butler, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) (202) 586-1777. E-mail: *Sarah.Butler@hq.doe.gov*.

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

SUPPLEMENTARY INFORMATION:

Table of Contents

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 room air conditioners ("room ACs"), the subject of this rulemaking.

Pursuant to EPCA, any new or amended energy conservation standard must be designed to achieve the maximum improvement in energy efficiency that 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 notice of proposed rulemaking 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 room ACs. The proposed standards, which are expressed in the amount of cooling provided per amount of energy consumed, measured in British thermal units per watt-hour (Btu/Wh) are shown in Table I.1. These proposed standards, if adopted, would apply to all room ACs

[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).

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 rulemaking.

Table I.1 Proposed Energy Conservation Standards for Room Air Conditioners

Equipment Class	CEER (*Btu/Wh*)
1. Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	13.1
2. Without reverse cycle, with louvered sides and 6,000 to 7,900 Btu/h	13.7
3. Without reverse cycle, with louvered sides and 8,000 to 13,900 Btu/h	16.0
4. Without reverse cycle, with louvered sides and 14,000 to 19,900 Btu/h	16.0
5a. Without reverse cycle, with louvered sides and 20,000 to 27,900 Btu/h	13.8
5b. Without reverse cycle, with louvered sides and 28,000 Btu/h or more	13.2
6. Without reverse cycle, without louvered sides, and less than 6,000 Btu/h	12.8
7. Without reverse cycle, without louvered sides and 6,000 to 7,900 Btu/h	12.8
8a. Without reverse cycle, without louvered sides and 8,000 to 10,900 Btu/h	14.1
8b. Without reverse cycle, without louvered sides and 11,000 to 13,900 Btu/h	13.9
9. Without reverse cycle, without louvered sides and 14,000 to 19,900 Btu/h	13.7
10. Without reverse cycle, without louvered sides and 20,000 Btu/h or more	13.8
11. With reverse cycle, with louvered sides, and less than 20,000 Btu/h	14.4
12. With reverse cycle, without louvered sides, and less than 14,000 Btu/h	13.7
13. With reverse cycle, with louvered sides, and 20,000 Btu/h or more	13.7
14. With reverse cycle, without louvered sides, and 14,000 Btu/h or more	12.8
15. Casement-Only	13.9
16. Casement-Slider	15.3

A. Benefits and Costs to Consumers

Table I.2 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of room ACs, as measured by the average life-cycle cost ("LCC") savings and the simple payback period ("PBP").[3] The average LCC savings are

[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).

positive for all product classes, and the PBP is less than the average lifetime of a room AC, which is estimated to be 9 years (see section IV.F.6 of this document).

Table I.2 Impacts of Proposed Energy Conservation Standards on Consumers of Room Air Conditioners for Representative Product Classes (TSL 3)

Room AC Product Class	Average LCC Savings (*2020$*)	Simple Payback Period (*years*)
1. Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	$63.49	0.7
2. Without reverse cycle, with louvered sides and 6,000 to 7,900 Btu/h	$80.02	0.9
3. Without reverse cycle, with louvered sides and 8,000 to 13,900 Btu/h	$99.14	2.8
4. Without reverse cycle, with louvered sides and 14,000 to 19,900 Btu/h	$97.49	2.9
5a. Without reverse cycle, with louvered sides and 20,000 Btu/h to 27,900 Btu/h	$152.52	2.6
5b. Without reverse cycle, with louvered sides and 28,000 Btu/h or more	$275.19	2.3
8a. Without reverse cycle, without louvered sides and 8,000 to 10,900 Btu/h	$74.28	3.3
8b. Without reverse cycle, without louvered sides and 11,000 to 13,900 Btu/h	$116.89	2.4
9. Without reverse cycle, without louvered sides and 14,000 to 19,900 Btu/h	$162.64	2.8
11. With reverse cycle, with louvered sides, and less than 20,000 Btu/h	$131.12	3.2
12. With reverse cycle, without louvered sides, and less than 14,000 Btu/h	$122.74	2.5
16. Casement-Slider	$81.33	4.0

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 (2021–2055). Using a real discount rate of 7.2 percent, DOE estimates that the INPV for manufacturers of room ACs in the case without amended standards is $1.08 billion in 2020$. Under the proposed standards, the change in INPV is estimated to range from -6.0 percent to 7.8 percent, which is approximately -$64.5 million to $84.1 million. In order to bring products into compliance with amended standards, DOE estimated that the industry would incur total conversion costs of $22.8 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 room ACs would save a significant amount of energy. Relative to the case without amended standards, the lifetime energy savings for room ACs purchased in the 30-year period that begins in the anticipated year of compliance with the amended standards (2026–2055) amount to 1.40 quadrillion British thermal units ("Btu"), or quads.[5] This represents a savings of 12 percent relative to the energy use of these products in the case without amended standards (referred to as the "no-new-standards case").

[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.

The cumulative net present value ("NPV") of total consumer benefits of the proposed standards for room ACs are $4.83 billion (at a 7-percent discount rate) and $10.56 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 room ACs purchased in 2026–2055.

In addition, the proposed standards for room ACs 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 49.5 million metric tons ("Mt")[6] of carbon dioxide ("CO_2"), 19.1 thousand tons of sulfur dioxide ("SO_2"), 69.4 thousand tons of nitrogen oxides ("NO_X"), 339.3 thousand tons of methane ("CH_4"), 0.5 thousand tons of nitrous oxide ("N_2O"), and 0.1 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

[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* ("*AEO 2021*"). *AEO 2021* 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 *AEO 2021* assumptions that effect air pollutant emissions.

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 is $2.39 billion. 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.

DOE also estimates health benefits from SO_2 and NO_X emissions reductions.[9] DOE estimates the present value of the health benefits would be $1.82 billion using a 7-percent discount rate, and $4.14 billion using a 3-percent discount rate.[10] DOE is currently only monetizing (for SO_2 and NO_X) PM2.5 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 PM2.5 emissions.[11]

---

[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, D.C., February 2021, *available at www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf?source=email*

[9] DOE estimated the monetized value of NO_X and SO_2 emissions reductions associated with electricity savings using benefit per ton estimates from the scientific literature. See section IV.L.2 of this document for further discussion.

[10] DOE estimates the economic value of these emissions reductions resulting from the considered TSLs for the purpose of complying with the requirements of Executive Order 12866.

[11] 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. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.

Table I.3 summarizes the economic benefits and costs expected to result from the proposed standards for room ACs. In the table, total benefits for both the 3-percent and 7-percent cases are presented using the average GHG social costs with 3-percent discount rate. 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. The estimated total net benefits using each of the four SC-GHG estimates are presented in section V.B.8.

Table I.3 Summary of Monetized Economic Benefits and Costs of Proposed Energy Conservation Standards for Room Air Conditioners for TSL 3

	Billion 2020$
3% discount rate	
Consumer Operating Cost Savings	13.87
Climate Benefits*	2.39
Health Benefits**	4.14
Total Benefits†	20.41
Consumer Incremental Product Costs‡	3.31
Net Benefits	17.10
7% discount rate	
Consumer Operating Cost Savings	6.89
Climate Benefits*	2.39
Health Benefits**	1.82
Total Benefits†	11.10
Consumer Incremental Product Costs‡	2.05
Net Benefits	9.05

Note: This table presents the costs and benefits associated with consumer room ACs shipped in 2026−2055. These results include benefits to consumers which accrue after 2055 from the products shipped in 2026−2055.
*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.50 through Table V.52. 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
** 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 consumer, climate, and health benefits. 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.55 for net benefits 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. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.
‡ Costs include incremental equipment costs as well as installation costs.

The benefits and costs of the proposed standards, for room ACs sold in 2026–2055, 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 GHG, NO_X, and SO_2 emission reductions, all annualized.[12]

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 room ACs shipped in 2026–2055. The climate benefits associated with

[12] 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.

reduced GHG emissions achieved as a result of the proposed standards are also calculated based on the lifetime of room ACs shipped in 2026–2055.

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, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated cost of the standards proposed in this rule is $216.9 million per year in increased equipment costs, while the estimated annual benefits are $727.5 million in reduced equipment operating costs, $137.5 million in climate benefits, $192.1 million in health benefits. In this case, the net benefit would amount to $840.2 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards is $190.1 million per year in increased equipment costs, while the estimated annual benefits are $796.7 million in reduced operating costs, $137.5 million in climate benefits, and $237.9 million in health benefits. In this case, the net benefit would amount to $982.0 million per year.

Table I.4 Annualized Monetized Benefits and Costs of Proposed Energy Conservation Standards for Room Air Conditioners for TSL 3

	Million 2020$/year		
	Primary Estimate	**Low-Net-Benefits Estimate**	**High-Net-Benefits Estimate**
3% discount rate			
Consumer Operating Cost Savings	796.7	751.9	847.8
Climate Benefits*	137.5	134.2	140.4
Health Benefits**	237.9	232.3	242.7
Total Benefits†	1,172.0	1,118.4	1,230.9
Consumer Incremental Product Costs‡	190.1	213.2	163.1
Net Benefits	982.0	905.2	1,067.7
7% discount rate			
Consumer Operating Cost Savings	727.5	693.3	768.4
Climate Benefits*	137.5	134.2	140.4
Health Benefits**	192.1	188.1	195.7
Total Benefits†	1,057.1	1,015.6	1,104.4
Consumer Incremental Product Costs‡	216.9	240.0	190.0
Net Benefits	840.2	775.7	914.5

Note: This table presents the costs and benefits associated with room ACs shipped in 2026–2055. These results include benefits to consumers which accrue after 2055 from the products shipped in 2026–2055.
* 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, and it emphasizes the importance and value of considering the benefits calculated using all four SC-GHG estimates. See section IV.L of this document for more details.
** 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 consumer, climate, and health benefits. 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. 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. In the

absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.
‡ 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. Based on the analyses described previously, DOE has tentatively concluded that the benefits of the proposed standards to the Nation (energy savings, positive NPV of consumer benefits, consumer LCC savings, and emission reductions) would outweigh the burdens (loss of INPV for manufacturers and LCC increases for some consumers).

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

Based on consideration of the public comments DOE receives in response to this 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 room ACs.

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 room ACs, the subject of this document. (42 U.S.C. 6292(a)(2)) EPCA prescribed energy conservation standards for these products (42 U.S.C. 6295(c)(1)), and directs DOE to conduct future rulemakings to determine whether to amend these standards. (42 U.S.C. 6295(c)(2)) 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 room ACs appear at title 10 of the Code of Federal Regulations ("CFR") part 430, subpart B, appendix F.

DOE must follow specific statutory criteria for prescribing new or amended standards for covered products, including room ACs. 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 ("Secretary") determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A) Furthermore, DOE may not adopt any standard that would not result in the significant conservation of energy. (42 U.S.C. 6295(o)(3))

Moreover, DOE may not prescribe a standard: (1) for certain products, including room ACs, if no test procedure has been established for the product, or (2) if DOE determines by rule that the standard is not technologically feasible or economically justified. (42 U.S.C. 6295(o)(3)(A)–(B)) In deciding whether a proposed standard is economically justified, DOE must determine whether the benefits of the standard exceed its burdens. (42 U.S.C. 6295(o)(2)(B)(i)) DOE must make this determination after receiving comments on the proposed standard, and by considering, to the greatest extent practicable, the following seven statutory factors:

1) The economic impact of the standard on manufacturers and consumers of the products subject to the standard;
2) The savings in operating costs throughout the estimated average life of the covered products in the type (or class) compared to any increase in the price,

initial charges, or maintenance expenses for the covered products that are likely to result from the standard;

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

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

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

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

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

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 room ACs 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

In a direct final rule published on April 21, 2011 ("April 2011 Direct Final Rule"), DOE prescribed the current energy conservation standards for room ACs. 76 FR 22454. These standards are set forth in DOE's regulations at 10 CFR 430.32(b) and are repeated in Table II.1 where CEER stands for "Combined Energy Efficiency Rating."

Table II.1 Federal Energy Conservation Standards for Room Air Conditioners

Room AC Product Class	**Minimum CEER,** (*Btu/Wh*)
1. Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	11.0
2. Without reverse cycle, with louvered sides and 6,000 to 7,999 Btu/h	11.0
3. Without reverse cycle, with louvered sides and 8,000 to 13,999 Btu/h	10.9
4. Without reverse cycle, with louvered sides and 14,000 to 19,999 Btu/h	10.7
5a. Without reverse cycle, with louvered sides and 20,000 Btu/h to 27,999 Btu/h	9.4
5b. Without reverse cycle, with louvered sides and 28,000 Btu/h or more	9.0
6. Without reverse cycle, without louvered sides, and less than 6,000 Btu/h	10.0
7. Without reverse cycle, without louvered sides and 6,000 to 7,999 Btu/h	10.0
8a. Without reverse cycle, without louvered sides and 8,000 to 10,999 Btu/h	9.6
8b. Without reverse cycle, without louvered sides and 11,000 to 13,999 Btu/h	9.5
9. Without reverse cycle, without louvered sides and 14,000 to 19,999 Btu/h	9.3

Room AC Product Class	**Minimum CEER,** (*Btu/Wh*)
10. Without reverse cycle, without louvered sides and 20,000 Btu/h or more	9.4
11. With reverse cycle, with louvered sides, and less than 20,000 Btu/h	9.8
12. With reverse cycle, without louvered sides, and less than 14,000 Btu/h	9.3
13. With reverse cycle, with louvered sides, and 20,000 Btu/h or more	9.3
14. With reverse cycle, without louvered sides, and 14,000 Btu/h or more	8.7
15. Casement-Only	9.5
16. Casement-Slider	10.4

2. History of Standards Rulemaking for Room ACs

EPCA prescribed initial energy conservation standards for room ACs and further directed DOE to conduct two cycles of rulemakings to determine whether to amend these standards. (42 U.S.C. 6295(c)(1)–(2)) DOE completed the first of these rulemaking cycles on September 24, 1997 by adopting amended performance standards for room ACs manufactured on or after October 1, 2000. 62 FR 50122. Additionally, DOE completed a second rulemaking cycle to amend the standards for room ACs by issuing the April 2011 Direct Final Rule, in which DOE prescribed the current energy conservation standards for room ACs manufactured on or after April 21, 2014. 76 FR 22454 (April 21, 2011). DOE subsequently published a final rule amending the compliance date for the current room AC standards to June 1, 2014. 76 FR 52852 (Aug. 24, 2011). In a separate notice, also published on August 24, 2011, DOE confirmed the adoption of these energy conservation standards in a notice of effective date and compliance dates for the April 2011 Direct Final Rule. 76 FR 52854.

As part of the current analysis, on June 18, 2015, DOE prepared a Request for

Information ("June 2015 RFI"), which solicited information from the public to help DOE determine whether amended standards for room ACs would result in a significant amount of additional energy savings and whether those standards would be technologically feasible and economically justified.[13] 80 FR 34843.

Comments received following the publication of the June 2015 RFI helped DOE identify and resolve issues related to the subsequent preliminary analysis.[14] DOE published a notice of public meeting and availability of the preliminary technical support document ("TSD") on June 17, 2020 ("June 2020 Preliminary Analysis"). 85 FR 36512. DOE subsequently held a public meeting on August 5, 2020, 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-0059-0013*.

DOE received comments in response to the June 2020 Preliminary Analysis from the interested parties listed in Table II.2.

[13] Pursuant to amendments to appendix A to 10 CFR part 430, subpart C ("Appendix A") DOE generally will issue an early assessment request for information announcing that DOE is considering initiating a rulemaking proceeding. Section 6(a)(1) of Appendix A; *see also* 85 FR 8626, 8637 (Feb. 14, 2020) and 86 FR 70892 (December 13, 2021). Section 6(a)(2) of Appendix A provides that if the DOE 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. Because this rulemaking was already in progress at the time the relevant amendments to the Process Rule were published, DOE did not reinitiate the entire rulemaking process. Additionally, the June 2015 RFI presented the issues, analyses, and processes relevant to consideration of amended standards for room ACs.

[14] Comments are available at *www.regulations.gov/document/EERE-2014-BT-STD-0059-0001/comment*

Table II.2 June 2020 Preliminary Analysis Written Comments

Organization(s)	Reference in this NOPR	Organization Type
Appliance Standards Awareness Project, Consumer Federation of America, National Consumer Law Center (on behalf of its low-income clients), Natural Resources Defense Council	Joint Commenters	Efficiency Organizations
Association of Home Appliance Manufacturers	AHAM	Trade Association
California Investor-Owned Utilities	California IOUs	Utilities
Northwest Energy Efficiency Alliance	NEEA	Efficiency Organization
Institute for Policy Integrity at NYU School of Law, Montana Environmental Information Center, Natural Resources Defense Council, Sierra Club, Union of Concerned Scientists	Social Cost of Carbon Commenters ("SCoC Commenters")	Efficiency Organizations
GE Appliances	GEA	Manufacturer
C. Keith Rice	Rice	Individual

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

C. Deviation from Appendix A

In accordance with section 3(a) of 10 CFR Part 430, subpart C, appendix A ("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(d)(2) of appendix A specifies that the length of the public comment period for a NOPR

[15] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop energy conservation standards for room ACs. (Docket NO. EERE-2014-BT-STD-0059, which is maintained at *www.regulations.gov/docket?D=EERE-2014-BT-STD-0059)*. The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

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, DOE requested comment in the June 2015 RFI on the technical and economic analyses and provided stakeholders a 76-day comment period. 80 FR 34843, 80 FR 44301. Additionally, DOE provided a 74-day comment period for the June 2020 preliminary analysis. 85 FR 36512, 85 FR 52280. 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.

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 making a determination whether a performance-related feature justifies a different standard, DOE must consider such factors as the utility of the feature to the consumer and other factors DOE determines are appropriate. (42 U.S.C. 6295(q)) DOE’s preliminary analysis indicated that the current room AC product classes are still appropriate.

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. In addition, consistent with section 8(d)(1)(i) of Appendix A, DOE will finalize amended test procedures that impact measured energy use or efficiency at least 180 days prior to the close of the comment period for a NOPR proposing new or amended energy conservation standards. DOE published a test procedure final rule on March 29, 2021, retaining the CEER metric used to express DOE’s current energy conservation standards for room ACs in Btu/Wh. 86 FR 16446. DOE’s test procedures for room ACs appear at appendix F to 10 CFR part 430, subpart B.

C. Technological Feasibility

1. General

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

For each trial standard level ("TSL"), DOE projected energy savings from application of the TSL to room ACs purchased in the 30-year period that begins in the year of compliance with the proposed standards (2026–2055).[16] The savings are measured over the entire lifetime of a room AC 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 room ACs. 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

[16] 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.

is used to generate and transmit the site electricity. DOE also calculates NES in terms of full-fuel cycle ("FFC") energy savings. The FFC metric includes the energy consumed in extracting, processing, and transporting primary fuels (*i.e.*, coal, natural gas, petroleum fuels), and thus presents a more complete picture of the impacts of energy conservation standards.[17] 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.

1. Significance of Savings

To adopt any new or amended standards for a covered product, DOE must determine that such action would result in significant energy savings. (42 U.S.C. 6295(o)(3)(B)) Although the term "significant" is not defined in the EPCA, the U.S. Court of Appeals, for the District of Columbia Circuit in *Natural Resources Defense Council v. Herrington*, 768 F.2d 1355, 1373 (D.C. Cir. 1985), opined that Congress intended "significant" energy savings in the context of EPCA to be savings that were not "genuinely trivial."

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.[18] For example, the United States recently

[17] 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).
[18] 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).

rejoined the Paris Agreement and will exert leadership in confronting the climate crisis. These actions have placed an increased emphasis on the importance of energy savings that reduce greenhouse gas emissions and help mitigate the climate crisis. Additionally, some covered products and equipment, particularly those providing space cooling, such as room ACs, are likely to consume significant energy 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. Lastly, 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 is evaluating the significance of energy savings on a case-by-case basis. DOE has initially determined the energy savings for the TSL proposed in this rulemaking are nontrivial, and, therefore, DOE considers them "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 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 product-specific 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. As part of the analysis of the need for national energy and water conservation, 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.

g. Other Factors

In determining whether an energy conservation standard is economically justified, DOE may consider 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 room ACs. Separate subsections address each component of DOE's analyses.

DOE used several analytical tools to estimate the impact of the standards proposed in this document. The first tool is a spreadsheet that calculates the LCC savings and PBP of potential amended or new energy conservation standards. The national impacts analysis uses a second spreadsheet set that provides shipments 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?D=EERE-2014-BT-STD-0059*. 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 room ACs. 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

In the June 2020 Preliminary Analysis, DOE did not identify any potential changes to the room AC scope of coverage or product classes. 85 FR 36512.

The Joint Commenters expressed concerns regarding DOE's current set of room AC product classes. (Joint Commenters, No. 20 at p. 1[19]) The Joint Commenters disagreed with DOE's explanation that Product Classes 1 and 6 are necessary, despite having the same efficiency requirements as Product Classes 2 and 7, respectively, to recognize the value to certain consumer segments of a low-cost, low-cooling capacity room AC in Product Classes 1 and 6. They did not object to maintaining these product class distinctions based on cooling capacity, but suggested that cost must not be a rationale for maintaining the distinctions because cost is not a "performance-related feature." *Id.*

[19] A notation in the form "Joint Commenters, No. 20 at p. 1" identifies a written comment: (1) made by the Joint Commenters; (2) recorded in document number 20 that is filed in the docket of this energy conservation standards rulemaking (Docket No. EERE-2014-BT-STD-0059) and available for review at *www.regulations.gov*; and (3) which appears on page 1 of document number 20.

DOE understands the Joint Commenters' concerns about cost being a rationale for distinguishing product classes. However, the cost is substantively related to the performance-related features used to distinguish between the product classes, namely product size and weight. The NOPR analysis, based on models currently on the market, identified different efficiency levels above the ENERGY STAR® qualification levels for Product Classes 1 and 2, showing that these product classes have performance-related distinctions between them.

While DOE is not proposing to combine product classes at this time, DOE is proposing a clarifying modification to the cooling capacity descriptors delineating the product classes, specifying that the capacity used to determine the product class of a basic model is the certified cooling capacity and expressing the capacity ranges to the nearest hundred British thermal units per hour ("Btu/h") in accordance with the rounding instruction in 10 CFR 429.15(a)(3). For example, Product Class 2 currently specifies it includes room ACs with capacities ranging from 6,000 to 7,999 Btu/h; however, DOE recognizes that based on the rounding instruction in 10 CFR 429.15(a)(3), the upper range of this product class is, in practice, 7,900 Btu/h. Accordingly, DOE proposes in this NOPR to revise the threshold values of cooling capacity in the product class descriptions to the nearest hundred Btu/h that would not exceed the existing thresholds. DOE believes this slight modification that is being proposed for product class delineation is what manufacturers are using today in practice due to the rounding instruction at 10 CFR 429.15(a)(3) and will not impact compliance with current energy conservation standards. DOE is simply proposing to add clarity and consistency amongst two existing regulatory provisions.

DOE requests comment on the proposal to make clarifying amendments to the product class descriptions, but otherwise not make any changes to room AC product classes.

For ease of reviewing this NOPR, DOE is presenting the results of its analysis using the existing product class descriptions. The proposed new labeling of the product class thresholds using the rounded cooling capacity values are included in the proposed standards in Table I.1 and Table V.58.

