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[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[Docket Number EERE–2013–BT–STD–0033]

RIN 1904-AD02

Energy Conservation Program: Energy Conservation Standards for Portable Air Conditioners

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

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

SUMMARY: The Energy Policy and Conservation Act of 1975 (EPCA), as amended, sets forth various provisions designed to improve energy efficiency for consumer products and certain commercial and industrial equipment. In addition to specifying a list of covered residential products and commercial equipment, EPCA contains provisions that enable the Secretary of Energy to classify additional types of consumer products as covered products. The U.S. Department of Energy (DOE) has previously published a proposed determination of coverage to classify portable air conditioners (ACs) as covered consumer products under the applicable provisions in EPCA. In this document, DOE

proposes energy conservation standards for portable ACs following its notice of final determination of coverage. This document also announces a public meeting to receive comment on these proposed standards and associated analyses and results.

DATES: Meeting: DOE will hold a public meeting on Tuesday, June 14, 2016, from 9:00 a.m. to 4:00 p.m., in Washington, DC. The meeting will also be broadcast as a webinar. 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 before and after the public meeting, but no later than [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER PUBLICATION**]. See section VIII, “Public Participation,” for details.

Comments regarding the likely competitive impact of the proposed standard should be sent to the Department of Justice contact listed in the **ADDRESSES** section before [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**].

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

Instructions: Any comments submitted must identify the NOPR for Energy Conservation Standards for Portable Air Conditioners, and provide docket