2. Technology Options

In the preliminary market analysis and technology assessment, DOE identified 22 technology options that would likely improve the efficiency of room ACs, as measured by the DOE test procedure:

Table IV.1 Technology Options for Room Air Conditioners

Increased Heat Transfer Surface Area
1. Increased heat exchanger surface area (frontal area, fin density and depth of coil)
2. Condenser coil subcooler
3. Suction line heat exchanger
Increased Heat Transfer Coefficient
4. Improved fin and tube design
5. Hydrophilic coating on fins
6. Microchannel heat exchangers
7. Spray condensate on condenser coil
Component Improvements
8. Improved indoor blower and outdoor fan blade design
9. Improved blower/fan motor design
10. Improved compressor efficiency
Improved Installation, Insulation, and Airflow
11. Improved installation materials

12. Reduced evaporator air recirculation
13. Reduced thermal bridging and internal air leakage
Part-load Performance
14. Variable-speed compressors
15. Variable-speed drive fans and blowers
16. Thermostatic or electronic expansion valves
17. Thermostatic cyclic controls
18. Air and water economizers
Standby Power Improvements
19. Low standby-power electronics
20. High frequency switching power supply
Alternative Refrigerants
21. SNAP-approved refrigerants (R-32, R-441A, and R-290)
Other Improvements
22. Washable air filters

Several commenters provided feedback on some of these technology options. These comments are summarized below, along with DOE's responses.

a. Reduced Evaporator Air Recirculation

The Joint Commenters referenced a 2013 National Renewable Energy Laboratory ("NREL") study in which room AC performance was found to degrade with evaporator air recirculation, with the cooling coefficient of performance ("COP") decreasing by 7 percent on average.[20, 21] The Joint Commenters emphasized NREL's conclusion that the room AC energy efficiency ratio ("EER") could be improved by at least 1 Btu/Wh using simple and low-cost methods such as supplying air from the bottom rather than the top of the interior face, or providing an attachment fin to separate supply and return airflows. The Joint Commenters noted that DOE mentioned the results of this NREL study in the

[20] As determined using experimental infrared camera imaging techniques applied to units outside of controlled calorimeter chamber conditions.
[21] *s3.amazonaws.com/szmanuals/f50601c1a4960b3d7627df44cc951d28.*

preliminary TSD but did not consider reduced evaporator air recirculation in the engineering analysis. Thus, given the large potential energy savings, the Joint Commenters urged DOE to investigate how to model the efficiency improvement associated with reduced evaporator air recirculation. (Joint Commenters, No. 20 at p. 2)

DOE is aware of, and has reviewed the 2013 NREL study cited by the Joint Commenters, and notes that that study had a limited sample of four room ACs from only two different manufacturers (Frigidaire and GE/Haier), and found a wide range of COP degradation due to evaporator air recirculation, from losses as low as 2 percent to as high as 19 percent. Without intensive airflow modeling of each unit analyzed in the DOE teardown sample, more data on evaporator air recirculation in the market as a whole, and test data from a unit incorporating the sort of airflow changes suggested by NREL (DOE is not aware of such a unit on the market), DOE is unable to properly assess the impacts, both positive and negative of evaporator air recirculation reduction as a technology. Therefore, DOE is not incorporating this technology into its engineering analysis. DOE seeks additional comment on whether evaporator air recirculation should be included in the engineering analysis.

b. Compressors

AHAM and GEA stated that their data do not support DOE’s assumptions regarding the efficiency of single-speed compressors. (AHAM, No. 19 at p. 12; GEA, No. 26 at pp. 1–2)

Feedback given to DOE by manufacturers during interviews supported the commenters' assertion that the efficiency of the most efficient single-speed compressor available was overestimated in the June 2020 Preliminary Analysis. Upon further analysis, DOE has reduced its estimate for the efficiency of the most efficient single-speed R-410a compressor available, from 13.1 to 10.9 Btu/Wh, based on a comprehensive survey of compressor catalogues and information provided by manufacturers, as discussed further in chapter 3 of the NOPR TSD. However, as discussed below, DOE also implemented a changeover from R-410A to R-32 refrigerant, resulting in the most efficient available single-speed compressor being 12.7 Btu/Wh. DOE requests comment on the updated single-speed compressor maximum efficiency estimates.

c. Significant New Alternatives Policy (SNAP)-Approved Refrigerants

In the June 2020 Preliminary Analysis, DOE discussed the potential for alternative refrigerants, restricted to the Significant New Alternatives Policy ("SNAP")-approved refrigerants (*i.e.* R-32, R-441A, R-290),[22] but decided to forgo implementing them in the engineering analysis because they either did not significantly improve unit efficiency or DOE lacked sufficient technical and economic data to assess the costs and benefits of a changeover. AHAM, the California IOUs, Joint Commenters, and NEEA disagreed with DOE's decision not to consider these alternative refrigerants in the engineering analysis. They stated that alternative refrigerants are already in use for some

[22] For the latest information on EPA SNAP regulations, visit: *www.epa.gov/snap/snap-regulations.*

product classes to meet current energy conservation standards (baseline) and ENERGY STAR (Efficiency Level ("EL 2")) levels. (AHAM, No. 19 at pp. 10−11; California IOUs, No. 23 at p. 3; Joint Commenters, No. 20 at p. 2; NEEA, No. 24 at pp. 4−5; NEEA, Public Meeting Transcript, No. 18 at pp. 59−60)[23] AHAM emphasized the significant costs associated with changing refrigerant type. (AHAM, No. 19 at pp. 10−11) The California IOUs, Joint Commenters, and NEEA specifically noted that room ACs using R-32 are now widely available in the United States, suggesting that the use of alternative refrigerants is not cost prohibitive to manufacturers, as DOE stated in the preliminary TSD. NEEA stated that manufacturers using R-32 in air conditioning systems have generally found energy savings ranging from 8 to 11 percent. AHAM, the California IOUs, and NEEA noted that there is currently a proposed rule from the California Air Resource Board ("CARB") that would ban all refrigerants with global warming potential ("GWP") equal to or greater than 750 in new residential and commercial AC systems beginning in 2023 and would likely push additional manufacturers to explore alternative refrigerants.[24] (AHAM, No. 19 at pp. 10−11; California IOUs, No. 23 at p. 3; Joint Commenters, No. 20 at p. 2; NEEA, No. 24 at pp. 4−5; NEEA, Public Meeting Transcript, No. 18 at pp. 59−60) The Joint Commenters referenced a study performed by the Oak Ridge National Laboratory ("ORNL") in which ORNL developed a high-efficiency room AC to determine the viability of a window AC

[23] A notation in the form "NEEA, Public Meeting Transcript, No. 18 at pp. 59-60" identifies an oral comment that DOE received on August 25, 2020 during the public meeting, and was recorded in the public meeting transcript in the docket for this energy conservation standards rulemaking (Docket No. EERE-2014-BT-STD-0059). This particular notation refers to a comment (1) made by the Northwest Energy Efficiency Alliance during the public meeting; (2) recorded in document number 18, which is the public meeting transcript that is filed in the docket of this energy conservation standards rulemaking; and (3) which appears on pages 59 through 60 of document number 18.
[24] See *https://ww2.arb.ca.gov/rulemaking/2020/hfc2020* for more information on the CARB refrigerant rulemaking.

unit with an EER over 13.0 Btu/Wh and found that using a “drop-in” 85-percent R-32 mixture as the refrigerant in place of R-410A boosted efficiency by about 3 percent and, thus, that pure R-32 would offer an additional efficiency gain. The Joint Commenters referenced another ORNL study in which a room AC unit was modified to use propane (R-290) and demonstrated an increase in EER of 17 percent. The Joint Commenters also stated that, while any cost impacts to consumers and/or manufacturers should be considered as part of the economic analysis, cost cannot be a consideration in determining what is technologically feasible. (Joint Commenters, No. 20 at p. 2) Thus, AHAM, the California IOUs, Joint Commenters, and NEEA urged DOE to further investigate alternative refrigerants as a technology option. (AHAM, No. 19 at pp. 10−11; California IOUs, No. 23 at p. 3; Joint Commenters, No. 20 at p. 2; NEEA, No. 24 at pp. 4−5) NEEA specifically urged DOE to consider R-32. (NEEA, No. 24 at pp. 4–5) The California IOUs encouraged DOE to work closely with CARB, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (“ASHRAE”) Standing Standard Project Committee 15 – Safety Standard for Refrigeration Systems, and the Air-Conditioning, Heating, and Refrigeration Institute (“AHRI”) Low-GWP Alternative Refrigeration Evaluation Program to address in this rulemaking the efficiency benefits from using low-GWP refrigerants in room ACs. (California IOUs, No. 23 at p. 3)

DOE is aware that R-32 refrigerant is currently in use in the room AC market and that adoption of the refrigerant in room ACs is increasing, in part due to the CARB regulation regarding low-GWP refrigerants. R-32 has a GWP of 675, just under a third of the GWP of R-410a, which is 2,090. However, the research findings on efficiency impacts due to the transition from R-410A to R-32 are inconsistent, ranging from a 2-

percent decrease in efficiency to the 8- to 11-percent increase cited by NEEA. Due to these inconsistent data, DOE did not consider efficiency gains due to R-32 implementation alone. However, as discussed previously, DOE found that the most efficient single-speed compressors available on the market use R-32 refrigerant, so DOE did incorporate a changeover to R-32 in the engineering analysis to capture the compressor efficiency gains that are technologically feasible by implementing improved-efficiency single-speed compressors (which use R-32 refrigerant) in place of existing baseline-efficiency single-speed compressors (which use R-410A refrigerant). DOE requests comment on the approach to addressing alternative refrigerants in this engineering analysis.

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

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

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.

Sections 6(b)(3) and 7(b) of Appendix A.

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 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

In the June 2020 Preliminary Analysis, DOE considered screening out air and water economizers and suction-line heat exchangers in the screening analysis, based on their negative impacts on product utility to consumers and on manufacturing impracticality.

AHAM agreed with DOE screening out these technologies. AHAM stated, as DOE noted, air and water economizers and suction line heat exchangers would increase the size and weight of room ACs, which would negatively impact consumer utility and require retooling. AHAM further stated that suction line heat exchangers could also decrease compressor lifetime. (AHAM, No. 19 at p. 10)

DOE agrees with the comments made by AHAM and proposes to screen out the same technologies in this NOPR analysis. For additional details, see chapter 4 of the NOPR TSD. DOE requests comment on the technologies screened out in the NOPR screening 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:

Table IV.2 Retained Design Options for Room Air Conditioners

Increased Heat Transfer Surface Area
1. Increased heat exchanger surface area (frontal area, fin density and depth of coil)
2. Condenser coil subcooler
Increased Heat Transfer Coefficient
3. Improved fin and tube design
4. Hydrophilic coating on fins
5. Microchannel heat exchangers
6. Spray condensate on condenser coil
Component Improvements
7. Improved indoor blower and outdoor fan blade design
8. Improved blower/fan motor design
9. Improved compressor efficiency
Improved Installation, Insulation, and Airflow
10. Improved installation materials
11. Reduced evaporator air recirculation
12. Reduced thermal bridging and internal air leakage
Part-Load Performance
13. Variable-speed compressors
14. Variable-speed drive fans and blowers
15. Thermostatic or electronic expansion valves
16. Thermostatic cyclic controls
Standby Power Improvements
17. Low standby-power electronics
Alternative Refrigerants
18. SNAP-approved refrigerants (R-32, R-441A, and R-290)
Other Improvements
19. Washable air filters

DOE determined that these technology options are technologically feasible because they are being used or have previously been used in commercially available products or working prototypes. DOE also finds that all of the remaining technology options meet the other screening criteria (*i.e.*, practicable to manufacture, install, and service; do not result in adverse impacts on consumer utility, product availability, health, or safety; and do not represent 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 room ACs. 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 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 rulemaking, DOE relies on a combination of these two approaches. For each product class, DOE analyzed a few units from different manufacturers to ensure the analysis was representative of various designs on the market. The analysis involved physically disassembling 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. DOE then considered the design options manufacturers would likely rely on to improve product efficiencies. From this information, DOE estimated the cost and efficiency impacts of incorporating specific design options at each efficiency level.

DOE analyzed six efficiency levels as part of the engineering analysis: (1) the current DOE standard (baseline); (2) an intermediate level above the baseline but below the ENERGY STAR level, either halfway between the two or at a level where a number of models were certified (EL 1); (3) the ENERGY STAR efficiency criterion (EL 2); (4) the efficiency attainable by a unit with the most efficient R-32 single-speed compressor on the market (EL 3); (5) an intermediate level representing the efficiency of variable-speed units on the market, as tested by DOE using the recently amended test procedure (EL 4); and (6) the maximum technologically feasible (max-tech) efficiency (EL 5).

In evaluating the technologies manufacturers could use to achieve the analyzed efficiency levels, DOE considered design options which made the largest impact on unit efficiency and for which the cost-efficiency relationship was well defined. Accordingly, DOE implemented increased heat exchanger area, condenser coil subcoolers, improved blower motor efficiency, improved compressor efficiency, variable-speed compressors, and low standby-power electronic controls as design options, some or all of which were used to estimate the cost required to reach each efficiently level. DOE did not consider for analysis certain technologies that met the screening criteria but were unable to be evaluated for one or more of the following reasons: (1) data are not available to evaluate the energy efficiency characteristics of the technology, (2) available data suggest that the efficiency benefits of the technology are negligible, and (3) certain technologies cannot be measured according to the conditions and methods specified in the existing test procedure. Further information on how the design options were chosen and implemented in the engineering analysis is available in chapter 5 of the NOPR TSD.

a. Baseline Efficiency

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 (*e.g.,* capacity, physical size). 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.

For this NOPR, DOE selected 19 baseline units, of the 48 total units selected, that fell within 12 of the 16 room AC product classes as reference points for each analyzed product class, against which DOE measured changes that would result from amended energy conservation standards to support the engineering, LCC, and PBP analyses. The baseline units in each of the analyzed product classes represent the basic characteristics of equipment in that class

b. Higher Efficiency Levels

As part of DOE's analysis, the maximum available efficiency level is the highest efficiency unit currently available on the market. DOE also defines the "max-tech" efficiency level to represent the maximum possible efficiency for a given product. As discussed in chapter 5 of the NOPR TSD, for the max-tech level, DOE modeled replacing permanent split capacitor ("PSC") fan motors with more efficient electronically commutated motors ("ECMs"), replacing single-speed compressors with the maximum efficiency variable-speed compressors available, reducing standby power to the minimum observed in DOE's teardown sample, and increasing the cabinet and heat exchanger to the largest feasible sizes to improve efficiency. For all product classes, the max-tech level identified for EL 5 exceeds any other regulatory or voluntary efficiency criteria currently in effect.

DOE notes that the max-tech level is based entirely on modeled combinations of design options that have not yet been combined in a commercially available product. Notably, the key design option, variable-speed compressors, are nascent in room ACs, and because there are no models on the market or prototypes that implement these highest efficiency variable-speed compressors, the efficiency level at max-tech for each product class is a numerical estimation. This is in contrast to the variable-speed compressors currently implemented in room ACs on the market today, for which performance has been characterized through testing. Furthermore, the room AC test procedure measures variable-speed unit performance differently than test procedures for other air conditioning products, so limited performance and efficiency data are available for the most efficient examples of this emergent technology for room ACs.

Additionally, the most efficient variable-speed compressors that were implemented in the analysis at the max-tech efficiency level are manufactured by one manufacturer and have rated EERs between 11.2 and 11.7 Btu/Wh, with a range of rated capacities between 4,705 Btu/h and 16,170 Btu/h. Given the lack of information regarding availability of these highest efficiency variable-speed compressors, and the limited number of variable-speed compressors rated at or near the compressors considered for the max-tech efficiency level, there may not be widespread availability of these high-efficiency variable-speed compressors.

The Joint Commenters and NEEA encouraged DOE to consider evaluating additional efficiency levels, particularly an intermediate level between EL 3 and EL 4. According to the Joint Commenters and NEEA, the most efficient products available today fall between these two efficiency levels. (Joint Commenters, No. 20 at pp. 2–3; NEEA, No. 24 at pp. 3 and 7) DOE agrees that the most efficient available units should be represented in the engineering analysis. In particular, variable-speed models, of which an increasing number of models are available, were not included in a separate efficiency level in the preliminary engineering analysis as a stand-alone design option. Therefore, DOE included a new efficiency level (EL 4) in the NOPR engineering analysis, between EL 3 and the max-tech level (EL 4 in the preliminary analysis, now EL 5 for this NOPR). This new EL 4 is an intermediate efficiency level that represents the efficiency of variable-speed units on the market, as tested by DOE using the recently amended test procedure. DOE modeled all teardown units to reach this efficiency level in the engineering analysis by replacing each single-speed compressor with a variable-speed compressor and adjusting the rated efficiency of the modeled variable-speed compressor to achieve the target overall CEER value. DOE requests comment on the new efficiency level (EL 4) in the engineering analysis.

AHAM and GEA stated that any energy standard levels achievable only with variable-speed compressors should not be selected and asserted that EL 3 and above would require the use of variable-speed compressors. AHAM and GEA further stated that manufacturers would likely begin using variable-speed compressors to meet energy conservation standards at EL 3. GEA supported AHAM's position and noted that incorporating variable-speed compressors into existing room AC units requires platform-level changes to room AC designs and manufacturing facilities. GEA further stated that, while variable-speed compressors are becoming available in some products, the technology is not sufficiently cost-effective to use as the basis for setting an energy standard level for this rulemaking. Thus, AHAM and GEA urged DOE to adjust its analysis to reflect the use of variable-speed compressors at EL 3. (AHAM, No. 19 at pp. 11−12; GEA, No. 26 at pp. 1−2)

As discussed in section IV.A.2.b of this document, DOE adjusted its estimated efficiency for the most efficient available single-speed compressors, thus slightly reducing the CEER level for EL 3, but along with the additional proposed changeover to more efficient compressors that use R-32 refrigerant, room ACs that implement single-speed compressors are still expected to meet EL 3. Therefore, DOE did not revise its analysis to assume that the use of variable-speed compressors would be necessary to achieve EL 3. DOE requests comment on the approach to design EL 3 as the level reached by the most efficient single-speed room ACs.

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 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 bill of materials ("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 teardowns. The resulting BOM provides the basis for the MPC estimates. DOE estimated the cost of the highest efficiency single-speed and variable-speed compressors implemented in EL 3 and

EL 5, respectively, by extrapolating the costs from price surveys of other compressors. DOE used this approach because, as discussed previously, DOE is not aware of these most efficient single-speed and variable-speed compressors being implemented in any available room ACs to date.

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 cooling capacity and features. DOE developed estimates of MPCs for each unit in the teardown sample, and also performed additional modeling for each of the teardown samples, to develop a comprehensive set of MPCs at each efficiency level. DOE then consolidated the resulting MPCs for each of DOE's teardown units and modeled units using a weighted average for product classes in which DOE analyzed units from multiple manufacturers. DOE's weighting factors were based on a market penetration analysis for each of the manufacturers within each product class. The resulting weighted-average incremental MPCs (*i.e.,* the additional costs manufacturers would likely incur by producing room ACs at each efficiency level compared to the baseline) are provided in Tables 5.5.5 and 5.5.6 in chapter 5 of the NOPR TSD. 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.

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 MPC estimates derived in the engineering analysis to consumer prices, which are then used in the LCC and PBP analysis and in the manufacturer impact analysis. At each step in the distribution channel, companies mark up the price of the product to cover business costs and profit margin.

To account for manufacturers' non-production costs and profit margin, DOE applied a non-production cost multiplier (the manufacturer markup) to the MPC. The resulting manufacturer selling price ("MSP") is the price at which the manufacturer distributes a unit into commerce. DOE developed an average manufacturer markup by examining the annual Securities and Exchange Commission ("SEC") 10-K reports filed by publicly traded manufacturers primarily engaged in appliance manufacturing and whose combined product range includes room ACs.

For room ACs, DOE further developed baseline and incremental markups for each link in the distribution chain (after the product leaves the manufacturer). 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 profit before and after new or amended standards.[25]

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;[26] and the 2017 Annual Wholesale Trade Survey for the "household appliances, and electrical and electronic goods merchant wholesalers" sector to estimate wholesaler markups.[27]

Chapter 12 of the NOPR TSD provides additional detail on the manufacturer markup and chapter 6 of this NOPR TSD provides additional detail on DOE's development of the baseline and incremental retail markups.

E. Energy Use Analysis

The purpose of the energy use analysis is to determine the annual energy consumption of room ACs at different efficiencies in representative U.S. single-family homes, multi-family residences, manufactured housing, and commercial buildings, and to assess the energy savings potential of increased room AC efficiency. The energy use

---

[25] 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.
[26] US Census Bureau, *Annual Retail Trade Survey*. 2017. *www.census.gov/programs-surveys/arts.html*
[27] US Census Bureau, *Annual Wholesale Trade Survey*. 2017. *www.census.gov/awts*

analysis estimates the range of energy use of room ACs 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 monetary savings in consumer operating costs that could result from adoption of amended or new standards.

To estimate annual room AC use and energy consumption in the June 2020 Preliminary Analysis, DOE first calculated the number of operating hours in cooling mode for each room AC in the residential and commercial samples using the reported energy use for room air conditioning in the Residential Energy Consumption Survey ("RECS") 2015[28] and Commercial Building Energy Consumption Survey ("CBECS") 2012,[29] along with estimates of the EER of the room AC(s) in each sample home or building. DOE based the latter on the reported age (or simulated age) of the unit and historical data on shipment-weighted average EER. In the June 2020 Preliminary Analysis, the estimated mean number of cooling mode operating hours for the residential room AC sample is 912 hours for the 6,000 to 7,999 Btu/h product class, 636 hours for the 8,000 to 13,999 Btu/h product classes, 422 hours for the 14,999 to 19,999 Btu/h product class, and 261 hours for the ≥ 20,000 Btu/h product class. The estimated mean number of cooling mode operating hours for the commercial room AC sample is 746

[28] U.S. Department of Energy-Energy Information Administration, Residential Energy Consumption Survey, 2015 Public Use Microdata Files, 2015. Washington, DC. Available online at: *www.eia.doe.gov/emeu/recs/recspubuse15/pubuse15.html*.
DOE will update all the 2015 RECS data to 2020 RECS if it is available prior to the final rule.

[29] U.S. Department of Energy-Energy Information Administration, Commercial Buildings Energy Consumption Survey, 2012 Public Use Microdata Files, 2012. Washington, DC. Available online at: *www.eia.doe.gov/emeu/cbecs/cbecspubuse12/pubuse12.html*
DOE will update all 2012 CBECS data to 2018 CBECS when it becomes available.

hours for the 6,000 to 7,999 Btu/h product class, 868 hours for the 8,000 to 13,999 Btu/h product classes, 921 hours for the 14,999 to 19,999 Btu/h product class, and 1,073 hours for the ≥ 20,000 Btu/h product class. DOE assumed that units plugged in, but not in cooling mode, would be in standby mode and included the contribution of standby power consumption in its energy use model.

AHAM agreed that, in the absence of field data on annual operating hours, DOE should use the most recent version of RECS and CBECS to establish the annual operating hours for residential room ACs. (AHAM, No. 19 at p. 15)

NEEA believes DOE has identified energy savings associated with room ACs, but contends that there are more energy savings achievable. NEEA encourages DOE to look at more of the efficiency technology options and how they perform the energy analysis in order to get more savings. (NEEA, Public Meeting Transcript, No. 18 at pp. 8–9) NEEA suggested modifying the energy use analysis to capture more of the benefits of other technologies in the market that are not necessarily captured in the current test procedure. (*Id.* at pp. 57–58)

DOE notes that the standards rulemaking must recommend efficiency levels that are both economically justified and technologically feasible. The availability of technologies used to achieve different efficiency levels are identified in the market and technology assessment (see chapter 3 of the NOPR TSD). DOE's engineering analysis analyzes technologies in currently available room AC units. The energy use analysis uses the efficiency levels and power consumption values from the engineering analysis.

Estimates for energy consumption are based on available data of how room ACs are operated in the field. DOE welcomes information about additional technologies that can be analyzed in the rulemaking process.

NEEA recommended that DOE include fan-only hours in its analysis and take into account energy savings from variable-speed fans and motors. NEEA stated that fan-only operation is likely to account for a significant number of operating hours, resulting in a significant portion of overall energy use. (NEEA, No. 24 at p. 5) Rice suggested measuring the energy consumption of the fan-mode during cooling mode operation when the fan typically runs continuously while the compressor cycles. If it is not accounted for, Rice recommended, at a minimum, that the energy use information on the Energy Label indicate that the energy costs is based on the economy mode setting. (Rice, No. 25 at p. 3)

DOE is unaware of a data set that can be used to estimate the amount of time room ACs spend in fan-only mode. For this NOPR analysis, DOE included the impact of fan-only mode energy consumption to the total energy use consumption, based on available data for portable ACs. Based on field metering data of portable ACs, fan-only mode is estimated at 30 percent of cooling mode hours.[30] DOE assumed that models below ENERGY STAR efficiency level would operate in fan-only mode 30 percent of cooling mode hours. For ELs that meet or exceed the ENERGY STAR level, DOE assumed a reduction in the amount of time the unit spent in fan-only mode based on the

[30] Burke *et al.*, 2014. "Using Field-Metered Data to Quantify Annual Energy Use of Residential Portable Air Conditioners." LBNL, Berkeley, CA. LBNL Report LBNL-6469E. September 2014.

ENERGY STAR Version 4.2 for room ACs criterion requiring that the unit run in off-cycle fan mode less than 17 percent of the time spent in off-cycle mode. Thus, for ELs that meet or exceed the ENERGY STAR efficiency level, DOE assumed units would operate in fan-only mode 5 percent of cooling mode hours. DOE welcomes feedback on its approach and any additional data that can be provided to estimate the amount of time spent in fan-only mode.

DOE notes that the Federal Trade Commission is responsible for the information included on the yellow EnergyGuide labels.

Edison Electric Institute ("EEI") noted that, in northern climates, many consumers unplug their units or even take them out of the windows during the wintertime, meaning the 8,000 standby hours value used in the annual energy use calculation formula could be an overestimate. EEI suggested gathering more data on this. (EEI, Public Meeting Transcript, No. 18 at pp. 51–52)

DOE agrees that many consumers unplug their room AC units in the non-cooling seasons in northern climates. However, DOE is not aware of reliable, publicly available data for hours spent in standby and off modes in room ACs. DOE recognizes that a room AC may be unplugged for a certain percentage of time, and, therefore, will not be in either standby mode or off mode. For the purposes of this NOPR analysis, DOE estimates that approximately half of room ACs are unplugged for half of the year. The ‘‘unplugged’’ time associated with these units is averaged over all units. DOE estimates active mode based on RECS inputs and time spent in fan-only mode based on available data for portable ACs. Standby hours comprise the remaining time. See chapter 7 of the NOPR TSD for further discussion.

The California IOUs noted that, in the LCC Excel spreadsheet downloaded from DOE's website, for product class ("PC") 2, the cooling mode operating hours are 2,922 hours, but for PC 3, the cooling mode operating hours are only 217 hours.[31] The California IOUs expressed concern at the cooling mode operating hour difference between PC 2 and PC 3. (California IOUs, Public Meeting Transcript, No. 18 at pp. 55–56)

DOE's LCC spreadsheet model uses a Monte Carlo simulation in its LCC calculations. Operating hours vary for each house in the household sample and are used as an input into the LCC calculations. The hours mentioned in the California IOUs comment represent the operating hours for one household in the sample and are not representative of the full household sample, or an entire Monte Carlo simulation. The average hours of use for the full sample used for each product class can be found in chapter 7 of the NOPR TSD.

Appliance Standards Awareness Project ("ASAP"), Rice, California IOUs, NEEA, and the Joint Commenters encouraged DOE to investigate modifications to the energy use model to account for potential energy savings by variable-speed units. ASAP stated that variable-speed units would be able to reduce cycling losses in addition to

[31] The Room Air Conditioning Life-Cycle Cost Analysis Spreadsheets (EERE-2014-BT-STD-0059-0010) can be found at *beta.regulations.gov/document/EERE-2014-BT-STD-0059-0010*.

providing additional part-load benefits. (ASAP, Public Meeting Transcript, No. 18 at p. 54) Rice noted that DOE's energy use methodology in the June 2020 Preliminary Analysis does not capture the benefits of part load operation and suggested applying a performance adjustment factor ("PAF") for ELs with variable-speed compressors. (Rice, No. 25 at p. 2) NEEA and the California IOUs further stated the energy use model in the June 2020 Preliminary Analysis only used the full-load energy EER of the compressors to calculate energy savings, meaning the analysis does not capture any inefficiencies due to single-speed compressor cycling at part load. (California IOUs, No. 23 at p. 2; NEEA, No. 24 at p. 5) The Joint Commenters noted that in addition to significantly reducing cycling losses, variable-speed operation improves heat exchanger effectiveness at reduced cooling loads, resulting in additional energy savings. (Joint Commenters, No. 20 at pp. 3–4)

For this NOPR analysis, DOE modified its approach to calculating energy use for models that use a variable-speed compressor to account for the reduced energy consumption during part load operation. Unlike single-speed compressors, variable-speed compressors have the ability to operate at part load depending on the cooling load. The amount of the time spent in part load operation will depend on the local climate of the household or business operating the room AC. For example, room ACs in milder climates will spend more time in part load operation relative to a household in a hot climate where a compressor is likely to run at maximum load. DOE accounted for geographic-dependent climate variability by calculating U.S. State-dependent PAFs using historical climate data spanning the period from 2008–2016 from the National Oceanic and Atmospheric Administration.[32] For each state in the U.S., DOE performed a temperature bin analysis to calculate within the cooling season (June through August) the fraction of time the outdoor dry bulb temperature was in one of four temperature bins: 80–84 degrees Fahrenheit ("°F"), 85–89°F, 90–94°F, and 95–99°F. DOE then calculated the corresponding PAF for each state using the methodology developed for variable-speed drive units in the test procedure and applied the PAF to the EER at full load. DOE requests feedback on its approach to calculating the energy-use of variable-speed compressors and would welcome field metered data to further investigate the varying amounts of energy use due to single-speed and variable-speed units.

Rice stated that the off-cycle energy use term in the June 2020 Preliminary Analysis energy-use model is inappropriate for a variable-speed room AC. Rice stated that it should be modified to account for lower standby energy usage due to longer run times in the cooling season for variable-speed units in meeting the cooling season load. Rice notes that since DOE's calculation of energy use in cooling mode assumes operation at full rated cooling capacity, it is inappropriate for use in the standby energy use term for variable-speed room ACs. (Rice, No. 25 at p. 2)

DOE's test procedure requires that the low compressor speed at the low test condition achieve a capacity that is 47–57 percent of the "peak" rated capacity. Therefore, DOE would not expect a variable-speed compressor unit to enter off-cycle mode above loads 47 percent of the rated capacity, which is close to a representative of

[32] National Oceanic and Atmospheric Administration. *Quality Controlled Local Climate Data*. *www.ncdc.noaa.gov/cdo-web/*

outdoor temperature conditions of 82°F. In this NOPR analysis, DOE calculates the energy use of variable-speed units using a geographic-dependent performance adjustment factor to account for time the unit spends at partial load. DOE is unaware of a data-set that would allow for the estimation of the change in cooling run time of variable-speed units relative to a single-speed unit. DOE welcomes any available information or data that can be used to improve assumptions in the energy use model.

The California IOUs noted that DOE uses EER to estimate average annual energy use, however, only CEER is listed for each energy use results tables in chapter 7 of the preliminary TSD. To minimize confusion that CEER was used to calculate the average annual energy use, the California IOUs recommended that DOE add EER to energy use tables along with the corresponding CEER for each EL. (California IOUs, No. 23 at p. 3)

DOE has included both EER and CEER in the energy use results tables in the NOPR TSD.

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

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 room ACs. The effect of new or amended energy conservation standards on individual consumers usually involves a reduction in operating cost and an increase in purchase cost. DOE used the following two metrics to measure consumer impacts:

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

- The PBP 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 room ACs 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 and commercial buildings. As stated previously, DOE developed household samples from the 2015

RECS[33] and commercial building samples from the 2012 CBECS. For each sample household or building, DOE determined the energy consumption for the room AC and the appropriate energy price. By developing a representative sample of households and commercial buildings, the analysis captured the variability in energy consumption and energy prices associated with the use of room ACs.

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 room AC user samples. For this rulemaking, the Monte Carlo approach is implemented in MS Excel together with the Crystal Ball™ add-on.[34] The model calculated the LCC and PBP for products at each efficiency level for 10,000 housing units or commercial buildings per simulation run. The analytical results include a distribution of 10,000 data

[33] DOE will update all the 2015 RECS data to 2020 RECS if it is available prior to the final rule. Similarly, DOE will update all 2012 CBECS data to 2018 CBECS when it becomes available.
[34] 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/middleware/technologies/crystalball.html* (last accessed August 31, 2021).

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 room ACs as if each were to purchase a new product in the expected year of required compliance with new or amended standards. Amended standards would apply to room ACs manufactured 3 years after the date on which any new or amended standard is published. (42 U.S.C. (m)(4)(A)(i)) For purposes of its analysis, DOE used 2026 as the first year of compliance with any amended standards for room ACs.

Table IV.3 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.3 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	Assumed no change with efficiency level.
Annual Energy Use	The total annual energy use by operating mode multiplied by the hours per year in each mode. Variability: Based on the 2015 RECS and 2012 CBECS.
Energy Prices	Electricity: Based on Edison Electric Institute data for 2020. Variability: Regional energy prices determined for each Census Division.
Energy Price Trends	Based on *AEO 2021* price projections by Census Division.
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	Weibull probability distribution developed from historical shipments, *American Housing Survey* and *RECS*, with an average lifetime of 9 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	2026

* 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 room ACs that utilize single-speed compressors, DOE obtained historical Producer Price Index ("PPI") data for room ACs from the Bureau of Labor Statistics ("BLS"). A PPI specific to "room air-conditioners and dehumidifiers, except portable dehumidifiers" was available for the time period between 1990 and 2009.[35] After 2009, PPI data was only available for the broader product family of "refrigeration and forced air heating equipment," which includes room ACs, spanning the years 2010–2020.[36] Inflation-adjusted price indices were calculated by dividing the PPI series by the gross domestic product index from Bureau of Economic Analysis for the same years. Using data from 1990–2020, the estimated learning rate (defined as the fractional reduction in price expected from each doubling of cumulative production) is 25 percent.

The Joint Commenters suggested an analysis with learning rates associated with specific technology options or components. (Joint Commenters, No. 20 at pp. 4–5)

DOE considered the inclusion of variable-speed compressors as a technology option in EL 4 and EL 5. To develop future prices specific for that technology, DOE applied a different price trend to the controls portion of the variable-speed compressors that contributes to the price increments moving from EL 3 (an efficiency level achieved with the highest efficiency single-speed compressor) to EL 4 and EL 5. DOE used PPI data on "semiconductors and related device manufacturing" between 1967 and 2020 to estimate the historic price trend of electronic components in the control.[37] The regression

[35] Room air-conditioners and dehumidifiers, except portable dehumidifiers PPI series ID: PCU3334153334156; *www.bls.gov/ppi/*.
[36] Air-conditioning, refrigeration, and forced air heating equipment manufacturing, Primary Products PPI series ID: PCU333415333415P; *www.bls.gov/ppi/*.
[37] Semiconductors and related device manufacturing PPI series ID: PCU334413334413; *www.bls.gov/ppi/*.

performed as an exponential trend line fit results in an R-square of 0.99, with an annual price decline rate of 6.3 percent. See chapter 8 of the NOPR TSD for further details on this topic.

The Joint Commenters noted that DOE's estimate of the learning rate for room ACs is likely a conservative estimate of how prices will decline over time. (Joint Commenters, No. 20 at pp. 4–5)

A retrospective analysis of the April 2011 Direct Final Rule for room ACs[38] compared the room AC average model-level price changes based on web-scraped retail price data from 2013 to 2017 (ex-post data) and the price factor index for the corresponding period derived in the April 2011 Direct Final Rule (ex-ante data). The result shows that the ex-ante data and ex-post data share similar price declining trends, and thus provide independent validation of the experience curve methodology adopted by DOE in the rulemaking analysis. To account for the uncertainties in the experience curve estimation, DOE also considered two alternative product price forecasts for room ACs (a high price decline and a low price decline scenarios and estimated their impacts on the consumer NPV for various standard levels (see section IV.H.3 of this document for details).

[38] Ganeshalingam, M., Ni, C., and Yang, H-C. 2021. A Retrospective Analysis of the 2011 Direct Final Rule for Room Air Conditioners. Lawrence Berkeley National Laboratory. LBNL-2001413.

DOE requests comments on its assumption and methodology for determining equipment price trends.

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous materials and parts needed to install the product. As in the June 2020 Preliminary Analysis, DOE found no evidence that installation costs would be impacted with increased efficiency levels and, thus, did not include installation costs in the LCC calculation.

3. Annual Energy Consumption

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

a. Rebound Effect

Higher-efficiency room ACs reduce the operating costs for a consumer, which can lead to greater use of room ACs. A direct rebound effect occurs when a product that is made more efficient is used more intensively, such that the expected energy savings from the efficiency improvement may not fully materialize. At the same time, consumers benefit from increased utilization of products due to rebound. Overall consumer welfare (taking into account additional costs and benefits) is generally understood to increase from rebound. DOE did not find any data on the rebound effect that is specific to room ACs. In the April 2011 Direct Final Rule, DOE estimated a rebound of 15 percent for room ACs for the NIA but did not include rebound in the LCC analysis. 76 FR 22454, 22511. Given the uncertainty and lack of data specific to room ACs, DOE did not include the rebound effect in the LCC analysis for this NOPR. DOE does include rebound in the NIA for a conservative estimate of national energy savings and the corresponding impact to consumer NPV. As in the April 2011 Direct Final Rule, DOE used a rebound effect of 15 percent for room ACs. See sections IV.H.2 and IV.H.3 of this document for further details on how the rebound effect is applied in the NIA.

4. Energy Prices

Because marginal electricity price more accurately captures the incremental savings associated with a change in energy use from higher efficiency, it provides a better representation of incremental change in consumer costs than average electricity prices. Therefore, DOE applied average electricity prices for the energy use of the product purchased at baseline efficiency, and marginal electricity prices for the incremental change in energy use associated with the other efficiency levels considered.

DOE derived annual electricity prices in 2020 for each census division using data from EEI Typical Bills and Average Rates reports.[39] For the residential sector, DOE used the EEI data to define a marginal price as the ratio of the change in the bill to the change

[39] Edison Electric Institute. Typical Bills and Average Rates Report. 2020. Winter 2020, Summer 2020: Washington, D.C.

in energy consumption. For the commercial sector, marginal prices depend on both the change in electricity consumption and the change in monthly peak-coincident demand. DOE used the EEI data to estimate both marginal energy charges and marginal demand charges.

DOE calculated weighted-average values for average and marginal price for the nine census divisions for both the residential and commercial sectors. As the EEI data are published separately for summer and winter, DOE calculated seasonal prices for each division and sector. See chapter 8 of the NOPR TSD for details.

To estimate energy prices in future years, DOE multiplied the average regional energy prices by a projection of annual change in national-average residential and commercial energy price in *AEO 2021*.[40] *AEO 2021* has an end year of 2050. To estimate electricity price trends after 2050, DOE used the average annual rate of change in electricity price from 2035 through 2050.

Rice suggested that consideration be given to showing energy cost information for both economy and cool mode settings to account for units with higher efficiency blower motor/fan assemblies that would have lower energy costs relative to less efficient blowers/fans in off-cycle mode. (Rice, No. 25 at p. 3)

[40] Energy Information Administration. *Annual Energy Outlook 2021 with Projections to 2050*. Washington, DC. Available at *www.eia.gov/forecasts/aeo/*.

As described in section IV.E of this document, DOE includes the energy contribution of fan-mode including time spent in off-cycle mode. DOE determines energy costs for the full range of product classes and efficiency levels.

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. Typically, small incremental increases in product efficiency produce no, or only minor, changes in repair and maintenance costs compared to baseline efficiency products. In this NOPR analysis, DOE did not include maintenance costs in the LCC.

In the June 2020 Preliminary Analysis, DOE assumed that repair frequencies are low and increase for the higher-capacity units due to more expensive equipment costs. DOE assumed that 1 percent of small-sized units (below 8,000 Btu/h), 2 percent of medium-sized units (8,000 to 20,000 Btu/h), and 3 percent of large-sized units (above 20,000 Btu/h) are maintained or repaired each year. DOE assumed that an average service call and repair/maintenance takes about 1 hour for small and medium-sized units and 2 hours for large units, and that the average material cost is equal to one-half of the incremental equipment cost. DOE maintains these assumptions in the NOPR analysis.

6. Product Lifetime

For room ACs, 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 room ACs of approximately 9 years. See chapter 8 of the NOPR TSD for further details.

7. Discount Rates

In the calculation of the LCC, DOE applies discount rates appropriate to residential and commercial sectors to estimate the present value of future operating costs. DOE estimated a distribution of residential and commercial discount rates for room ACs based on consumer financing costs and the opportunity cost of consumer funds (for the residential sector) and cost of capital of publicly traded firms (for the commercial sector).

For households, DOE applies weighted-average discount rates calculated from consumer debt and asset data, rather than marginal or implicit discount rates.[41] DOE notes that the LCC does not analyze the appliance purchase decision, so the implicit discount rate is not relevant in this model. The LCC estimates net present value over the

[41] 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.

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, 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*[42] ("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

[42] U.S. Board of Governors of the Federal Reserve System. Survey of Consumer Finances. 1995, 1998, 2001, 2004, 2007, 2010, 2013, 2016, and 2019. (Last accessed August 20, 2021.) *www.federalreserve.gov/econresdata/scf/scfindex.htm*.

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.

For commercial-sector room ACs, DOE used the cost of capital to estimate the present value of cash flows to be derived from a typical company project or investment. Most companies use both debt and equity capital to fund investments, so the cost of capital is the weighted-average cost to the firm of equity and debt financing. This corporate finance approach is referred to as the weighted-average cost of capital. DOE used currently available economic data in developing 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).

DOE utilized confidential 2019 shipments data disaggregated by product class and efficiency provided by AHAM in response to the June 2020 Preliminary Analysis to estimate the efficiency distribution in 2019. In the preliminary analysis, DOE assumed an annual 0.25 percent increase in shipment-weighted CEER to develop the efficiency distribution in 2026. The efficiency trend used in this NOPR is supported by a retrospective analysis of the April 2011 Direct Final Rule which used a similar efficiency trend.[43] For this NOPR, DOE assumed this trend applied to efficiency levels with single-speed compressors (EL 0, EL 1, EL 2, and EL 3). DOE assumed the adoption of variable-speed technologies (EL 4 and EL 5) would follow a Bass diffusion curve which describes how new technologies diffuse into the consumer market.[44] DOE assumed that shipments to variable-speed technologies would account for 5 percent of shipments in each product class by 2026. The estimated market shares for the no-new-standards case for room ACs in 2026 are shown in Table IV.4 through Table IV.6. See chapter 8 of the NOPR TSD for further information on the derivation of the efficiency distributions.

[43] Ganeshalingam, M., Ni, C., and Yang, H-C. 2021. A Retrospective Analysis of the 2011 Direct Final Rule for Room Air Conditioners. Lawrence Berkeley National Laboratory. LBNL-2001413.
[44] Bass, F. M. A New Product Growth Model for Consumer Durables. Management Science. 1969. 15(5): pp. 215–227.

Table IV.4 Room Air Conditioners without Reverse Cycle and with Louvered Sides: No-New-Standards Case Market Shares in 2026

Efficiency Level	<6,000 Btu/h (PC1)		6,000−7,999 Btu/h (PC2)		8,000−13,999 Btu/h (PC3)	
	Efficiency	Market Share %	Efficiency	Market Share %	Efficiency	Market Share %
	CEER		*CEER*		*CEER*	
Baseline	11.0	7.7%	11.0	0.0%	10.9	0.0%
1	11.4	85.2%	11.4	74.6%	11.4	31.1%
2	12.1	2.1%	12.1	18.3%	12.0	63.0%
3	13.1	0.0%	13.7	2.1%	14.3	0.9%
4	16.0	5.0%	16.0	5.0%	16.0	5.0%
5	20.2	0.0%	20.2	0.0%	22.4	0.0%
Efficiency Level	**14,000−19,999 Btu/h (PC4)**		**20,000−27,999 Btu/h (PC5a)**		**>=28,000 Btu/h (PC5b)**	
	Efficiency	Market Share %	Efficiency	Market Share %	Efficiency	Market Share %
	CEER		*CEER*		*CEER*	
Baseline	10.7	0.0%	9.4	0.0%	9.0	40.3%
1	11.1	0.0%	9.8	8.7%	9.4	45.7%
2	11.8	94.7%	10.3	86.2%	9.9	9.0%
3	14.0	0.3%	11.8	0.0%	10.3	0.0%
4	16.0	5.0%	13.8	5.0%	13.2	5.0%
5	20.6	0.0%	19.1	0.0%	16.7	0.0%

Table IV.5 Room Air Conditioners without Reverse Cycle and without Louvered Sides: No-New-Standards Case Market Shares in 2026

Efficiency Level	8,000−10,999 Btu/h (PC 8a)		11,000−13,999 Btu/h (PC8b)		14,000−19,999 Btu/h (PC9)	
	Efficiency	Market Share %	Efficiency	Market Share %	Efficiency	Market Share %
	CEER		*CEER*		*CEER*	
Baseline	9.6	0.0%	9.50	0.0%	9.3	39.1%
1	10.1	11.4%	10.00	0.0%	9.7	46.9%
2	10.6	83.6%	10.50	94.3%	10.2	9.0%
3	12.3	0.0%	12.32	0.7%	10.9	0.0%
4	14.1	5.0%	12.80	5.0%	13.7	5.0%
5	18.7	0.0%	19.09	0.0%	16.6	0.0%

Table IV.6 Room Air Conditioners with Reverse Cycle, Casement-Slider: No-New-Standards Case Market Shares in 2026

Efficiency Level	w/ Louvers (PC11) <20,000 Btu/h		wo/ Louvers (PC12) <14,000 Btu/h		Casement-Slider (PC16)	
	Efficiency *CEER*	Market Share %	Efficiency *CEER*	Market Share %	Efficiency *CEER*	Market Share %
Baseline	9.8	50.7%	9.3	39.1%	10.4	34.4%
1	10.4	35.2%	9.7	46.9%	10.8	51.6%
2	10.8	9.0%	10.2	9.0%	11.4	9.0%
3	12.3	0.0%	11.3	0.0%	13.2	0.0%
4	14.4	5.0%	13.7	5.0%	15.3	5.0%
5	18.7	0.0%	16.2	0.0%	19.7	0.0%

DOE requests feedback on its approach to projecting the efficiency distribution in 2026.

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.[45] 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

[45] 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.

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 shipments for room ACs are developed by considering the demand from replacements for units in stock that fail and the demand from first-time owners in existing households. DOE calculated shipments due to replacements using the retirement function developed for the LCC analysis. DOE calculated shipments due to first-time owners in existing households using estimates from room AC saturation in RECS 2015 and projections of housing stock from *AEO 2021*. See chapter 8 of the NOPR TSD for details.

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 June 2020 Preliminary Analysis, DOE employs a 0.2-percent efficiency elasticity rate and a price elasticity of -0.45 in its shipments model. These values are based on analysis of aggregated data for five residential appliances including room ACs.[46] 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.

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

ASAP and the Joint Commenters noted that the efficiency elasticity was omitted from chapter 9 of the preliminary TSD. (ASAP, Public Meeting Transcript, No. 18 at pp. 94–95; Joint Commenters, No. 20 at p. 5) ASAP and the Joint Commenters encouraged DOE to confirm and clarify whether the efficiency elasticity is considered in calculating the standards-case shipments. (Joint Commenters, No. 20 at p. 5)

Chapter 9 of the NOPR TSD has been updated to display the impact of the price and efficiency elasticity in calculating the standards-case shipments.

AHAM recommended that DOE do as it generally does and rely on shipment-weighted data in its analysis and provided DOE data for 2019 shipments by product class. (AHAM, No. 19 at p. 9)

DOE appreciates the 2019 shipments by product class and efficiency level provided by AHAM and has updated the NOPR to reflect the AHAM data.

NEEA noted that DOE's shipment projections are likely low and do not follow the market's historical trends – DOE's analysis showed a very small growth in annual shipments through 2052 to a peak of approximately 8.5 million units per year. NEEA stated that this slow growth trend does not match the historic growth seen in the room AC market. For the number of replacement units, NEEA recommended that DOE amend its analysis to consider early retirement of units driven by new features, such as increased efficiency and smart rooms ACs, which could increase the number of shipments. For new units, NEEA recommended that DOE consider an increasing market penetration factor to account for the growth of room AC use in climates where cooling has not been needed traditionally. (NEEA, No. 24 at pp. 5–6)

DOE notes that between 2014 and 2019, room AC shipments have been approximately 7 million units with no clear indication of steady growth over that period. DOE determines the replacement market from lifetime estimates of room ACs. Early retirement of units to purchase more efficient and/or units with additional features are currently accounted for in the lifetime distribution. A retrospective analysis of the April 2011 Direct Final Rule for room ACs,[47] which also accounted for shipments due to replacements and first-time owners, generally found that DOE projections matched with AHAM shipments data in 2017 and 2018. DOE acknowledges that a warming climate could increase purchase of room ACs in climates where cooling has not been needed traditionally, but it is not aware of any data that would facilitate an accurate estimate of this future demand. DOE welcomes shipments data that include markets in addition to replacement and first-time user markets.

Chapter 9 of the NOPR TSD provides additional details on the shipments analysis.

DOE requests comment on its general methodology for estimating shipments.

[47] Ganeshalingam, M., Ni, C., and Yang, H-C. 2021. A Retrospective Analysis of the 2011 Direct Final Rule for Room Air Conditioners. Lawrence Berkeley National Laboratory. LBNL-2001413.

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.[48] ("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 room ACs sold from 2026 through 2055.

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

[48] The NIA accounts for impacts in the 50 states.

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.7 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.7 Summary of Inputs and Methods for the National Impact Analysis

Inputs	Method
Shipments	Annual shipments from shipments model.
Compliance Date of Standard	2026
Efficiency Trends	Bass diffusion curve to allocate shipments to ELs with variable-speed technology and annual 0.25% increase in shipment-weighted CEER for ELs with single-speed technology.
Annual Energy Consumption per Unit	Calculated for each efficiency level based on inputs from energy use analysis.
Total Installed Cost per Unit	Calculated for each efficiency level based on inputs from the LCC analysis.
Repair and Maintenance Cost per Unit	Calculated for each efficiency level on inputs from the LCC analysis.
Electricity Price	Estimated average and marginal electricity prices from the LCC analysis based on EEI data.
Electricity Price Trends	*AEO* 2021 projections (to 2050) and extrapolation using a fixed annual rate of price change between 2035 and 2050 thereafter.
Energy Site-to-Primary and FFC Conversion	A time-series conversion factor based on *AEO* 2021.
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.7 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 room ACs over the entire shipments projection period, DOE assumed that market share for ELs with variable-speed technologies would follow a Bass diffusion curve, while the shipment-weighted CEER for ELs with single-speed compressors would increase annually by 0.25 percent in CEER based on historical trends in shipment-weighted efficiency.[49] The approach is further described in chapter 10 of the NOPR TSD.

In its reference scenario, DOE assumed that variable-speed technologies would comprise 25 percent of the market by the end of the analysis period (2055). DOE also performed sensitivity scenarios assuming a low penetration of variable-speed technologies (10 percent of the market in 2055) and a high penetration of variable-speed technologies (50 percent of the market in 2055). The results of these scenarios can be found in appendix 10E of the NOPR TSD. DOE requests comment on its approach to projecting market share for variable-speed technologies over the course of the analysis period.

[49] Ganeshalingam, M., Ni, C., and Yang, H-C. 2021. A Retrospective Analysis of the 2011 Direct Final Rule for Room Air Conditioners. Lawrence Berkeley National Laboratory. LBNL-2001413.

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 in 2026. In the year of compliance, the market shares of products in the no-new-standards case that do not meet the standard under consideration would “roll up” to the minimum EL that meets the standard, and the market share of products above the standard would remain unchanged. As in the no-new-standards case, DOE assumed an annual increase of 0.25 percent in CEER over the analysis period for ELs with single-speed technology.

The Joint Commenters noted that data on sales over the past decade suggest that the “roll-up” scenario considered by DOE may underestimate the savings from amended standards and suggested DOE consider reevaluating the use of the “roll-up” scenario for estimating the market distribution of each efficiency level following the adoption of a standard. (Joint Commenters, No. 20 at p. 5)

DOE acknowledges multiple drivers in the room AC market, one of which is the amended standard process. Although DOE uses a roll-up to allocate market share by efficiency level in the year a standard is enacted, an efficiency trend is applied in subsequent years in the standards case to account for the observed historical trends in efficiency. See chapter 10 of the NOPR TSD for details.

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 *AEO 2021*. Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

Use of higher-efficiency products is occasionally associated with a direct rebound effect, which refers to an increase in utilization of the product due to the reduction in operating cost induced by improved efficiency. A direct rebound effect occurs when a product that is made more efficient is used more intensively, reducing expected energy savings from the efficiency improvement. At the same time, consumers can benefit from increased utilization of products due to the direct rebound effect. DOE did not find any data on the rebound effect specific to room ACs, but it applied a rebound effect of 15 percent as suggested by Sorrell *et al.*[50] and was done in the April 2011 Direct Final Rule. The calculated NES at each efficiency level is therefore reduced by 15 percent. DOE also included the rebound effect in the NPV analysis accounting for the additional net benefit from increased room AC usage as described in section IV.H.3 of this document.

---

[50] Sorrell, S., J. Dimitropoulos, M. Sommerville. 2009. Empirical estimates of the direct rebound effect: A review. Energy Policy 37 (2009) 1356–1371.

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[51] 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.

EEI suggested incorporating the *AEO* full-fuel-cycle conversion for DOE's next update. (EEI, Public Meeting Transcript, No. 18 at pp. 83–84)

For this NOPR analysis, DOE reports the full-fuel-cycle energy savings in its NIA using inputs from *AEO 2021*. See chapter 10 of the NOPR TSD for a full description.

[51] 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*.

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.6 of this document, DOE developed room AC 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 2055, the end date of the analysis period, the average single-speed compressor room AC price is projected to drop 23 percent and the variable-speed compressor room AC price is projected to drop about 37 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 alternate product price projections on the consumer NPV for the considered TSLs for room ACs. In addition to the default price trend, DOE considered high and low product price sensitivity cases. In the high price scenario, DOE based the price decline of the non-variable speed controls portion on room AC PPI data limited to the period between the period 1990–2009, which shows a faster price decline relative to the full time series For the variable-speed controls portion, DOE used a faster price decline derived from the lower bound of the 95 percent confidence interval fitting PPI data for semiconductors. In the low price decline scenario, DOE assumed a constant price for the non-variable-speed controls portion of the price and a slower price decline estimate for the variable-speed controls portion derived from the upper bound of the 95 percent confidence interval fitting PPI data for semiconductors over the analysis period. The derivation of these price trends and the results of these sensitivity cases are described in appendix 10C of the NOPR TSD. The operating cost savings are energy cost savings, which are calculated using the estimated energy savings in each year and the projected price of electricity. To estimate energy prices in future years, DOE multiplied the average regional energy prices by the projection of annual national-average residential and commercial energy price changes in the Reference case from *AEO 2021*, which has an end year of 2050. For the years after 2050, DOE used the average annual rate of change in electricity price from 2035 through 2050. As part of the NIA, DOE also analyzed scenarios that used inputs from variants of the *AEO 2021* 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 10C of the NOPR TSD.

As described in section IV.H.2 of this document, DOE assumed a 15 percent rebound from an increase in utilization of the product arising from the increase in efficiency (i.e., the direct rebound effect). In considering the consumer welfare gained due to the direct rebound effect, DOE accounted for change in consumer surplus attributed to additional cooling from the purchase of a more efficient unit. Overall consumer welfare is generally understood to be enhanced from rebound. The net consumer impact of the rebound effect is included in the calculation of operating cost savings in the consumer NPV results. See appendix 10F of the NOPR TSD for details on DOE's treatment of the monetary valuation of the rebound effect. DOE requests comments on its approach to monetizing the impact of the rebound effect.

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.[52] The discount rates for the determination of NPV are in contrast to the discount rates used in the LCC analysis, which are designed to reflect a consumer's perspective. The 7-percent real value is an estimate of the average before-tax rate of return to private capital in the 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

[52] United States Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. Section E. Available at *obamawhitehouse.archives.gov/omb/circulars_a004_a-4/* (last accessed June 15, 2021).

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 and shows the percentages of those both negatively and positively impacted. DOE used the LCC and PBP spreadsheet model to estimate the impacts of the considered efficiency levels on these subgroups for product classes with a sufficient sample size in 2015 RECS to perform a Monte Carlo analysis. Chapter 11 of the NOPR TSD describes the consumer subgroup analysis.

J. Manufacturer Impact Analysis

1. Overview

DOE performed a MIA to estimate the impacts of amended energy conservation standards on manufacturers of room ACs. 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 standards cases (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 Federal product-specific 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 room AC manufacturing industry based on publicly available data and information from its market and technology assessment, engineering analysis, and shipments analysis. This preparation included a top-down analysis of room AC manufacturers that DOE used to derive preliminary financial parameters for the GRIM (*e.g.*, materials, labor, overhead, and depreciation expenses; selling, general, and administrative expenses ("SG&A"); and R&D expenses). DOE also used public sources of information to further calibrate its initial characterization of the room AC manufacturing industry, including company filings of form 10-K from the SEC,[53] corporate annual reports, the April 2011 Direct Final Rule, and the U.S. Census Bureau's *Economic Census*.[54] DOE also relied on subscription-based resources such as reports from Dun & Bradstreet.[55]

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 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:

[53] *www.sec.gov/edgar/searchedgar/companysearch.html*
[54] *www.census.gov/programs-surveys/qpc/data/tables.html*
[55] *app.dnbhoovers.com*

(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 room ACs 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 VII.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, 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 2021 (the base year of the MIA analysis) and continuing to 2055. DOE calculated INPVs by summing the stream of annual discounted cash flows during this period. For manufacturers of room ACs, DOE used a real discount rate of 7.2 percent, which was derived from public financial data 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, and information gathered 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.

b. Shipments Projections

The GRIM estimates manufacturer revenues based on total unit shipment projections and the distribution of those shipments by product class and by efficiency level. 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. See chapter 9 of the NOPR TSD for additional details on DOE's shipments projections.

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) product conversion costs, and (2) capital conversion costs. 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. 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. 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.

To calculate the MPCs for room ACs at and above the baseline, DOE performed teardowns for representative units. The data generated from these analyses were then used to estimate the capital investments in equipment, tooling, and conveyor required of original equipment manufacturers ("OEMs") at each efficiency level, taking into account such factors as product design, raw materials, purchased components, and fabrication method. Changes in equipment, tooling, and conveyer were used to estimate capital conversion costs. Additionally, capital conversion costs accounted for investments in appearance tooling made by manufacturers that are not OEMs.

DOE relied on feedback from industry to evaluate the product conversion costs industry would likely incur at the considered standard levels. DOE integrated feedback from manufacturers, both OEM and non-OEM, on redesign effort and staffing to estimate product conversion cost. Manufacturer numbers were aggregated to protect confidential information.

The conversion cost figures used in the GRIM can be found in section V.B.2 of this document. For additional information on the 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 non-production cost markups to the MPCs estimated in the engineering analysis for each product class and efficiency level. Modifying these 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 markup scenario, and (2) a preservation of per-unit operating profit markup 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" markup 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 absolute dollar markup will increase as well. DOE assumed the industry-average manufacturer markup—which includes SG&A expenses, R&D expenses, interest, and profit—to be 1.26 for room ACs. Manufacturers tend to believe it is optimistic to assume that they would be able to maintain the same gross margin percentage markup as their production costs increase, particularly for minimally efficient products. Therefore, DOE assumes that 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 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 manufacturer markup 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 markup scenarios is presented in section V.B.2.a of this document.

3. Manufacturer Interviews

DOE interviewed manufacturers representing approximately 40 percent of the basic models in DOE's Compliance Certification Database ("CCD"). Participants included OEMs and importers.

In interviews, DOE asked manufacturers to describe their major concerns regarding potential increases in energy conservation standards for room ACs. 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 DOE's responses throughout the rest of this document.

a. Compressor availability

For the June 2020 Preliminary Analysis, DOE selected EL 3 levels to represent an intermediate efficiency between EL 2 (the ENERGY STAR level) and EL 4 (the max-tech level)[56] that could be reached with single-speed compressor designs for all product classes. 85 FR 36512. In interviews, manufacturers raised concerns about the ability to meet the preliminary analysis' CEER values at EL 3 without the use of variable-speed compressors. Manufacturers asserted that the single-speed compressors necessary to meet the preliminary analysis EL 3 levels are not available to all manufacturers and encouraged DOE to base EL 3 on compressors that are widely available on the market.

b. Physical design constraints

[56] For the June 2020 Preliminary Analysis, DOE analyzed five efficiency levels as part of its engineering analysis. In response to stakeholder comments to the preliminary analysis, DOE analyzed an additional efficiency level in the NOPR engineering analysis between EL 3 and the max-tech level (EL 4 in the preliminary analysis, now EL 5 for this NOPR).

Manufacturers noted that through-the-wall ("TTW") products are designed to fit specific sleeve sizes and the market requires replacement products to fit existing sleeves. Additionally, window units are constrained by average window dimensions. Further, manufacturers noted that they design the boxed product to meet either 50 pound ("lb") or 150 lb weight thresholds, reflecting requirements related to worker safety standards, parcel delivery service thresholds, and customer utility. Manufacturers noted that maintaining existing product dimensions is an important feature to their end-users, particularly in the replacement market.

c. Cost increases and component shortages

Manufacturers noted that recent increases in raw material prices, escalating shipping and transportation costs, and limited component availability 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 June 2020 Preliminary Analysis, interested parties submitted written comments addressing several topics including cumulative regulatory burden.

AHAM and GEA commented that DOE should include proposed changes to both standards and refrigerants, as well as the economic impact of U.S. tariffs on Chinese imports, when determining the cumulative regulatory burden placed on manufacturers.

AHAM and GEA also urged DOE to incorporate the financial results of cumulative regulatory burden analysis into the GRIM to account for the time and resources needed to comply with concurrent regulations. (AHAM, No. 19 at pp. 12 and 17–19; GEA No. 26 at p. 2)

DOE analyzes cumulative regulatory burden pursuant to 10 CFR part 430, subpart C, appendix A. Pursuant to Appendix A, the Department will recognize and consider the overlapping effects on manufacturers of new or revised DOE standards and other Federal regulatory actions affecting the same products or equipment. The results of this analysis can be found in section V.B.2.e of this document. DOE endeavors to provide analyses that take market conditions and the effect of other Federal regulatory actions into account, such as the U.S. tariffs on Chinese imports and the transition to alternative refrigerants. DOE incorporates these factors into their range of analyses, including the market and technology assessment, screening analysis, engineering analysis, energy usage analysis, NIA, and MIA.

In consideration of AHAM's comment on the possibility that California may prohibit HFCs and the resulting transition to alternative refrigerants (AHAM, No. 40 at p. 12), DOE evaluated potential impacts of CARB's proposed 750 GWP limit on the energy efficiency of new room ACs. This State regulation is specific to the products regulated by this NOPR and would require redesign of the covered product. Based on interviews and through review of market data, DOE found that all but one OEM is producing R-32 room AC models. Additionally, based on interview feedback, all OEMs intend to transition entirely to R-32 room ACs by 2023 regardless of DOE actions related to the energy conservation standards for room ACs. Thus, DOE did not consider the redesign costs related to R-32 to be conversion costs, as the change in refrigerant is independent of DOE actions related to any amended energy conservation standards.

DOE is aware of one OEM still in the process of redesigning room ACs to make use of R-32 and to comply with the requirements in Underwriters Laboratories ("UL") Standard UL 60335-2-40, "Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers" ("UL 60335-2-40") for their products that are manufactured in-house. To account for these investments, DOE incorporated an estimate of the on-going costs for that business into its GRIM.

Regarding U.S. tariffs on Chinese imports, tariff levels have escalated in recent years. At the time of the April 2011 Direct Final Rule, most room ACs imported into the U.S. were manufactured in China. Since that time, the Section 301 tariffs on room ACs increased to 10 percent in September 2018 and to 25 percent in May 2019.[57] As result of

---

[57] The Office of the United States Trade Representative ("USTR") released a list of Chinese imports subject to new tariffs on September 18, 2018. The tariffs were set at 10 percent and had an effective date of September 24, 2018. Room ACs fall under Harmonized Tariffs Schedule ("HTS") code 8415.10.30, "Window or wall type air conditioning machines, self-contained," and were subject to those tariffs. The USTR press release on the adoption of the tariffs and the affected imports can be found at: *ustr.gov/about-us/policy-offices/press-office/press-releases/2018/september/ustr-finalizes-tariffs-200*. The Notice of Modification of Section 301 can be found at: *ustr.gov/sites/default/files/enforcement/301Investigations/83%20FR%2047974.pdf*

Initially, the tariffs on room ACs were set to increase to 25 percent on January 1, 2019. The increase was delayed in subsequent negotiations. Ultimately the USTR raised tariffs on room ACs to 25 percent on May 10, 2019. The USTR press release on the increase in tariffs can be found at: *ustr.gov/sites/default/files/enforcement/301Investigations/83%20FR%2047974.pdf*. The Notice of Modification of Section 301 can be found at: *ustr.gov/sites/default/files/enforcement/301Investigations/84_FR_20459.pdf* tariffs, as noted by AHAM, “some manufacturers have had to shift production to other countries to avoid the tariffs.” (AHAM, No. 19 at pp. 18–19) DOE understands that these products are now made in countries in East Asia and Southeast Asia not subject to Section 301 tariffs. However, due to uncertainty about the exact countries of origin, DOE’s engineering analysis continues to rely on data based on a Chinese point of origin. To revise MPCs to account for points of origin outside of China, DOE would require information on the countries of manufacture and 5-year averages for key inputs, such as fully burdened production labor wage rates and local raw material prices, used to develop MPCs.

To better model the impact of Section 301 tariffs on room AC products that continue to be manufactured in China, DOE requires additional information about the portion of products still manufactured in China and how the tariffs are absorbed by the entities along the room AC value chain, such as the foreign OEMs, U.S. importers, retailers, and consumers. Increases in retail price may affect consumer purchasing decisions, as captured by the price sensitivity modeled in the shipments analysis.

Additional details about cumulative regulatory burden and requests for comment can be found in section V.B.2.d of this document.

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 power sector emissions of CO_2, NO_X, SO_2, and Hg uses marginal emissions factors that were derived from data in *AEO 2021*, as described in section IV.M of this document. Details of the methodology are described in the appendices to chapters 13 and 15 of the NOPR TSD.

Power sector emissions of CO_2, CH_4, and N_2O are estimated using Emission Factors for Greenhouse Gas Inventories published by the EPA.[58] The FFC upstream emissions are estimated based on the methodology described in chapter 15 of the NOPR TSD. The upstream emissions include both emissions from extraction, processing, and transportation of fuel, and "fugitive" emissions (direct leakage to the atmosphere) of CH_4 and CO_2.

The emissions intensity factors are expressed in terms of physical units per megawatt-hours ("MWh") or million British thermal units ("MMBtu") of site energy

[58] *www.epa.gov/sites/production/files/2016-09/documents/emission-factors_nov_2015_v2.pdf* (last accessed June 14, 2021).

savings. 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 2021*, which incorporates the projected impacts of existing air quality regulations on emissions. *AEO 2021* 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.[59]

SO_2 emissions from affected electric generating units ("EGUs") are subject to nationwide and regional emissions cap-and-trade programs. Title IV of the Clean Air Act sets an annual emissions cap on SO_2 for affected EGUs in the 48 contiguous States and the District of Columbia (D.C.). (42 U.S.C. 7651 et seq.) SO_2 emissions from 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.[60] *AEO 2021* incorporates implementation of CSAPR, including the

[59] For further information, see the Assumptions to *AEO 2021* 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 June 14, 2021).
[60] 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

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 of 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. 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 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

an additional five states in the CSAPR ozone season program; 76 FR 80760 (Dec. 27, 2011) (Supplemental Rule).

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, NO_X 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 *AEO 2021* 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 *AEO 2021*, 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 considered in 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. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law. DOE requests comment on how to address the climate benefits and other non-monetized effects of the proposal.

1. Monetization of Greenhouse Gas Emissions

For the purpose of complying with the requirements of Executive Order 12866, DOE estimates the monetized benefits of the reductions in emissions of CO_2, CH_4, and N_2O by using a measure of the social cost ("SC") of each pollutant (e.g., SC-GHGs). 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 guidance, and DOE would reach the same conclusion presented in this notice in the absence of the social cost of greenhouse gases, including the February 2021 Interim Estimates presented by the Interagency Working Group on the Social Cost of Greenhouse Gases. 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, including the February 2021 Interim Estimates presented by the Interagency Working Group on the Social Cost of Greenhouse Gases.

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 Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) (IWG, 2021). 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 CH4 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, an interagency working group (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-CO2) 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) 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 (ECS) – 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 social cost of methane (SC-CH4) and nitrous oxide (SC-N2O) using methodologies that are consistent with the methodology underlying the SC-CO_2 estimates. The modeling approach that extends the IWG SC-CO2 methodology to non-CO2 GHGs has undergone multiple stages of peer review. The SC-CH4 and SC-N2O estimates were developed by Marten et al. (2015) 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-CO2 estimates, the IWG announced a National Academies of Sciences, Engineering, and Medicine review of the SC-CO2 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-CO2 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). 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-CO2 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" (EO 13783, Section 5(c)).

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 EO that reflect the full impact of GHG emissions, including by taking global damages into account. The interim SC-GHG estimates published in February 2021, specifically the SC-CH4 estimates, are used here to estimate the climate benefits for this proposed rulemaking. The EO 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 EO 13990. In particular, the IWG found that the SC-GHG estimates used under EO 13783 fail to reflect the full impact of GHG emissions in multiple ways. First, the IWG found that a global perspective is essential for SC-GHG estimates because it fully captures climate impacts that affect the United States and which have been omitted from prior U.S.-specific estimates due to methodological constraints. Examples of omitted effects include direct effects on U.S. citizens, assets, and investments located abroad, supply chains, and tourism, and spillover pathways such as economic and political destabilization and global migration. 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. 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. 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-CH4. This approach is the same as that taken in DOE regulatory analyses from 2012 through 2016. Prior to that, in 2008 DOE presented Social Cost of Carbon (SCC) estimates based on values the Intergovernmental Panel on Climate Change (IPCC) identified in literature at that time. 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, 2016b), and recommended that discount rate uncertainty and relevant aspects of intergenerational ethical considerations be accounted for in selecting future discount rates. 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 to 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.

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 generated using the values presented in the 2021 update from the IWG's February 2021 TSD. Table IV.8 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.[61]

[61] 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.

Table IV.8 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 each of the four sets of $SC-CO_2$ cases specified, the values for emissions in 2020 were $14, $51, $76, and $152 per metric ton avoided (values expressed in 2020$). DOE derived values after 2050 based on the trend in 2020–2050 in each of the four cases in the IWG update. DOE derived values from 2051 to 2070 based on estimates published by EPA.[62] These estimates are based on methods, assumptions, and parameters identical to the 2020-2050 estimates published by the IWG. DOE derived values after 2070 based on the trend in 2060-2070 in each of the four cases in the IWG update.

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

[62] See EPA, *Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards: Regulatory Impact Analysis*, Washington, D.C., December 2021. Available at: *https://www.epa.gov/system/files/documents/2021-12/420r21028.pdf* (last accessed January 13, 2022).

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.[63] Table IV.9 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.

Table IV.9 Annual SC-CH_4 and SC-N_2O Values from 2021 Interagency Update, 2020–2050 (2020$ per Metric Ton)

	SC-CH_4				SC-N_2O			
	Discount Rate and Statistic				Discount Rate and Statistic			
	5%	3%	2.5%	3%	5%	3%	2.5 %	3%
Year	Average	Average	Average	95th percentile	Average	Average	Average	95th percentile

[63] 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, D.C., February 2021.
www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf?source=email

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

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 of the NOPR TSD for the annual emissions reduction. See appendix 14A of the NOPR TSD for the annual SC-CH_4 and SC-N_2O values.

2. Monetization of Other Air Pollutants

For this NOPR, 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.[64] 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

[64] *Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 21 Sectors*. www.epa.gov/benmap/estimating-benefit-ton-reducing-pm25-precursors-21-sectors

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 room ACs using a method described in appendix 14B of the NOPR TSD.

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

The SCoC Commenters presented reasons why DOE should, as it has in the past, monetize the full climate benefits of greenhouse gas emissions reductions, using the best available estimates, which were derived by the Interagency Working Group on the Social Cost of Greenhouse Gases. The SCoC Commenters also stated that DOE should factor these benefits into its choice of the maximum efficiency level that is economically justified, consistent with its statutory requirement to assess the national need to conserve energy under the Energy Policy and Conservation Act. (SCoC, No. 21 at p. 1)

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. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.

M. Utility Impact Analysis

The utility impact analysis estimates several effects on the electric power generation industry that would result from the adoption of new or amended energy conservation standards. The utility impact analysis estimates the changes in installed electrical capacity and generation that would result for each TSL. The analysis is based on published output from the NEMS associated with *AEO 2021*. 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 *AEO 2021* 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.[65] 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.

[65] 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."

One method for assessing the possible effects on the demand for labor of such shifts in economic activity is to compare sector employment statistics developed by the Labor Department's 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.[66] 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 Technologies version 4 ("ImSET").[67] ImSET is a special-purpose

---

[66] 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*.
[67] 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.

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, 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 room ACs. It addresses the TSLs examined by DOE, the projected impacts of each of these levels if adopted as energy conservation standards for room ACs, 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 by grouping individual efficiency levels for each class into TSLs. Use of TSLs allows DOE to identify and consider manufacturer cost interactions between the product 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. DOE analyzed the benefits and burdens of five TSLs for room ACs. DOE developed TSLs that combine efficiency levels for each analyzed product class. 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 room ACs. TSL 5 represents the max-tech energy efficiency for all product classes and corresponds to EL 5. TSL 4 corresponds to EL 4 for all product classes, consistent with the implementation of commercially available variable-speed compressors based on the current availability of variable speed compressors at cooling capacities ≥ 8,000 Btu/h. However, as of 2022, there are no models commercially available that incorporate variable-speed compressors for cooling capacities less than 8,000 Btu/h, and the uncertainties of the possibilities of incorporating variable-speed compressors in smaller units may have the potential to eliminate room ACs with the smallest cooling capacities from the market. TSL 3, therefore, is constructed with EL 4 for product classes with cooling capacities ≥ 8,000 Btu/h, corresponding to the inclusion of commercially available variable-speed compressors, and EL 3 for cooling capacities < 8,000 Btu/h, corresponding to the incorporation of maximum energy efficient single-speed compressors. TSL 2 corresponds to EL 3 for all product classes and represents room ACs with the maximum energy efficient single-speed compressor. TSL 1 corresponds to EL 2 for all product classes and represents the current ENERGY STAR level.

Table V.1 Trial Standard Levels for Room Air Conditioners

Product Class	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
	CEER (Btu/Wh)				
Room AC without reverse cycle, with louvered sides					
<6,000 Btu/h (PC 1)	12.1	13.1	13.1	16.0	20.2
6,000 to 7,999 Btu/h (PC 2)	12.1	13.7	13.7	16.0	20.2
8,000 to 13,999 Btu/h (PC 3)	12.0	14.3	16.0	16.0	22.4
14,000 to 19,999 Btu/h (PC 4)	11.8	14.0	16.0	16.0	20.6
20,000 to 27,999 Btu/h (PC 5a)	10.3	11.8	13.8	13.8	19.1
≥28,000 Btu/h (PC 5b)	9.9	10.3	13.2	13.2	16.7
Room AC without reverse cycle, without louvered sides					
<6,000 Btu/h (PC 6)	11.0	12.8	12.8	14.7	19.4
6,000 to 7,999 Btu/h (PC 7)	11.0	12.8	12.8	14.7	19.4
8,000 to 10,999 Btu/h (PC 8a)	10.6	12.3	14.1	14.1	18.7
11,000 to 13,999 Btu/h (PC 8b)	10.5	12.3	13.9	13.9	19.1
14,000 to 19,999 Btu/h (PC 9)	10.2	10.9	13.7	13.7	16.6
≥20,000 Btu/h (PC 10)	10.3	11.0	13.8	13.8	16.8
Room AC with reverse cycle, with louvered sides					
<20,000 Btu/h (PC 11)	10.8	12.3	14.4	14.4	18.7
≥20,000 Btu/h (PC 13)	10.2	11.7	13.7	13.7	18.9
Room AC with reverse cycle, without louvered sides					
<14,000 Btu/h (PC 12)	10.2	11.3	13.7	13.7	16.2
≥14,000 Btu/h (PC 14)	9.6	11.2	12.8	12.8	17.5
Casement					
Casement-Only (PC 15)	10.5	12.2	13.9	13.9	18.1
Casement-Slide (PC 16)	11.4	13.2	15.3	15.3	19.7

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.[68] DOE did not consider a TSL with EL 1 because DOE's projected efficiency distribution indicated a significant portion of the market would meet or exceed EL 1 in the no-new-standards case by the compliance year leading to smaller national energy savings and lower LCC savings for a standard set at EL 1 relative to EL 2. As such, the least efficient level considered for TSLs in this NOPR is EL 2.

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

DOE analyzed the economic impacts on room AC consumers 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

[68] 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, 10, and 12.

LCC and PBP include total installed costs (*i.e.*, product price plus installation costs), and operating costs (*i.e.*, annual energy use, energy prices, energy price trends, repair costs, and maintenance costs). The LCC calculation also uses product lifetime and a discount rate. Chapter 8 of the NOPR TSD provides detailed information on the LCC and PBP analyses.

Table V.2 through Table V.25 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 of each pair of tables, 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 Room Air Conditioners PC 1, Without Reverse Cycle and with Louvers, Less than 6,000 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	11.0	$370.65	$62.66	$468.55	$839.20	-	9.3
1	-	11.4	$372.06	$61.05	$456.64	$828.70	0.9	9.3
2	1	12.1	$374.95	$55.09	$412.42	$787.37	0.6	9.3
3	2,3	13.1	$379.10	$51.10	$382.87	$761.97	0.7	9.3
4	4	16.0	$464.91	$42.09	$316.27	$781.19	4.6	9.3
5	5	20.2	$477.52	$34.22	$257.85	$735.38	3.8	9.3

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

Table V.3 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 1, Without Reverse Cycle and with Louvers, Less than 6,000 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	11.4	$0.82	0%
1	12.1	$39.28	1%
2,3	13.1	$63.49	3%
4	16.0	$45.25	40%
5	20.2	$91.06	32%

* The savings represent the average LCC for affected consumers.

Table V.4 Average LCC and PBP Results for Room Air Conditioners PC 2, Without Reverse Cycle and with Louvers, 6,000–7,999 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	11.0	$407.59	$81.06	$616.44	$1,024.03	-	9.3
1	-	11.4	$409.87	$78.35	$595.94	$1,005.81	0.8	9.3
2	1	12.1	$413.43	$71.82	$546.61	$960.05	0.6	9.3
3	2,3	13.7	$421.94	$64.22	$489.11	$911.04	0.9	9.3
4	4	16.0	$511.73	$54.87	$418.34	$930.08	4.0	9.3
5	5	20.2	$562.03	$44.64	$341.01	$903.04	4.2	9.3

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

Table V.5 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 2, Without Reverse Cycle and with Louvers, 6,000–7,999 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	11.4	$0.00	0%
1	12.1	$34.23	2%
2,3	13.7	$80.02	5%
4	16.0	$62.00	40%
5	20.2	$89.03	43%

* The savings represent the average LCC for affected consumers.

Table V.6 Average LCC and PBP Results for Room Air Conditioners PC 3, Without Reverse Cycle, with Louvered Sides, and 8,000–13,999 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	10.9	$512.47	$104.95	$792.93	$1,305.40	-	9.3
1	-	11.4	$514.75	$101.34	$765.80	$1,280.55	0.6	9.3
2	1	12.0	$518.90	$92.17	$697.03	$1,215.93	0.5	9.3
3	2	14.3	$532.62	$78.23	$592.36	$1,124.98	0.8	9.3
4	3,4	16.0	$616.54	$67.97	$514.54	$1,131.08	2.8	9.3
5	5	22.4	$675.20	$50.21	$381.46	$1,056.67	3.0	9.3

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

Table V.7 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 3, Without Reverse Cycle, with Louvered Sides, and 8,000–13,999 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	11.4	$0.00	0%
1	12.0	$19.31	0%
2	14.3	$104.92	4%
3,4	16.0	$99.14	30%
5	22.4	$173.55	30%

* The savings represent the average LCC for affected consumers.

Table V.8 Average LCC and PBP Results for Room Air Conditioners PC 4, Without Reverse Cycle and with Louvers, 14,000–19,999 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	10.7	$642.61	$120.26	$903.35	$1,545.97	-	9.3
1	-	11.1	$644.60	$116.98	$878.91	$1,523.51	0.6	9.3
2	1	11.8	$651.70	$106.07	$797.78	$1,449.48	0.6	9.3
3	2	14.0	$662.16	$90.20	$679.66	$1,341.82	0.7	9.3
4	3,4	16.0	$769.44	$76.52	$577.36	$1,346.80	2.9	9.3
5	5	20.6	$813.45	$60.04	$454.84	$1,268.29	2.8	9.3

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

Table V.9 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 4, Without Reverse Cycle and with Louvers, 14,000–19,999 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	11.1	$0.00	0%
1	11.8	$0.00	0%
2	14.0	$102.30	1%
3,4	16.0	$97.49	35%
5	20.6	$176.00	32%

* The savings represent the average LCC for affected consumers.

Table V.10 Average LCC and PBP Results for Room Air Conditioners PC 5a, Without Reverse Cycle and with Louvers, 20,000–27,999 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	9.4	$800.55	$145.28	$1,057.96	$1,858.52	-	9.3
1	-	9.8	$803.27	$139.93	$1,019.56	$1,822.83	0.5	9.3
2	1	10.3	$819.84	$129.42	$944.08	$1,763.92	1.2	9.3
3	2	11.8	$831.48	$113.20	$827.62	$1,659.10	1.0	9.3
4	3,4	13.8	$938.90	$91.54	$670.41	$1,609.31	2.6	9.3
5	5	19.1	$1,011.43	$65.92	$486.74	$1,498.16	2.7	9.3

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

Table V.11 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 5a, Without Reverse Cycle and with Louvers, 20,000–27,999 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	9.8	$0.00	0%
1	10.3	$5.28	1%
2	11.8	$105.03	2%
3,4	13.8	$152.52	32%
5	19.1	$263.67	34%

* The savings represent the average LCC for affected consumers.

Table V.12 Average LCC and PBP Results for Room Air Conditioners PCs 5b, Without Reverse Cycle and with Louvers, Greater than 28,000 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	9.0	$848.65	$176.79	$1,288.42	$2,137.07	-	9.3
1	-	9.4	$851.46	$169.46	$1,235.83	$2,087.29	0.4	9.3
2	1	9.9	$855.66	$156.16	$1,140.31	$1,995.97	0.3	9.3
3	2	10.3	$859.12	$148.64	$1,086.31	$1,945.43	0.4	9.3
4	3,4	13.2	$998.92	$110.63	$811.63	$1,810.54	2.3	9.3
5	5	16.7	$1,049.36	$87.20	$643.64	$1,693.01	2.2	9.3

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

Table V.13 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 5b, Without Reverse Cycle and with Louvers, Greater than 28,000 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	9.4	$20.50	0%
1	9.9	$99.12	0%
2	10.3	$147.14	0%
3,4	13.2	$275.19	24%
5	16.7	$392.72	25%

* The savings represent the average LCC for affected consumers.

Table V.14 Average LCC and PBP Results for Room Air Conditioners PC 8a, Without Reverse Cycle and without Louvered Sides, 8,000–10,999 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	9.6	$526.19	$106.80	$806.94	$1,333.14	-	9.3
1	-	10.1	$529.28	$102.12	$771.88	$1,301.16	0.7	9.3
2	1	10.6	$532.73	$94.84	$717.22	$1,249.95	0.5	9.3
3	2	12.3	$543.73	$82.19	$622.28	$1,166.01	0.7	9.3
4	3,4	14.1	$649.32	$69.87	$528.88	$1,178.20	3.3	9.3
5	5	18.7	$681.04	$53.86	$408.91	$1,089.95	2.9	9.3

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

Table V.15 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 8a, Without Reverse Cycle and without Louvered Sides, 8,000–10,999 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	10.1	$0.00	0%
1	10.6	$5.67	0%
2	12.3	$85.72	4%
3,4	14.1	$74.28	37%
5	18.7	$162.53	29%

* The savings represent the average LCC for affected consumers.

Table V.16 Average LCC and PBP Results for Room Air Conditioners PC 8b, Without Reverse Cycle and without Louvered Sides, 11,000–13,999 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	9.5	$575.83	$131.04	$989.84	$1,565.68	-	9.3
1	-	10.0	$578.86	$125.53	$948.49	$1,527.35	0.5	9.3
2	1	10.5	$582.99	$114.83	$868.19	$1,451.18	0.4	9.3
3	2	12.3	$595.41	$99.04	$749.68	$1,345.10	0.6	9.3
4	3,4	13.9	$684.21	$85.02	$643.37	$1,327.58	2.4	9.3
5	5	19.1	$731.28	$63.62	$483.08	$1,214.36	2.3	9.3

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

Table V.17 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 8b, Without Reverse Cycle and without Louvered Sides, 11,000–13,999 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	10.0	$0.00	0%
1	10.5	$0.00	0%
2	12.3	$100.02	3%
3,4	13.9	$116.89	26%
5	19.1	$230.10	23%

* The savings represent the average LCC for affected consumers.

Table V.18 Average LCC and PBP Results for Room Air Conditioners PC 9, Without Reverse Cycle and without Louvered Sides, 14,000–19,999 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	9.3	$719.11	$117.88	$883.56	$1,602.67	-	9.3
1	-	9.7	$722.16	$113.34	$849.88	$1,572.04	0.7	9.3
2	1	10.2	$730.98	$104.87	$787.15	$1,518.13	0.9	9.3
3	2	10.9	$736.20	$98.41	$739.24	$1,475.44	0.9	9.3
4	3,4	13.7	$836.63	$75.96	$572.18	$1,408.81	2.8	9.3
5	5	16.6	$865.13	$63.30	$478.47	$1,343.60	2.7	9.3

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

Table V.19 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 9, Without Reverse Cycle and without Louvered Sides, 14,000–19,999 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	9.7	$11.98	1%
1	10.2	$58.37	3%
2	10.9	$98.98	2%
3,4	13.7	$162.64	24%
5	16.6	$227.85	24%

* The savings represent the average LCC for affected consumers.

Table V.20 Average LCC and PBP Results for Room Air Conditioners PC 11, With Reverse Cycle and with Louvered Sides, less than 20,000 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	9.8	$576.42	$105.97	$808.00	$1,384.41	-	9.3
1	-	10.4	$580.33	$100.68	$767.83	$1,348.17	0.7	9.3
2	1	10.8	$584.09	$92.59	$706.50	$1,290.59	0.6	9.3
3	2	12.3	$595.08	$82.32	$628.54	$1,223.62	0.8	9.3
4	3,4	14.4	$692.20	$69.57	$531.79	$1,223.99	3.2	9.3
5	5	18.7	$737.07	$55.29	$423.44	$1,160.51	3.2	9.3

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

Table V.21 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 11, With Reverse Cycle and with Louvered Sides, less than 20,000 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	10.4	$18.13	2%
1	10.8	$67.57	2%
2	12.3	$131.52	4%
3,4	14.4	$131.12	30%
5	18.7	$194.60	31%

* The savings represent the average LCC for affected consumers.

Table V.22 Average LCC and PBP Results for Room Air Conditioners PC 12, With Reverse Cycle and without Louvered Sides, less than 14,000 Btu/h

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	9.3	$641.40	$87.09	$655.95	$1,297.35	-	9.3
1	-	9.7	$644.16	$83.90	$632.10	$1,276.26	0.9	9.3
2	1	10.2	$652.09	$77.88	$587.01	$1,239.10	1.2	9.3
3	2	11.3	$659.94	$71.00	$535.57	$1,195.51	1.2	9.3
4	3,4	13.7	$714.83	$57.84	$436.71	$1,151.54	2.5	9.3
5	5	16.2	$741.39	$49.73	$376.08	$1,117.48	2.7	9.3

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

Table V.23 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 12, With Reverse Cycle and without Louvered Sides, less than 14,000 Btu/h

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	9.7	$8.12	2%
1	10.2	$39.97	7%
2	11.3	$81.20	7%
3,4	13.7	$122.74	20%
5	16.2	$156.81	24%

* The savings represent the average LCC for affected consumers.

Table V.24 Average LCC and PBP Results for Room Air Conditioners PC 16, Casement-Slider

EL	TSL	CEER	Average Costs *2020$*				Simple Payback *years*	Average Lifetime *years*
			Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
0	-	10.4	$501.23	$86.26	$656.88	$1,158.11	-	9.3
1	-	10.8	$503.64	$83.42	$635.46	$1,139.09	0.8	9.3
2	1	11.4	$507.10	$76.33	$581.83	$1,088.93	0.6	9.3
3	2	13.2	$516.42	$67.41	$514.31	$1,030.73	0.8	9.3
4	3,4	15.3	$616.56	$57.41	$438.70	$1,055.26	4.0	9.3
5	5	19.7	$641.98	$45.89	$351.50	$993.49	3.5	9.3

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

Table V.25 Average LCC Savings Relative to the No-New-Standards Case for Room Air Conditioners PC 16, Casement-Slider

TSL	CEER	Life-Cycle Cost Savings	
		Average LCC Savings* *2020$*	Percent of Consumers that Experience Net Cost
-	10.8	$6.42	2%
1	11.4	$49.45	2%
2	13.2	$104.75	4%
3,4	15.3	$81.33	38%
5	19.7	$143.10	34%

* The savings represent the average LCC for affected consumers.

b. Consumer Subgroup Analysis

In the consumer subgroup analysis, DOE estimated the impact of the considered TSLs on low-income households and 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 Classes 4, 5a, 5b, and 9 for either low-income households or senior-only households due to insufficient sample size and does not report results for those product classes.[69] Table V.26 through Table V.41 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.26 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households: Room Air Conditioners PC 1, Without Reverse Cycle and with Louvers, Less than 6,000 Btu/h

		Average Life-Cycle Cost Savings* *2020$*			Simple Payback Period *years*		
EL	**TSL**	**Low-Income Households‡**	**Senior-Only Households****	**All Households†**	**Low-Income Households**	**Senior-Only Households****	**All Households†**
1	-	$0.86	-	$0.79	0.9	-	0.9
2	1	$40.12	-	$37.74	0.6	-	0.6
3	2,3	$64.92	-	$60.91	0.7	-	0.8
4	4	$52.08	-	$39.15	4.5	-	5.0
5	5	$98.55	-	$83.08	3.8	-	4.1

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.
‡ Low-income households represent 60.0 percent of all households for this product class.
** Insufficient sample size to conduct subgroup analysis.
† The savings represent results of residential consumers only and exclude results from commercial consumers.

[69] Product Classes 4, 5a, 5b, and 9 account for approximately 9 percent of the total room AC market.

Table V.27 Comparison of Percent of Impacted Consumers for Consumer Subgroups and All Households: Room Air Conditioners PC 1, Without Reverse Cycle and with Louvers, Less than 6,000 Btu/h

		Percent of Consumers that Experience Net Cost			Percent of Consumers that Experience Net Benefit		
EL	TSL	Low-Income Households‡	Senior-Only Households**	All Households†	Low-Income Households	Senior-Only Households**	All Households†
1	-	0%	-	0%	8%	-	8%
2	1	0%	-	1%	93%	-	92%
3	2,3	0%	-	2%	95%	-	93%
4	4	35%	-	41%	60%	-	54%
5	5	26%	-	32%	74%	-	68%

‡ Low-income households represent 60.0 percent of all households for this product class.
** Insufficient sample size to conduct subgroup analysis.
† Results for residential consumers only and exclude results from commercial consumers.

Table V.28 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households: Room Air Conditioners PC 2, Without Reverse Cycle and with Louvers, 6,000–7,999 Btu/h

		Average Life-Cycle Cost Savings* *2020$*			Simple Payback Period *years*		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	$0.00	$0.00	$0.00	0.8	0.7	0.8
2	1	$36.28	$41.20	$35.27	0.6	0.5	0.6
3	2,3	$84.74	$96.89	$82.61	0.8	0.7	0.9
4	4	$67.05	$88.31	$65.64	3.9	3.5	4.0
5	5	$98.48	$130.37	$95.14	4.2	3.7	4.2

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.
‡ Low-income households represent 50.1 percent of all households for this product class.
§ Senior-only households represent 24.7 percent of all households for this product class.
† The savings represent results of residential consumers only and exclude results from commercial consumers.

Table V.29 Comparison of Percent of Impacted Consumers for Consumer Subgroups and All Households: Room Air Conditioners PC 2, Without Reverse Cycle and with Louvers, 6,000–7,999 Btu/h

		Percent of Consumers that Experience Net Cost			Percent of Consumers that Experience Net Benefit		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	0%	0%	0%	0%	0%	0%
2	1	1%	2%	1%	74%	72%	73%
3	2,3	3%	5%	4%	90%	88%	89%
4	4	38%	31%	38%	58%	64%	57%
5	5	40%	33%	41%	60%	67%	59%

‡ Low-income households represent 50.1 percent of all households for this product class.
§ Senior-only households represent 24.7 percent of all households for this product class.
† Results for residential consumers only.

Table V.30 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households: Room Air Conditioners PC 3, Without Reverse Cycle, with Louvered Sides, and 8,000–13,999 Btu/h

		Average Life-Cycle Cost Savings* 2020$			Simple Payback Period years		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	$0.00	$0.00	$0.00	0.6	0.7	0.7
2	1	$22.44	$17.94	$18.66	0.5	0.6	0.5
3	2	$122.51	$96.97	$101.79	0.7	0.8	0.8
4	3,4	$122.56	$81.51	$94.44	2.6	3.2	3.0
5	5	$218.31	$148.90	$165.48	2.7	3.3	3.2

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.
‡ Low-income households represent 25.7 percent of all households for this product class.
§ Senior-only households represent 26.6 percent of all households for this product class.
† The savings represent results of residential consumers only and exclude results from commercial consumers.

Table V.31 Comparison of Percent of Impacted Consumers for Consumer Subgroups and All Households: Room Air Conditioners PC 3, Without Reverse Cycle, with Louvered Sides, and 8,000–13,999 Btu/h

		Percent of Consumers that Experience Net Cost			Percent of Consumers that Experience Net Benefit		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	0%	0%	0%	0%	0%	0%
2	1	0%	0%	0%	30%	30%	30%
3	2	4%	6%	4%	90%	88%	90%
4	3,4	28%	38%	29%	67%	57%	66%
5	5	27%	40%	30%	73%	60%	70%

‡ Low-income households represent 25.7 percent of all households for this product class.
§ Senior-only households represent 26.6 percent of all households for this product class.
† Results for residential consumers only.

Table V.32 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households: Room Air Conditioners PC 8a, Without Reverse Cycle and without Louvered Sides, 8,000–10,999 Btu/h

		Average Life-Cycle Cost Savings* 2020$			Simple Payback Period years		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	$0.00	$0.00	$0.00	0.6	0.7	0.7
2	1	$6.90	$5.42	$5.55	0.5	0.6	0.6
3	2	$100.26	$79.59	$83.45	0.6	0.8	0.8
4	3,4	$96.07	$57.33	$70.43	3.0	3.7	3.5
5	5	$203.50	$139.26	$155.62	2.7	3.2	3.1

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.
‡ Low-income households represent 25.7 percent of all households for this product class.
§ Senior-only households represent 26.6 percent of all households for this product class.
† The savings represent results of residential consumers only and exclude results from commercial consumers.

Table V.33 Comparison of Percent of Impacted Consumers for Consumer Subgroups and All Households: Room Air Conditioners PC 8a, Without Reverse Cycle and without Louvered Sides, 8,000–10,999 Btu/h

		Percent of Consumers that Experience Net Cost			Percent of Consumers that Experience Net Benefit		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	0%	0%	0%	0%	0%	0%
2	1	0%	0%	0%	11%	11%	11%
3	2	4%	5%	3%	91%	91%	92%
4	3,4	35%	46%	36%	61%	50%	59%
5	5	26%	38%	28%	74%	62%	72%

‡ Low-income households represent 25.7 percent of all households for this product class.
§ Senior-only households represent 26.6 percent of all households for this product class.
† Results for residential consumers only.

Table V.34 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households: Room Air Conditioners PC 8b, Without Reverse Cycle and without Louvered Sides, 11,000–13,999 Btu/h

		Average Life-Cycle Cost Savings* *2020$*			Simple Payback Period *years*		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	$0.00	$0.00	$0.00	0.5	0.6	0.6
2	1	$0.00	$0.00	$0.00	0.4	0.5	0.5
3	2	$117.02	$92.83	$97.18	0.5	0.7	0.7
4	3,4	$141.94	$96.54	$111.99	2.2	2.6	2.5
5	5	$280.86	$201.36	$221.12	2.1	2.6	2.5

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.
‡ Low-income households represent 25.7 percent of all households for this product class.
§ Senior-only households represent 26.6 percent of all households for this product class.
† The savings represent results of residential consumers only and exclude results from commercial consumers.

Table V.35 Comparison of Percent of Impacted Consumers for Consumer Subgroups and All Households: Room Air Conditioners PC 8b, Without Reverse Cycle and without Louvered Sides, 11,000–13,999 Btu/h

		Percent of Consumers that Experience Net Cost			Percent of Consumers that Experience Net Benefit		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	0%	0%	0%	0%	0%	0%
2	1	0%	0%	0%	0%	0%	0%
3	2	3%	4%	3%	91%	90%	91%
4	3,4	24%	34%	25%	71%	61%	70%
5	5	20%	31%	22%	80%	69%	78%

‡ Low-income households represent 25.7 percent of all households for this product class.
§ Senior-only households represent 26.6 percent of all households for this product class.
† Results for residential consumers only.

Table V.36 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households: Room Air Conditioners PC 11, With Reverse Cycle and with Louvered Sides, less than 20,000 Btu/h

		Average Life-Cycle Cost Savings* *2020$*			Simple Payback Period *years*		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	$21.00	$19.73	$18.57	0.7	0.7	0.7
2	1	$77.89	$73.55	$69.29	0.5	0.5	0.6
3	2	$152.91	$143.97	$135.03	0.7	0.7	0.8
4	3,4	$160.90	$146.67	$136.12	2.9	3.0	3.2
5	5	$241.86	$220.82	$202.33	2.8	3.0	3.2

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.
‡ Low-income households represent 39.4 percent of all households for this product class.
§ Senior-only households represent 25.0 percent of all households for this product class.
† The savings represent results of residential consumers only and exclude results from commercial consumers.

Table V.37 Comparison of Percent of Impacted Consumers for Consumer Subgroups and All Households: Room Air Conditioners PC 11, With Reverse Cycle and with Louvered Sides, less than 20,000 Btu/h

		Percent of Consumers that Experience Net Cost			Percent of Consumers that Experience Net Benefit		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	1%	2%	2%	49%	49%	49%
2	1	1%	2%	1%	85%	83%	84%
3	2	3%	5%	3%	93%	90%	92%
4	3,4	24%	30%	27%	72%	65%	68%
5	5	24%	31%	28%	76%	69%	72%

‡ Low-income households represent 39.4 percent of all households for this product class.
§ Senior-only households represent 25.0 percent of all households for this product class.
† Results for residential consumers only.

Table V.38 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households: Room Air Conditioners PC 12, With Reverse Cycle and without Louvered Sides, less than 14,000 Btu/h

		Average Life-Cycle Cost Savings* *2020$*			Simple Payback Period *years*		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	$9.52	$9.75	$8.10	0.8	0.8	0.9
2	1	$46.78	$47.40	$39.96	1.1	1.0	1.2
3	2	$94.76	$96.18	$81.15	1.1	1.0	1.2
4	3,4	$142.91	$146.29	$122.08	2.4	2.3	2.6
5	5	$186.10	$190.33	$156.32	2.5	2.5	2.8

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.
‡ Low-income households represent 41.1 percent of all households for this product class.
§ Senior-only households represent 25.1 percent of all households for this product class.
† The savings represent results of residential consumers only and exclude results from commercial consumers.

Table V.39 Comparison of Percent of Impacted Consumers for Consumer Subgroups and All Households: Room Air Conditioners PC 12, With Reverse Cycle and without Louvered Sides, less than 14,000 Btu/h

		Percent of Consumers that Experience Net Cost			Percent of Consumers that Experience Net Benefit		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	1%	2%	1%	38%	37%	38%
2	1	4%	8%	6%	82%	78%	80%
3	2	4%	8%	6%	90%	87%	89%
4	3,4	16%	20%	19%	79%	75%	76%
5	5	19%	23%	22%	81%	77%	78%

‡ Low-income households represent 41.1 percent of all households for this product class.
§ Senior-only households represent 25.1 percent of all households for this product class.
† Results for residential consumers only.

Table V.40 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households: Room Air Conditioners PC 16, Casement-Slider

		Average Life-Cycle Cost Savings* *2020$*			Simple Payback Period *years*		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	$7.03	$7.33	$6.38	0.8	0.8	0.9
2	1	$55.02	$57.23	$49.31	0.5	0.5	0.6
3	2	$117.04	$121.97	$104.50	0.7	0.7	0.8
4	3,4	$94.78	$100.47	$80.20	3.8	3.7	4.2
5	5	$167.19	$176.90	$142.02	3.3	3.2	3.6

* The savings represent the average LCC for affected consumers. Negative values denoted in parentheses.
‡ Low-income households represent 44.9 percent of all households for this product class.
§ Senior-only households represent 21.4 percent of all households for this product class.
† The savings represent results of residential consumers only and exclude results from commercial consumers.

Table V.41 Comparison of Percent of Impacted Consumers for Consumer Subgroups and All Households: Room Air Conditioners PC 16, Casement-Slider

		Percent of Consumers that Experience Net Cost			Percent of Consumers that Experience Net Benefit		
EL	TSL	Low-Income Households‡	Senior-Only Households§	All Households†	Low-Income Households	Senior-Only Households	All Households†
1	-	1%	3%	2%	32%	31%	32%
2	1	1%	3%	2%	84%	83%	84%
3	2	3%	7%	4%	92%	88%	91%
4	3,4	33%	36%	37%	62%	60%	58%
5	5	28%	32%	32%	72%	68%	68%

‡ Low-income households represent 44.9 percent of all households for this product class.
§ Senior-only households represent 21.4 percent of all households for this product class.
† Results for residential consumers only.

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 room ACs. 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.42 presents the rebuttable-presumption payback periods for the considered TSLs for room ACs. 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.42 Rebuttable-Presumption Payback Periods

Product Class	Trial Standard Level				
	1	2	3	4	5
	years				
PC1: Room Air Conditioners, without reverse cycle, with louvered sides, and less than 6,000 Btu/h	1.0	1.0	1.0	7.0	5.3
PC2: Room Air Conditioners, without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	0.9	1.0	1.0	5.4	5.2
PC3: Room Air Conditioners, without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	0.6	0.8	3.5	3.5	3.1
PC4: Room Air Conditioners, without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	0.6	0.5	2.5	2.5	2.2
PC5a: Room Air Conditioners, without reverse cycle, with louvered sides, and 20,000 to 27,999 Btu/h	0.8	0.5	1.8	1.8	1.6
PC5b: Room Air Conditioners, without reverse cycle, with louvered sides, and 28,000 Btu/h or more	0.2	0.2	1.5	1.5	1.4
PC8a: Room Air Conditioners, without reverse cycle, without louvered sides, and 8,000 to 10,999 Btu/h	0.6	0.7	3.8	3.8	3.0
PC8b: Room Air Conditioners, without reverse cycle, without louvered sides, and 11,000 to 13,999 Btu/h	0.5	0.6	2.8	2.8	2.4
PC9: Room Air Conditioners, without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	0.7	0.6	2.2	2.2	1.9
PC11: Room Air Conditioners, with reverse cycle, with louvered sides, and less than 20,000 Btu/h	0.7	0.8	3.8	3.8	3.3
PC12: Room Air Conditioners, with reverse cycle, without louvered sides, and less than 14,000 Btu/h	1.3	1.1	3.1	3.1	2.9
PC16: Room Air Conditioners, Casement-Slider	0.7	0.8	4.8	4.8	3.9

2. Economic Impacts on Manufacturers

DOE performed an MIA to estimate the impact of amended energy conservation standards on manufacturers of room ACs. 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. The following tables summarize the estimated financial impacts of potential amended energy conservation standards on manufacturers of room ACs, as well as the conversion costs that DOE estimates manufacturers of room ACs would incur at each TSL.

The impact of potential amended energy conservation standards were analyzed under two markup 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. The preservation of gross margin percentage scenario provides the upper bound while the preservation of operating profits 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 (2021–2055). 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.43 Manufacturer Impact Analysis Results for the Room Air Conditioner Industry*

	Units	No New STDs Case	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
INPV	$ MM	1,081	1,072 to 1,075	1,053 to 1,078	1,016 to 1,165	968 to 1,247	611 to 992
Change in INPV	%	-	(0.8) to (0.5)	(2.5) to (0.3)	(6.0) to 7.8	(10.4) to 15.4	(43.5) to (8.2)
Free Cash Flow (2025)	$ MM	72.6	66.8	60.0	64.1	62.8	(139.3)
Change in Free Cash Flow (2025)	%	-	(8.0)	(17.3)	(11.7)	(13.5)	(291.7)
Conversion Costs	$ MM	-	13.6	29.1	22.8	26.7	475.9

*Negative values denoted by parentheses.

At TSL 1, the standard is set to existing ENERGY STAR levels (EL 2) for all product classes. DOE estimates the change in INPV to be minimal under both manufacturer markup scenarios. INPV is expected to range from -0.8 percent to -0.5 percent. At this level, free cash flow is estimated to decrease by 8.0 percent compared to the no-new-standards case value of $72.6 million in the year 2025, the year before the standards year. DOE's shipments analysis estimates approximately 75 percent of current shipments meet this level. At TSL 1, DOE does not expect industry to adopt new or larger chassis sizes. Capital conversion costs may be necessary for incremental updates in tooling. Product conversion costs are driven by specification, sourcing, and testing of more efficient compressors. DOE estimates capital conversion costs of $10.6 million and product conversion costs of $3.0 million. Conversion costs total $13.6 million.

At TSL 2, the standard reflects an efficiency level attainable by units with the most efficient R-32 single-speed compressor on the market, in combination with other design options, for all product classes (EL 3). DOE estimates the change in INPV to range from -2.5 percent to -0.3 percent. At this level, free cash flow is estimated to decrease by 17.3 percent compared to the base-case value in the year before the standards year. DOE's shipments analysis estimates approximately 30 percent of current shipments meet this level. At TSL 2, DOE does not expect industry to adopt new or larger chassis designs. Capital conversion costs may be necessitated by the incorporation of additional design options, such as the inclusion of sub-cooling. Product conversion costs are driven by the need to redesign models to incorporate more efficient single-speed compressors as well as other design options. DOE estimates capital conversion costs of $24.3 million and product conversion costs of $4.8 million. Conversion costs total $29.1 million.

At TSL 3, the standard varies based by product class. For product classes with cooling capacities less than 8,000 Btu/h, the standard reflects an efficiency level attainable by units with the most efficient R-32 single-speed compressor on the market (EL 3) in combination with other design options. For product classes with cooling capacities greater than or equal to 8,000 Btu/h, the standard reflects an efficiency level consistent with the implementation commercially available variable-speed compressors (EL 4). DOE estimates the change in INPV to range from -6.0 percent to 7.8 percent. At this level, free cash flow is estimated to decrease by 11.7 percent compared to the base-case value in the year before the standards year. DOE's shipments analysis estimates approximately 1 percent of current shipments meet this level.

At this level, DOE does not expect industry to adopt new or larger chassis designs. For product classes with cooling capacities greater than or equal to the 8,000 Btu/h threshold, additional capital conversion costs may be necessary to adjust appearance tooling. DOE anticipates greater redesign efforts and product conversion costs as manufacturers move these products to variable-speed compressor designs. DOE estimates capital conversion costs of $6.2 million and product conversion costs of $16.6 million. Conversion costs total $22.8 million.

In interviews and through review of market data, DOE found that all but one OEM currently produce R-32 room AC models. Additionally, based on interview feedback, all OEMs intend to entirely transition to R-32 room ACs by 2023 regardless of DOE actions related to the energy conservation standards for room ACs. Thus, DOE did not consider the redesign costs related to R-32 as conversion costs that are the result of any amended energy conservation standards. However, DOE does take costs associated with the transition to low-GWP refrigerants into account in its modeling of the GRIM, as discussed in the cumulative regulatory burden portion of this notice in section V.B.2.d of this document.

At TSL 4, the standard reflects the efficiency consistent with the implementation of commercially available variable-speed compressors for all product classes (EL 4). DOE estimates the change in INPV to range from -10.4 percent to 15.4 percent. At this level, free cash flow is estimated to decrease by 13.5 percent compared to the base-case value in the year before the standards year. DOE's shipments analysis estimates that less than 1 percent of current shipments meet this level. At this level, DOE does not expect industry to adopt new or larger chassis designs. Capital conversion costs may be necessary for adjustments in appearance tooling. Compared to lower ELs, DOE anticipates significantly greater redesign efforts and product conversion costs as manufacturers move all products to variable-speed compressor designs. Based on DOE's CCD, DOE estimates that OEMs would need to redesign all product platforms to meet the efficiency levels required by TSL 4. DOE estimates capital conversion costs of $6.0 million and product conversion costs of $20.7 million. Conversion costs total $26.7 million.

At TSL 5, the standard reflects max-tech efficiency (EL 5) for all product classes. DOE estimates the change in INPV to range from -43.5 percent to -8.2 percent. At this level, free cash flow is estimated to decrease by 291.7 percent compared to the base-case value in the year before the standards year. In DOE's review of the market, no models currently meet this level. DOE estimates capital conversion costs of $455.0 million and product conversion costs of $20.8 million. Conversion costs total $475.9 million.[70]

At this level, DOE expects significant changes to chassis size for both window and TTW units. As a result, capital conversion costs increase significantly as manufacturers adjust equipment and tooling to accommodate new dimensions. As with EL 4, DOE anticipates significant redesign efforts and product conversion costs as manufacturers move all products to variable-speed compressor designs. OEMs would need to redesign all product platforms to meet the efficiency levels required by TSL 5.

At TSL 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.

b. Direct Impacts on Employment

DOE's research indicates no room ACs are currently made in domestic production facilities. DOE expects that amended standards would have no impact on domestic production employment, which would remain at zero. Manufacturers maintain offices in the United States to handle design, marketing, technical support, and other business needs. Large changes in total annual shipments may lead to companies reducing their non-production room AC staff. However, DOE's shipments model does not

[70] Capital conversion costs and product conversion costs may not sum to total due to independent rounding.

forecast substantial changes in total annual shipments for the standards case. If total shipments remain relatively steady DOE would not expect any change to non-production employment as a result of amended standards. See section IV.G of this document for additional details on DOE's shipments analysis.

c. Impacts on Manufacturing Capacity

In interviews, manufacturers noted that the majority of room ACs are manufactured overseas by high-volume manufacturers producing product for a range of international markets. Manufacturers had few concerns about production line constraints below the max-tech level. However, at the max-tech level, some manufacturers noted concerns about having sufficient technical resources to oversee the redesign and testing of all room AC products to incorporate variable-speed technology.

Additionally, DOE notes that the most efficient variable-speed compressors that were implemented in the NOPR analysis are offered by only a single manufacturer. Based on public information, DOE was unable to determine the availability and pricing of these compressors. Given the lack of information regarding availability of these highest efficiency variable-speed compressors and the limited number of variable-speed compressors rated at or near the efficiency of compressors considered for the max-tech efficiency level, there may not be sufficient availability of the highest efficiency variable-speed compressors to meet the entire industry's production capacity needs at all cooling capacities of room ACs at EL 5.

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 VII.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. DOE requests information regarding the impact of cumulative regulatory burden on manufacturers of room ACs associated with multiple DOE standards or product-specific regulatory actions of other Federal agencies.

DOE evaluates product-specific regulations that will take effect approximately 3 years before or after the 2026 compliance date of any amended energy conservation standards for room ACs. This information is presented in Table V.44 below.

Table V.44 Compliance Dates and Expected Conversion Expenses of Federal Energy Conservation Standards Affecting Room Air Conditioner Manufacturers

Federal Energy Conservation Standard	Number of Manufacturers*	Number of Manufacturers Affected from Today's Rule**	Approx. Standards Year	Industry Conversion Costs (*Millions $*)	Industry Conversion Costs / Product Revenue***
Commercial Warm Air Furnaces 81 FR 2420 (January 15, 2016)	16	1	2023	$7.5 to $22.2 (2014$)	1.7% to 5.1%†
Small, Large, and Very Large Commercial Package Air Conditioning and Heating Equipment 81 FR 2420 (January 15, 2016)	29	4	2018 and 2023‡	$520.8 (2014$)	4.9%
Residential Central Air Conditioners and Heat Pumps 82 FR 1786 (January 6, 2017)	51	8	2023	$342.6 (2015$)	0.5%
Portable Air Conditioners 85 FR 1378 (January 10, 2020)	11	5	2025	$320.9 (2015$)	6.7%
Commercial Packaged Boilers 85 FR 1592 (January 10, 2020)	43	1	2023	$21.2 (2015$)	2.3%

* This column presents the total number of manufacturers identified in the energy conservation standard rule contributing to cumulative regulatory burden.
** This column presents the number of manufacturers producing room AC equipment that are also listed as manufacturers in the listed 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.
†Low and high conversion cost scenarios were analyzed as part of this Direct Final Rule. The range of estimated conversion expenses presented here reflects those two scenarios.
‡The Direct Final Rule for Small, Large, and Very Large Commercial Package Air Conditioning and Heating Equipment adopts an amended standard in 2018 and a higher amended standard in 2023. The conversion costs are spread over an 8-year conversion period ending in 2022, with over 80 percent of the conversion costs occurring between 2019 and 2022.

In addition to the Federal, product-specific cumulative regulatory burden described above, DOE considered the impacts of other factors in its review of burdens that could lead to industry constraints.

CARB's proposed 750 GWP limit for new room air conditioning equipment:

DOE evaluated potential impacts of CARB's proposed 750 GWP limit for new room ACs that would take effect in 2023.[71] This proposed State regulation is specific to the products regulated by this NOPR. Based on manufacturer interviews, DOE understands that all OEMs and major manufacturers intend to transition their complete portfolio of room AC offerings for the U.S. market to R-32 refrigerant to meet CARB's proposed requirement by 2023. DOE's research and testing indicates that the transition to R-32 would likely not have a negative impact on product efficiency.

DOE is aware of one OEM still in the process of redesigning room ACs to make use of R-32, including compliance with the relevant safety standard UL 60335-2-40.[72] The on-going effort to transition its room AC product lines to make use of R-32 requires a level of investment beyond the typical annual R&D expenditures. To account for these investments, both the product development to make use of R-32 and product updates to meet UL 60335-2-40, DOE has attempted to incorporate the on-going cost into its GRIM.

[71] *ww3.arb.ca.gov/board/res/2020/res20-37.pdf*

[72] UL 60335-2-40 includes safety requirements for the use of flammable refrigerants in the covered product. *Standard for Household and Similar Electrical Appliances - Safety - Part 2-40: Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers.* UL 60335-2-40, Edition 3:2019. Northbrook, IL: Underwriters' Laboratories.

DOE did not receive any quantitative estimates of the cost of the transition to R-32. For modeling purposes, DOE assumed that the transition to R-32 would require a doubling of R&D expenditures (2.2 percent of revenue) annually in the period between the base year and the compliance of the analysis for that business. This value is based on qualitative statements made by the OEM.

DOE requests comment on the magnitude of costs associated with transitioning room AC models to low-GWP refrigerants, such as R-32, along with the associated UL costs that would be incurred between the publication of this NOPR and the proposed compliance date of amended standards. Quantification and categorization of these costs, such as engineering efforts, testing lab time, UL certification costs, and capital investments, would enable DOE to refine its analysis.

Section 301 tariffs on certain Chinese goods:

Regarding U.S. tariffs on Chinese imports, tariff levels have escalated in recent years. At the time of the April 2011 Direct Final Rule, most room ACs imported into the United States were manufactured in China. Since that time, as discussed above, the Section 301 tariffs on room ACs increased to 10 percent in September 2018 and to 25 percent in May 2019. As result of tariffs, as noted by AHAM, “some manufacturers have had to shift production to other countries to avoid the tariffs.” (AHAM, No. 19 at pp. 18–19) DOE understands that these products are now made in countries in East Asia and Southeast Asia not subject to Section 301 tariffs. However, due to uncertainty about the exact countries of origin, DOE’s engineering analysis continues to rely on data based on a Chinese point of origin. To revise MPCs to account for points of origin outside of China, DOE would require information on the countries of manufacture and 5-year averages for key inputs used to develop manufacturer production costs, such as fully-burdened production labor wage rates and local raw material prices.

To better model the impact of Section 301 tariffs on room ACs that continue to be manufactured in China, DOE requires additional information about the portion of products still manufactured there and how the tariffs are absorbed by the entities along the room AC value chain, such as the foreign OEMs, U.S. importers, retailers, and consumers. Increases in retail price may affect consumer purchasing decisions, as captured by the price sensitivity modeled in the shipments analysis.

DOE requests comment on the percentage of room ACs manufactured outside of China and the countries of origin, as well as information on the country-specific fully-burdened labor rates and key raw material prices.

DOE requests comment on the impact of tariffs on pricing at each step in the distribution chain, as well as the percentage change in retail price paid by the consumer as result of Section 301 tariffs.

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 room ACs, 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 (2026–2055). Table V.45 presents DOE's projections of the national energy savings for each TSL considered for room ACs. The savings were calculated using the approach described in section IV.H.2 of this document.

Table V.45 Cumulative National Energy Savings for Room Air Conditioners; 30 Years of Shipments (2026–2055)

	Trial Standard Level				
	1	**2**	**3**	**4**	**5**
	quads				
Primary energy savings	0.28	0.91	1.35	1.79	3.31
FFC energy savings	0.29	0.94	1.40	1.86	3.44

OMB Circular A-4[73] requires agencies to present analytical results, including separate schedules of the monetized benefits and costs that show the type and timing of

[73] U.S. Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. *https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/*.

benefits and costs. Circular A-4 also directs agencies to consider the variability of key elements underlying the estimates of benefits and costs. For this rulemaking, DOE undertook a sensitivity analysis using 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.[74] The review timeframe established in EPCA is generally not synchronized with the product lifetime, product manufacturing cycles, or other factors specific to room ACs. 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.46. The impacts are counted over the lifetime of room ACs purchased in 2026–2034.

Table V.46 Cumulative National Energy Savings for Room Air Conditioners; 9 Years of Shipments (2026–2034)

	Trial Standard Level				
	1	**2**	**3**	**4**	**5**
	quads				
Primary energy savings	0.11	0.37	0.51	0.65	1.08
FFC energy savings	0.12	0.38	0.53	0.67	1.12

[74] 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.

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 room ACs. In accordance with OMB's guidelines on regulatory analysis,[75] DOE calculated NPV using both a 7-percent and a 3-percent real discount rate. Table V.47 shows the consumer NPV results with impacts counted over the lifetime of products purchased in 2026–2055.

Table V.47 Cumulative Net Present Value of Consumer Benefits for Room Air Conditioners; 30 Years of Shipments (2026–2055)

Discount Rate	Trial Standard Level				
	1	2	3	4	5
	billion 2020$				
3 percent	2.71	8.55	10.56	12.21	22.59
7 percent	1.35	4.25	4.83	5.21	9.64

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.48. The impacts are counted over the lifetime of products purchased in 2026–2034. 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.

[75] U.S. Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. *https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/*.

Table V.48 Cumulative Net Present Value of Consumer Benefits for Room Air Conditioners; 9 Years of Shipments (2026–2034)

Discount Rate	Trial Standard Level				
	1	2	3	4	5
	billion 2020$				
3 percent	1.40	4.41	4.78	4.98	8.99
7 percent	0.87	2.70	2.76	2.69	4.95

The previous results reflect the use of a default trend to estimate the change in price for room ACs over the analysis period (see section IV.F.6 of this document). DOE also conducted a sensitivity analysis that considered one scenario with a low price decline and one 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 fixed price case, the NPV of consumer benefits is lower than in the default case.

c. Indirect Impacts on Employment

It is estimated that amended energy conservation standards for room ACs 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 (2026–2035), 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 room ACs under consideration in this rulemaking.

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 of 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 room ACs is expected to yield environmental benefits in the form of reduced emissions of certain air pollutants and greenhouse gases. Table V.49 provides DOE's estimate of cumulative emissions reductions expected to result from the TSLs considered in this 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.49 Cumulative Emissions Reduction for Room Air Conditioners Shipped in 2026–2055

	Trial Standard Level				
	1	**2**	**3**	**4**	**5**
Power Sector Emissions					
CO_2 (*million metric tons*)	9.74	31.08	46.13	61.03	112.32
SO_2 (*thousand tons*)	3.98	12.68	18.82	24.90	45.83
NO_X (*thousand tons*)	3.98	12.71	18.80	24.83	45.55
Hg (*tons*)	0.02	0.08	0.11	0.15	0.27
CH_4 (*thousand tons*)	0.71	2.28	3.37	4.45	8.16
N_2O (*thousand tons*)	0.10	0.32	0.47	0.62	1.13
Upstream Emissions					
CO_2 (*million metric tons*)	0.72	2.29	3.42	4.53	8.36
SO_2 (*thousand tons*)	0.05	0.17	0.26	0.34	0.63
NO_X (*thousand tons*)	10.66	33.97	50.61	67.08	123.95
Hg (*tons*)	0.00	0.00	0.00	0.00	0.00
CH_4 (*thousand tons*)	70.73	225.37	335.89	445.30	823.18
N_2O (*thousand tons*)	0.00	0.01	0.02	0.02	0.04
Total FFC Emissions					
CO_2 (*million metric tons*)	10.46	33.37	49.55	65.55	120.68
SO_2 (*thousand tons*)	4.03	12.86	19.08	25.24	46.45
NO_X (*thousand tons*)	14.64	46.68	69.41	91.92	169.50
Hg (*tons*)	0.02	0.08	0.11	0.15	0.28
CH_4 (*thousand tons*)	71.44	227.64	339.26	449.75	831.34
N_2O (*thousand tons*)	0.10	0.33	0.49	0.64	1.18

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 room ACs. Section IV.L of this document discusses the SC-CO_2 values that DOE used. Table V.50 presents the value of CO_2 emissions reduction at each TSL.

Table V.50 Present Social Value of CO_2 Emissions Reduction for Room Air Conditioners Shipped in 2026–2055

TSL	SC-CO_2 Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	million 2020$			
1	99.0	418.0	650.4	1,272.0
2	317.7	1,339.3	2,082.1	4,076.6
3	464.4	1,969.6	3,067.2	5,993.9
4	609.2	2,592.3	4,040.8	7,888.1
5	1,101.6	4,721.6	7,374.2	14,364.6

As discussed in section IV.L.1.b of this document, DOE estimated monetary benefits likely to result from the reduced emissions of CH_4 and N_2O that DOE estimated for each of the considered TSLs for room ACs. Table V.51 presents the value of the CH_4 emissions reduction at each TSL, and Table V.52 presents the value of the N_2O emissions reduction at each TSL.

Table V.51 Present Social Value of Methane Emissions Reduction for Room Air Conditioners Shipped in 2026–2055

TSL	SC-CH_4 Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	million 2020$			
1	30.5	88.3	122.5	234.2
2	98.0	282.2	391.2	749.3
3	143.9	418.0	580.6	1,109.1
4	189.3	552.3	767.8	1,464.9
5	344.3	1,014.1	1,412.8	2,688.2

Table V.52 Present Social Value of Nitrous Oxide Emissions Reduction for Room Air Conditioners Shipped in 2026–2055

TSL	SC-N_2O Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	million 2020$			
1	0.37	1.44	2.21	3.82
2	1.18	4.60	7.09	12.22
3	1.72	6.75	10.42	17.95
4	2.25	8.88	13.72	23.61
5	4.06	16.14	24.99	42.94

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 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 benefits associated with SO_2 emissions reductions anticipated to result from the considered TSLs for room ACs. The dollar-per-ton values that DOE used are discussed in section IV.L.2 of this document. Table V.53 presents the present value for SO_2 for each TSL calculated using 7-percent and 3-percent discount rates.

Table V.53 Present Value of SO_2 Emissions Reduction for Room Air Conditioners Shipped in 2026–2055

TSL	SC-SO_2 Case	
	7% Discount Rate	**3% Discount Rate**
	million 2020$	
1	106.3	236.2
2	343.0	758.4
3	492.2	1,109.7
4	639.2	1,456.8
5	1,130.5	2,639.1

DOE also estimated the monetary value of the economic benefits associated with NO_X emissions reductions anticipated to result from the considered TSLs for room ACs. The dollar-per-ton values that DOE used are discussed in section IV.L.2 of this document. Table V.54 presents the present value for NO_X emissions reduction for each TSL calculated using 7-percent and 3-percent discount rates.

Table V.54 Present Value of NO_X Emissions Reduction for Room Air Conditioners Shipped in 2026–2055

TSL	SC-NO_X Case	
	7% Discount Rate	**3% Discount Rate**
	million 2020$	
1	285.7	643.9
2	922.2	2,067.7
3	1,326.6	3,032.6
4	1,724.1	3,985.0
5	3,056.7	7,236.1

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 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 National Economic Impacts

Table V.55 presents the NPV values that result from adding the monetized estimates of the potential economic, climate, and health benefits resulting from reduced GHG, SO_2, and NO_X 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 room ACs, and are measured for the lifetime of products shipped in 2026–2055. 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 room ACs shipped in 2026–2055. 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.55 NPV of Consumer Benefits Combined with Monetized Climate and Health Benefits from Emissions Reductions (billions 2020$)

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
3% discount rate for NPV of Consumer and Health Benefits (billion 2020$)					
5% d.r., Average SC-GHG case	3.7	11.8	15.3	18.5	33.9
3% d.r., Average SC-GHG case	4.1	13.0	17.1	20.8	38.2
2.5% d.r., Average SC-GHG case	4.4	13.9	18.4	22.5	41.3
3% d.r., 95th percentile SC-GHG case	5.1	16.2	21.8	27.0	49.6
7% discount rate for NPV of Consumer and Health Benefits (billion 2020$)					
5% d.r., Average SC-GHG case	1.9	5.9	7.3	8.4	15.3
3% d.r., Average SC-GHG case	2.3	7.1	9.0	10.7	19.6
2.5% d.r., Average SC-GHG case	2.5	8.0	10.3	12.4	22.6
3% d.r., 95th percentile SC-GHG case	3.3	10.4	13.8	16.9	30.9

The national operating cost savings are domestic U.S. monetary savings that occur as a result of purchasing the covered room ACs, and are measured for the lifetime of products shipped in 2026–2055. The benefits associated with reduced GHG emissions achieved as a result of the adopted standards are also calculated based on the lifetime of room ACs shipped in 2026–2055.

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 room ACs 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 forego the purchase of a product in the standards case, this decreases sales for product manufacturers, and the impact on manufacturers attributed to lost revenue is included in the MIA. Second, DOE accounts for energy savings attributable only to products actually used by consumers in the standards case; if a 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.[76]

[76] 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*.

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.[77] 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 Room AC Standards

Table V.56 and Table V.57 summarize the quantitative impacts estimated for each TSL for room ACs. The national impacts are measured over the lifetime of room ACs purchased in the 30-year period that begins in the anticipated year of compliance with amended standards (2026–2055). The energy savings, emissions reductions, and value of emissions reductions refer to full-fuel-cycle results. DOE exercises its own judgment in presenting monetized climate benefits as recommended in applicable Executive Orders and DOE would reach the same conclusion presented in this notice in the absence of the social cost of greenhouse gases, including the February 2021 Interim Estimates presented

[77] Sanstad, A.H. *Notes on the Economics of Household Energy Consumption and Technology Choice*. 2010. Lawrence Berkeley National Laboratory. *www1.eere.energy.gov/buildings/appliance_standards/pdfs/consumer_ee_theory.pdf* (last accessed June 16, 2021).

by the Interagency Working Group on the Social Cost of Greenhouse Gases. The efficiency levels contained in each TSL are described in section V.A of this document.

Table V.56 Summary of Analytical Results for Room Air Conditioner TSLs: National Impacts

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
Cumulative FFC National Energy Savings (*quads*)					
Quads	0.29	0.94	1.40	1.86	3.44
Cumulative FFC Emissions Reduction (Total FFC Emissions)					
CO_2 (*million metric tons*)	10.5	33.4	49.5	65.6	120.7
SO_2 (*thousand tons*)	4.0	12.9	19.1	25.2	46.5
NO_X (*thousand tons*)	14.6	46.7	69.4	91.9	169.5
Hg (*tons*)	0.0	0.1	0.1	0.1	0.3
CH_4 (*thousand tons*)	71.4	227.6	339.3	449.7	831.3
N_2O (*thousand tons*)	0.1	0.3	0.5	0.6	1.2
Present Value of Monetized Benefits and Costs (*3% discount rate, billion 2020$*)					
Consumer Operating Cost Savings	2.93	9.47	13.87	18.25	33.49
Climate Benefits*	0.51	1.63	2.39	3.15	5.75
Health Benefits**	0.88	2.83	4.14	5.44	9.88
Total Benefits†	4.32	13.92	20.41	26.85	49.12
Consumer Incremental Product Costs‡	0.22	0.92	3.31	6.04	10.90
Consumer Net Benefits	2.71	8.55	10.56	12.21	22.59
Total Net Benefits	4.10	13.00	17.10	20.81	38.22
Present Value of Monetized Benefits and Costs (*7% discount rate, billions 2020$*)					
Consumer Operating Cost Savings	1.48	4.79	6.89	8.96	16.06
Climate Benefits*	0.51	1.63	2.39	3.15	5.75
Health Benefits**	0.39	1.27	1.82	2.36	4.19
Total Benefits†	2.38	7.68	11.10	14.48	25.99
Consumer Incremental Product Costs‡	0.12	0.54	2.05	3.75	6.42
Consumer Net Benefits	1.35	4.25	4.83	5.21	9.64
Total Net Benefits	2.25	7.14	9.05	10.73	19.58

Note: This table presents the costs and benefits associated with room ACs shipped in 2026–2055. These results include benefits to consumers which accrue after 2055 from the products shipped in 2026–2055.
* 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.50 through Table V.52. 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.
** 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 consumer, climate, and health benefits. 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.55 for net benefits 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. In the absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.
‡ Costs include incremental equipment costs as well as installation costs.

Table V.57 Summary of Analytical Results for Room Air Conditioner TSLs: Manufacturer and Consumer Impacts

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
Manufacturer Impacts					
Industry NPV (*million 2020$*) (No-new-standards case INPV = 1,081)	1,072 to 1,075	1,053 to 1,078	1,016 to 1,165	968 to 1,247	611 to 992
Industry NPV (*% change*)	(0.8) to (0.5)	(2.5) to (0.3)	(6.0) to 7.8	(10.4) to 15.4	(43.5) to (8.2)
Consumer Average LCC Savings (*2020*$)					
PC1: Room Air Conditioners, without reverse cycle, with louvered sides, and less than 6,000 Btu/h	$39.28	$63.49	$63.49	$45.25	$91.06
PC2: Room Air Conditioners, without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	$34.23	$80.02	$80.02	$62.00	$89.03
PC3: Room Air Conditioners, without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	$19.31	$104.92	$99.14	$99.14	$173.55
PC4: Room Air Conditioners, without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	$0.00	$102.30	$97.49	$97.49	$176.00
PC5a: Room Air Conditioners, without reverse cycle, with louvered sides, and 20,000 to 27,999 Btu/h	$5.28	$105.03	$152.52	$152.52	$263.67
PC5b: Room Air Conditioners, without reverse cycle, with louvered sides, and 28,000 Btu/h or more	$99.12	$147.14	$275.19	$275.19	$392.72
PC8a: Room Air Conditioners, without reverse cycle, without louvered sides, and 8,000 to 10,999 Btu/h	$5.67	$85.72	$74.28	$74.28	$162.53
PC8b: Room Air Conditioners, without reverse cycle, without louvered sides, and 11,000 to 13,999 Btu/h	$0.00	$100.02	$116.89	$116.89	$230.10
PC9: Room Air Conditioners, without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	$58.37	$98.98	$162.64	$162.64	$227.85

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
PC11: Room Air Conditioners, with reverse cycle, with louvered sides, and less than 20,000 Btu/h	$67.57	$131.52	$131.12	$131.12	$194.60
PC12: Room Air Conditioners, with reverse cycle, without louvered sides, and less than 14,000 Btu/h	$39.97	$81.20	$122.74	$122.74	$156.81
PC16: Room Air Conditioners, Casement-Slider	$49.45	$104.75	$81.33	$81.33	$143.10
Shipment-Weighted Average*	$27.35	$85.73	$85.64	$76.04	$133.84
Consumer Simple PBP (*years*)					
PC1: Room Air Conditioners, without reverse cycle, with louvered sides, and less than 6,000 Btu/h	0.6	0.7	0.7	4.6	3.8
PC2: Room Air Conditioners, without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	0.6	0.9	0.9	4.0	4.2
PC3: Room Air Conditioners, without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	0.5	0.8	2.8	2.8	3.0
PC4: Room Air Conditioners, without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	0.6	0.7	2.9	2.9	2.8
PC5a: Room Air Conditioners, without reverse cycle, with louvered sides, and 20,000 to 27,999 Btu/h	1.2	1.0	2.6	2.6	2.7
PC5b: Room Air Conditioners, without reverse cycle, with louvered sides, and 28,000 Btu/h or more	0.3	0.4	2.3	2.3	2.2
PC8a: Room Air Conditioners, without reverse cycle, without louvered sides, and 8,000 to 10,999 Btu/h	0.5	0.7	3.3	3.3	2.9
PC8b: Room Air Conditioners, without reverse cycle, without louvered sides, and 11,000 to 13,999 Btu/h	0.4	0.6	2.4	2.4	2.3
PC9: Room Air Conditioners, without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	0.9	0.9	2.8	2.8	2.7
PC11: Room Air Conditioners, with reverse cycle, with louvered sides, and less than 20,000 Btu/h	0.6	0.8	3.2	3.2	3.2
PC12: Room Air Conditioners, with reverse cycle, without louvered sides, and less than 14,000 Btu/h	1.2	1.2	2.5	2.5	2.7
PC16: Room Air Conditioners, Casement-Slider	0.6	0.8	4.0	4.0	3.5
Shipment-Weighted Average*	0.6	0.8	1.7	3.6	3.4
Percent of Consumers that Experience a Net Cost					
PC1: Room Air Conditioners, without reverse cycle, with louvered sides, and less than 6,000 Btu/h	1%	3%	3%	40%	32%

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
PC2: Room Air Conditioners, without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	2%	5%	5%	40%	43%
PC3: Room Air Conditioners, without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	0%	4%	30%	30%	30%
PC4: Room Air Conditioners, without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	0%	1%	35%	35%	32%
PC5a: Room Air Conditioners, without reverse cycle, with louvered sides, and 20,000 to 27,999 Btu/h	1%	2%	32%	32%	34%
PC5b: Room Air Conditioners, without reverse cycle, with louvered sides, and 28,000 Btu/h or more	0%	0%	24%	24%	25%
PC8a: Room Air Conditioners, without reverse cycle, without louvered sides, and 8,000 to 10,999 Btu/h	0%	4%	37%	37%	29%
PC8b: Room Air Conditioners, without reverse cycle, without louvered sides, and 11,000 to 13,999 Btu/h	0%	3%	26%	26%	23%
PC9: Room Air Conditioners, without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	3%	2%	24%	24%	24%
PC11: Room Air Conditioners, with reverse cycle, with louvered sides, and less than 20,000 Btu/h	2%	4%	30%	30%	31%
PC12: Room Air Conditioners, with reverse cycle, without louvered sides, and less than 14,000 Btu/h	7%	7%	20%	20%	24%
PC16: Room Air Conditioners, Casement-Slider	2%	4%	38%	38%	34%
Shipment-Weighted Average*	1%	3%	16%	36%	33%

Parentheses indicate negative (-) values.
* Weighted by shares of each product class in total projected shipments in 2026.

DOE first considered TSL 5, which represents the max-tech efficiency levels. TSL 5 would save an estimated 3.44 quads of energy, an amount DOE considers significant. Under TSL 5, the NPV of consumer benefit would be $9.64 billion using a discount rate of 7 percent, and $22.59 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 5 are 120.7 Mt of CO_2, 46.5 thousand tons of SO_2, 169.5 thousand tons of NO_X, 0.3 tons of Hg, 831.3 thousand tons of CH_4, and 1.2 thousand tons of N_2O. The estimated monetary value of the GHG emissions reduction (associated with the average SC-GHG at a 3-percent discount rate) at TSL 5 is $5.75 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 5 is $4.19 billion using a 7-percent discount rate and $9.88 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 combined monetized NPV at TSL 5 is $19.58 billion. Using a 3-percent discount rate for all consumer and emissions benefits and costs, the estimated combined monetized NPV at TSL 5 is $38.22 billion. The estimated total monetized NPV is provided for additional information; however, DOE primarily relies upon the consumer NPV when determining whether a standard level is economically justified.

At TSL 5, the shipment-weighted average LCC savings is $133.84. The simple payback period is 3.4 years. The fraction of consumers experiencing a net LCC cost is 33 percent.

At TSL 5, the projected change in manufacturer INPV ranges from a decrease of $470.1 million to a decrease of $88.4 million, which corresponds to decreases of 43.5 percent and 8.2 percent, respectively. At this level, free cash flow is estimated to decrease by 291.7 percent compared to the base-case value in the year before the standards year. Conversion costs total $475.9 million.

As discussed in sections IV.C.1–2 of this document, DOE believes there is uncertainty regarding the estimated compressor cost and availability of the highest efficiency variable-speed compressors across the full range of capacities at TSL 5, particularly in the smaller capacity room ACs. These uncertainties stem from the fact that the efficiency level for TSL 5 is obtained by using the highest efficiency variable-speed compressors that are currently available to be incorporated into room ACs at the time the analysis was competed. In addition, variable speed compressors representing these efficiencies are manufactured by just one manufacturer. It is unclear whether the highest efficiency variable-speed compressors will be available to all manufacturers of room ACs since there is only a single supplier at this time. In addition, these highest efficiency variable-speed compressors are not currently available in the full range of capacities, which could limit the current product offerings by manufacturers. Furthermore, due to the single supplier for these highest efficiency variable-speed compressors and their unknown manufacturing volume and potential bottlenecks for ramp-up manufacturing capabilities, there is a likelihood that there may not be sufficient supply to meet the demand of the market for the full range of cooling capacities for room ACs, should TSL 5 be selected. This may have the potential to eliminate room ACs of certain cooling capacities from the market as well impact the overall number of room ACs available on the market should TSL 5 be selected.

The Secretary tentatively concludes that at TSL 5 for room ACs, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the climate and health benefits would be outweighed by the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV, and the potential for product unavailability due to limitations in key components such as the highest efficiency variable-speed compressors necessary to reach the max-tech efficiency levels. Consequently, the Secretary has tentatively concluded that TSL 5 is not economically justified.

Then DOE considered TSL 4. TSL 4 would save an estimated 1.86 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be \$5.21 billion using a discount rate of 7 percent, and \$12.21 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 65.6 Mt of CO_2, 25.2 thousand tons of SO_2, 91.9 thousand tons of NO_X, 0.1 tons of Hg, 449.7 thousand tons of CH_4, and 0.6 thousand tons of N_2O. The estimated monetary value of the GHG emissions reduction (associated with the average SC-GHG at a 3-percent discount rate) at TSL 4 is \$3.15 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 4 is \$2.36 billion using a 7-percent discount rate and \$5.44 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 combined monetized NPV at TSL 4 is $10.73 billion. Using a 3-percent discount rate for all consumer and emissions benefits and costs, the estimated combined monetized NPV at TSL 4 is $20.81 billion. The estimated total monetized NPV is provided for additional information; however, DOE primarily relies upon the consumer NPV when determining whether a standard level is economically justified.

At TSL 4, the shipment-weighted average LCC impact is a savings of $76.04. The shipment-weighted simple payback period is 3.6 years. The fraction of consumers experiencing a net LCC cost is 36 percent.

At TSL 4, the projected change in manufacturer INPV ranges from a decrease of $112.9 million to an increase of $166.5 million, which corresponds to a decrease of 10.4 percent and an increase of 15.4 percent, respectively. At this level, free cash flow is estimated to decrease by 13.5 percent compared to the base-case value in the year before the standards year. Conversion costs total $26.7 million.

TSL 4 represents commercially available room ACs that implement variable-speed compressors, based on models with cooling capacities greater than 8,000 Btu/h. However, for room ACs with the smallest cooling capacities (*i.e.*, less than 8,000 Btu/h), uncertainties exist regarding both the availability of variable-speed compressors that can be integrated into these smaller-size units and the feasibility of incorporating these variable-speed compressors with related components into a more space-constrained chassis than for larger-capacity room ACs. There are no models commercially available that incorporate variable-speed compressors for cooling capacities less than 8,000 Btu/h, and the uncertainties may have the potential to eliminate room ACs with the smallest cooling capacities from the market, should TSL 4 be selected. While there are similarly no room ACs currently on the market with variable-speed compressors at cooling capacities greater than 22,000 Btu/h, other air conditioning products with such cooling capacities (*e.g.*, mini-split air conditioners) do exist in the U.S. market, thereby not giving rise to the same uncertainties as for the smallest cooling capacities.

The Secretary tentatively concludes that at TSL 4 for room ACs, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the climate and health benefits would be outweighed by the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a reduction in INPV and potential unavailability of key components for small-capacity product classes. Consequently, the Secretary has tentatively concluded that TSL 4 is not economically justified.

DOE then considered TSL 3, which would save an estimated 1.40 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be $4.83 billion using a discount rate of 7 percent, and $10.56 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 49.5 Mt of CO_2, 19.1 thousand tons of SO_2, 69.4 thousand tons of NO_X, 0.1 tons of Hg, 339.3 thousand tons of CH_4, and 0.5 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 $2.39 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 3 is $1.82 billion using a 7-percent discount rate and $4.14 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, SO_2 reduction benefits, and NO_X reduction benefits, and the 3-percent discount rate for GHG social costs, the estimated combined monetized NPV at TSL 3 is $9.05 billion. Using a 3-percent discount rate for all consumer and emissions benefits and costs, the estimated combined monetized NPV at TSL 3 is $17.10 billion. The estimated total monetized NPV is provided for additional information; however, DOE primarily relies upon the consumer NPV when determining whether a standard level is economically justified.

At TSL 3, the shipment-weighted average LCC impact is a savings of $85.64. The shipment-weighted simple payback period is 1.7 years. The fraction of consumers experiencing a net LCC cost is 16 percent.

At TSL 3, the projected change in manufacturer INPV ranges from a decrease of $64.5 million to an increase of $84.1 million, which corresponds to a decrease of 6.0 percent and an increase of 7.8 percent, respectively. At this level, free cash flow is estimated to decrease by 11.7 percent compared to the base-case value in the year before the standards year. Conversion costs total $22.8 million.

After considering the analysis and weighing the benefits and burdens, the Secretary has tentatively concluded that a standard set at TSL 3 for room ACs would be economically justified. At this TSL, the average LCC savings for room AC consumers is positive. An estimated 16 percent of room AC 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 75 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 monetized climate benefits from GHG emissions reductions and health benefits from SO_2 and NO_X emissions reductions are included – representing $2.39 billion in climate benefits (associated with the average SC-GHG at a 3-percent discount rate), and $4.14 billion (using a 3-percent discount rate) or $1.82 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 4 and TSL 5, 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. Although results are presented here in terms of TSLs, DOE analyzes and evaluates all possible ELs for each product class in its analysis. For room ACs with cooling capacities greater than or equal to 8,000 Btu/h, TSL 3 corresponds to EL 4, the highest efficiency level below max-tech, incorporating commercially available variable-speed compressors. The variable-speed compressor required to achieve the max-tech efficiency level is currently available from only a single manufacturer, leading to the likelihood there may not be sufficient supply at that efficiency level to meet the demand of the market for the full range of cooling capacities for room ACs. For room ACs with cooling capacities less than 8,000 Btu/h, TSL 3 corresponds to EL 3, incorporating the maximum available energy efficient single-speed compressors. Both EL 4 and EL 5 for room ACs with cooling capacities less than 8,000 Btu/h incorporate variable-speed compressors based off of modeling of available compressors for models with cooling capacities greater than or equal to 8,000 Btu/h. Uncertainties exist at those efficiency levels regarding both the availability of variable-speed compressors that can be integrated into these smaller-size units and the feasibility of incorporating these variable-speed compressors with related components into a more space-constrained chassis than for larger-capacity room ACs. There are no models commercially available that incorporate variable-speed compressors for cooling capacities less than 8,000 Btu/h. The proposed standard levels at TSL 3 results in positive LCC savings for all product classes, significantly reduce the number of consumers experiencing a net cost, and reduce the decrease in INPV and 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 room ACs at TSL 3. The proposed amended energy conservation standards for room ACs, which are expressed as CEER and include the rounded cooling capacity product class descriptions discussed in section IV.A.1 of this document, are shown in Table V.58.

Table V.58 Proposed Amended Energy Conservation Standards for Room Air Conditioners for TSL 3

Product Class	Proposed Standard CEER (Btu/h)
Room AC without reverse cycle, with louvered sides	
<6,000 Btu/h (1)	13.1
6,000 to 7,900 Btu/h (2)	13.7
8,000 to 13,900 Btu/h (3)	16.0
14,000 to 19,900 Btu/h (4)	16.0
20,000 to 27,900 Btu/h (5a)	13.8
≥28,000 Btu/h (5b)	13.2
Room AC without reverse cycle, without louvered sides	
<6,000 Btu/h (6)	12.8
6,000 to 7,900 Btu/h (7)	12.8
8,000 to 10,900 Btu/h (8a)	14.1
11,000 to 13,900 Btu/h (8b)	13.9
14,000 to 19,900 Btu/h (9)	13.7
≥20,000 Btu/h (10)	13.8
Room AC with reverse cycle, with louvered sides	

Product Class	Proposed Standard CEER (Btu/h)
<20,000 Btu/h (11)	14.4
≥20,000 Btu/h (13)	13.7
Room AC with reverse cycle, without louvered sides	
<14,000 Btu/h (12)	13.7
≥14,000 Btu/h (14)	12.8
Casement	
Casement-Only (15)	13.9
Casement-Slider (16)	15.3

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 GHGs, NO_X, and SO_2 emission reductions.

Table V.59 shows the annualized values for room ACs 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 health benefits from reduced SO_2 and NO_X, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated cost of the proposed standards for room ACs is $216.9 million per year in increased equipment costs, while the estimated annual benefits are $727.5 million in reduced operating costs, $137.5 million in climate benefits, and $192.1 million in monetized health benefits. In this case, the net monetized benefit amounts to $840.2 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards for room ACs is $190.1 million per year in increased equipment costs, while the estimated annual benefits are $796.7 million in reduced operating costs, $137.5 million in climate benefits, and $237.9 million in monetized health benefits. In this case, the net monetized benefit amounts to $982.0 million per year.

Table V.59 Annualized Benefits and Costs of Proposed Energy Conservation Standards for Room Air Conditioners (TSL 3)

	Million 2020$/year		
	Primary Estimate	**Low-Net-Benefits Estimate**	**High-Net-Benefits Estimate**
3% discount rate			
Consumer Operating Cost Savings	796.7	751.9	847.8
Climate Benefits*	137.5	134.2	140.4
Health Benefits**	237.9	232.3	242.7
Total Benefits†	1,172.0	1,118.4	1,230.9
Consumer Incremental Product Costs‡	190.1	213.2	163.1
Net Benefits	982.0	905.2	1,067.7
7% discount rate			
Consumer Operating Cost Savings	727.5	693.3	768.4
Climate Benefits*	137.5	134.2	140.4
Health Benefits**	192.1	188.1	195.7
Total Benefits†	1,057.1	1,015.6	1,104.4
Consumer Incremental Product Costs‡	216.9	240.0	190.0
Net Benefits	840.2	775.7	914.5

Note: This table presents the costs and benefits associated with room ACs shipped in 2026−2055. These results include benefits to consumers which accrue after 2055 from the products shipped in 2026−2055.
* 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, and it emphasizes the importance and value of considering the benefits calculated using all four SC-GHG estimates. See section IV.L of this document for more details.
** 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 consumer, climate, and health benefits. 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 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. In the

absence of further intervening court orders, DOE will revert to its approach prior to the injunction and present monetized benefits where appropriate and permissible under law.
‡ Costs include incremental equipment costs as well as installation costs.

VI. Cooling Capacity Verification

DOE is proposing to add the cooling capacity of room ACs to 10 CFR 429.134 to help regulated entities understand how DOE will determine the product class that applies to a given basic model in the context of an enforcement investigation. DOE is proposing a similar approach that it has adopted for portable air conditioners, packaged terminal air conditioners and heat pumps, and dehumidifiers. More specifically, DOE is going to compare the mean of the tested cooling capacity from the units of a given basic model that DOE has tested for enforcement rounded to the nearest hundred to the certified cooling capacity by the manufacturer. DOE will use the certified cooling capacity of the manufacturer if the mean of the DOE tested units is within 5 percent of the certified cooling capacity. If the manufacturer does not have a valid certification, including if the certified cooling capacity was incorrectly certified, or the certified cooling capacity is found to be outside of the 5 percent tolerance, DOE will use the rounded mean of the DOE tested units within the enforcement sample to determine the applicable product class and energy conservation standard for this particular basic model. DOE believes these proposed provisions provide additional clarity and transparency to the enforcement process. The proposal can be found in 10 CFR 429.134 and DOE seeks comment on this approach.

VII. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

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

1) Insufficient information and the high costs of gathering and analyzing relevant information leads some consumers to miss opportunities to make cost-effective investments in energy efficiency.
2) In some cases, the benefits of more-efficient equipment are not realized due to misaligned incentives between purchasers and users. An example of such a case is when the equipment purchase decision is made by a building contractor or building owner who does not pay the energy costs.
3) There are external benefits resulting from improved energy efficiency of appliances and equipment that are not captured by the users of such products. These benefits include externalities related to public health, environmental protection, and national energy security that are not reflected in energy prices, such as reduced emissions of air pollutants and greenhouse gases that impact human health and global warming.

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

In addition, the Administrator of OIRA has determined that the proposed regulatory action is an "economically" significant regulatory action under section (3)(f)(1) of E.O. 12866. Accordingly, pursuant to section 6(a)(3)(C) of the Order, DOE has provided to OIRA an assessment, including the underlying analysis, of benefits and costs anticipated from the regulatory action, together with, to the extent feasible, a quantification of those costs; and an assessment, including the underlying analysis, of costs and benefits of potentially effective and reasonably feasible alternatives to the planned regulation, and an explanation why the planned regulatory action is preferable to the identified potential alternatives. These assessments can be found in the technical support document for this rulemaking.

DOE has also reviewed this regulation pursuant to E.O. 13563, issued on January 18, 2011. 76 FR 3281 (Jan. 21, 2011). E.O. 13563 is supplemental to and explicitly reaffirms the principles, structures, and definitions governing regulatory review established in E.O. 12866. To the extent permitted by law, agencies are required by E.O. 13563 to (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.

DOE emphasizes as well that 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, 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 NOPR is consistent with these principles, including the requirement that, to the extent permitted by law, benefits justify costs and that net benefits are maximized.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis ("IRFA") for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by 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 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 room ACs. (42 U.S.C. 6295(m)) The current room AC energy conservation standards were implemented by a direct final rule published on April 21, 2011 (76 FR 22454) and subsequently confirmed on August 24, 2011. 76 FR 52854. Compliance with those standards has been required since June 1, 2014. 76 FR 52852. 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 notice of proposed rulemaking including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6295(m))

For manufacturers of room ACs, the Small Business Administration ("SBA") has set a size threshold, which defines those entities classified as "small businesses" for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. (See 13 CFR part 121.) The size standards are listed by North American Industry Classification System ("NAICS") code and industry description and are available at *www.sba.gov/document/support--table-size-standards*. Manufacturing of room ACs is classified under NAICS 333415, "Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing." The SBA sets a threshold of 1,250 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 manufacturers. DOE's research involved DOE's Compliance Certification Database

("CCD"),[78] California Energy Commission's Modernized Appliance Efficiency Database System ("MAEDbS"),[79] ENERGY STAR Product Finder,[80] individual company websites, and market research tools (*e.g.*, reports from Dun & Bradstreet[81]) to create a list of companies that manufacture, produce, import, or assemble the products covered by this rulemaking. DOE also asked stakeholders and industry representatives if they were aware of any other small manufacturers during manufacturer interviews and at DOE public meetings.

DOE identified eight OEMs of room AC products sold in the United States. Upon initial review, one OEM was identified as a small manufacturer based in the United States. However, in August 2021, a large manufacturer acquired the small manufacturer.[82] Following that acquisition, no domestic room AC OEMs qualify as a small business. Given the lack of small entities with a direct compliance burden, DOE certifies that the proposed rule would not have "a significant economic impact on a substantial number of small entities." DOE requests comment on this certification conclusion.

---

[78] *regulations.doe.gov/certification-data/#q=Product_Group_s%3A**

[79] *cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx*

[80] *energystar.gov/productfinder/*

[81] *app.dnbhoovers.com*

[82] https://www.rheem.com/about/news-releases/rheem-acquires-friedrich-air-conditioning (published August 30, 2021).

DOE has submitted a 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 room ACs 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 room ACs, 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 room ACs. 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. 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 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 room AC 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 room ACs, 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 room ACs 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 6295(o)(2)(A) and 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 (Public Law 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 room ACs, 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.[83] 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.

VIII. Public Participation

A. Attendance at the Webinar

The time, date, and location of the webinar are listed in the **DATES** and **ADDRESSES** sections at the beginning of this document. If no participants register for the webinar then it will be cancelled. Webinar registration information, participant

[83] 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*.

instructions, and information about the capabilities available to webinar participants will be published on DOE's website: *https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=52*. 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 an interest in the topics addressed in this document, or who is representative of a group or class of persons that has an interest in these issues, may request an opportunity to make an oral presentation at the webinar. Requests may be sent by email to the Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B 1000 Independence Avenue, SW., Washington, DC 20585-0121, or *ApplianceStandardsQuestions@ee.doe.gov*. Persons who wish to speak should include with their request a computer file in WordPerfect, Microsoft Word, PDF, or text (ASCII) file format that briefly describes the nature of their interest in this rulemaking and the topics they wish to discuss. Such persons should also provide a daytime telephone number where they can be reached.

Persons requesting to speak should briefly describe the nature of their interest in this rulemaking and provide a telephone number for contact. DOE requests persons selected to make an oral presentation to submit an advance copy of their statements at least two weeks before the webinar. At its discretion, DOE may permit persons who cannot supply an advance copy of their statement to participate, if those persons have made advance alternative arrangements with the Building Technologies Office. As necessary, requests to give an oral presentation should ask for such alternative arrangements.

C. Conduct of the Public Meeting

DOE will designate a DOE official to preside at the webinar/public meeting and may also use a professional facilitator to aid discussion. The meeting will not be a judicial or evidentiary-type public hearing, but DOE will conduct it in accordance with section 336 of EPCA. (42 U.S.C. 6306) A court reporter will be present to record the proceedings and prepare a transcript. DOE reserves the right to schedule the order of presentations and to establish the procedures governing the conduct of the webinar/public meeting. There shall not be discussion of proprietary information, costs or prices, market share, or other commercial matters regulated by U.S. anti-trust laws. After the webinar/public meeting, interested parties may submit further comments on the proceedings, as well as on any aspect of the rulemaking, until the end of the comment period.

The public meeting will be conducted in an informal, conference style. DOE will present summaries of comments received before the webinar/public meeting, allow time for prepared general statements by participants, and encourage all interested parties to share their views on issues affecting this rulemaking. Each participant will be allowed to make a general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will allow, as time permits, other participants to comment briefly on any general statements.

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly. 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/public meeting will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the previous procedures that may be needed for the proper conduct of the webinar/public meeting.

A transcript of the webinar/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* webpage will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment itself or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Otherwise, persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information ("CBI")). Comments submitted through *www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

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 proposal to not make any changes to room AC product classes. See section IV.A.1.

2) DOE seeks comment on whether evaporator air recirculation should be included in the engineering analysis. See section IV.A.2.a.

3) DOE seeks comment on the updated single-speed compressor maximum efficiency estimates. See section IV.A.2.b.

4) DOE seeks comment on the approach to alternative refrigerants in this engineering analysis. See section IV.A.2.c.

5) DOE seeks comment on the technologies screened out in the NOPR screening analysis. See section IV.B.1.

6) DOE requests comment on the new efficiency level (EL 4) in the engineering analysis. See section IV.C.1.b.

7) DOE seeks comment on the approach to design EL 3 as the level reached by the most efficient single-speed room ACs. See section IV.C.1.b.

8) DOE requests comment on the incremental MPCs from the NOPR engineering analysis. See section IV.C.3.

9) DOE welcomes feedback on its approach to estimating fan-only use operating hours and any additional data that can be provided to estimate the amount of time spent in fan-only mode. See section IV.E.

10) DOE requests feedback on its approach to calculating the energy-use of variable-speed compressors and would welcome field metered data to further investigate the varying amounts of energy use due to single-speed and variable-speed units. See section IV.E.

11) DOE requests comments on its assumption and methodology for determining equipment price trends. See section IV.F.1.

12) DOE requests feedback on its approach to projecting the efficiency distribution in 2026. See section IV.F.8.

13) DOE welcomes shipments data that include markets in addition to replacement and first-time user markets. See section IV.G.

14) DOE requests comment on its general methodology for estimating shipments. See section IV.G.

15) DOE requests comment its approach to projecting market share for variable-speed technologies over the course of the analysis period. See section IV.H.1.

16) DOE requests comment on its approach to monetizing the impact of the rebound effect in standards cases. See section IV.H.3.

17) DOE requests comment on the magnitude of costs associated with transitioning room AC models to low-GWP refrigerants, such as R-32, along with the associated UL costs that would be incurred between the publication of this NOPR and the proposed compliance date of amended standards. Quantification and categorization of associated costs, such as engineering efforts, test lab time, UL certification costs, and capital investments, would enable DOE to refine its analysis. See section V.B.2.d.

18) DOE requests information regarding the impact of cumulative regulatory burden on manufacturers of room ACs associated with multiple DOE standards or product-specific regulatory actions of other Federal agencies. See section V.B.2.d.

19) DOE requests comment on the percentage of room ACs manufactured outside of China and the countries of origin, as well as information on the country-specific fully-burdened labor rates and key raw material prices.

20) DOE requests comment on the impact of tariffs on pricing at each step in the distribution chain, as well as the percentage change in retail price paid by the consumer as a result of Section 301 tariffs. See section V.B.2.e.

21) DOE requests comment on the certification conclusion.

Additionally, DOE welcomes comments on other issues relevant to the conduct of this rulemaking that may not specifically be identified in this document.

IX. Approval of the Office of the Secretary

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

List of Subjects

10 CFR Part 429

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

10 CFR Part 430

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

Signing Authority

This document of the Department of Energy was signed on March 28, 2022, by Kelly 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 March 28, 2022.

X Kelly Speakes-Backman

Digitally signed by Kelly Speakes-Backman
Date: 2022.03.28 17:27:16 -04'00'

Kelly Speakes-Backman
Principal Deputy Assistant Secretary
Energy Efficiency and Renewable Energy

For the reasons set forth in the preamble, DOE proposes to amend part 429 of chapter II, subchapter D, of title 10 of the Code of Federal Regulations, as set forth below:

In §429.134, add paragraph (s) to read as follows:

§429.134 Product-specific enforcement provisions.

* * * * *

(s) *Room air conditioners.* Verification of cooling capacity. DOE will measure the cooling capacity of each unit DOE tests pursuant to the test requirements of 10 CFR part 430. DOE will calculate the mean of the test results, rounded to the nearest hundred, and compare it to the value of cooling capacity certified by the manufacturer for the basic model. The certified cooling capacity will be considered valid only if the basic model is properly certified pursuant to 10 CFR Part 429, and the rounded mean from testing pursuant to this section is within five percent of the cooling capacity reported in the manufacturer's most recent valid certification report at the time of DOE's assessment test.

(1) If the certified cooling capacity is valid, DOE will use the certified cooling capacity as the basis for identifying the correct product class for the basic model and the minimum combined energy efficiency ratio allowed for the basic model.

(2) If the certified cooling capacity is not valid, DOE will use the mean measured cooling capacity of the units in the sample, rounded to the nearest hundred, as the basis

for identifying the correct product class for the basic model and the minimum combined energy efficiency ratio allowed for the basic model.

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. In §430.32, edit paragraph (b) to read as follows:

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

* * * * *

(b) (1)

Equipment Class	Combined Energy Efficiency Ratio, effective until [DATE 3 YEARS AFTER THE PUBLICATION OF THE FINAL RULE]
1. Without reverse cycle, with louvered sides, and with a certified cooling capacity* less than 6,000 Btu/h	11.0
2. Without reverse cycle, with louvered sides and with a certified cooling capacity of 6,000 to 7,999 Btu/h	11.0
3. Without reverse cycle, with louvered sides and with a certified cooling capacity of 8,000 to 13,999 Btu/h	10.9
4. Without reverse cycle, with louvered sides and with a certified cooling capacity of 14,000 to 19,999 Btu/h	10.7
5a. Without reverse cycle, with louvered sides and with a certified cooling capacity of 20,000 Btu/h to 27,999 Btu/h	9.4
5b. Without reverse cycle, with louvered sides and with a certified cooling capacity of 28,000 Btu/h or more	9.0
6. Without reverse cycle, without louvered sides, and with a certified cooling capacity less than 6,000 Btu/h	10.0
7. Without reverse cycle, without louvered sides and with a certified cooling capacity of 6,000 to 7,999 Btu/h	10.0
8a. Without reverse cycle, without louvered sides and with a certified cooling capacity of 8,000 to 10,999 Btu/h	9.6
8b. Without reverse cycle, without louvered sides and with a certified cooling capacity of 11,000 to 13,999 Btu/h	9.5
9. Without reverse cycle, without louvered sides and with a certified cooling capacity of 14,000 to 19,999 Btu/h	9.3
10. Without reverse cycle, without louvered sides and with a certified cooling capacity of 20,000 Btu/h or more	9.4
11. With reverse cycle, with louvered sides, and with a certified cooling capacity less than 20,000 Btu/h	9.8
12. With reverse cycle, without louvered sides, and with a certified cooling capacity less than 14,000 Btu/h	9.3
13. With reverse cycle, with louvered sides, and with a certified cooling capacity of 20,000 Btu/h or more	9.3
14. With reverse cycle, without louvered sides, and with a certified cooling capacity of 14,000 Btu/h or more	8.7
15. Casement-Only	9.5
16. Casement-Slider	10.4

* The certified cooling capacity is determined by the manufacturer in accordance with 10 CFR 429.15(a)(3).

(2)

Equipment Class	Combined Energy Efficiency Ratio, effective starting [DATE 3 YEARS AFTER THE PUBLICATION OF THE FINAL RULE]
1. Without reverse cycle, with louvered sides, and with a certified cooling capacity* less than 6,000 Btu/h	13.1
2. Without reverse cycle, with louvered sides and with a certified cooling capacity of 6,000 to 7,900 Btu/h	13.7
3. Without reverse cycle, with louvered sides and with a certified cooling capacity of 8,000 to 13,900 Btu/h	16.0
4. Without reverse cycle, with louvered sides and with a certified cooling capacity of 14,000 to 19,900 Btu/h	16.0
5a. Without reverse cycle, with louvered sides and with a certified cooling capacity of 20,000 Btu/h to 27,900 Btu/h	13.8
5b. Without reverse cycle, with louvered sides and with a certified cooling capacity of 28,000 Btu/h or more	13.2
6. Without reverse cycle, without louvered sides, and with a certified cooling capacity less than 6,000 Btu/h	12.8
7. Without reverse cycle, without louvered sides and with a certified cooling capacity of 6,000 to 7,900 Btu/h	12.8
8a. Without reverse cycle, without louvered sides and with a certified cooling capacity of 8,000 to 10,900 Btu/h	14.1
8b. Without reverse cycle, without louvered sides and with a certified cooling capacity of 11,000 to 13,900 Btu/h	13.9
9. Without reverse cycle, without louvered sides and with a certified cooling capacity of 14,000 to 19,900 Btu/h	13.7
10. Without reverse cycle, without louvered sides and with a certified cooling capacity of 20,000 Btu/h or more	13.8
11. With reverse cycle, with louvered sides, and with a certified cooling capacity less than 20,000 Btu/h	14.4
12. With reverse cycle, without louvered sides, and with a certified cooling capacity less than 14,000 Btu/h	13.7
13. With reverse cycle, with louvered sides, and with a certified cooling capacity of 20,000 Btu/h or more	13.7
14. With reverse cycle, without louvered sides, and with a certified cooling capacity of 14,000 Btu/h or more	12.8
15. Casement-Only	13.9
16. Casement-Slider	15.3

* The certified cooling capacity is determined by the manufacturer in accordance with 10 CFR 429.15(a)(3).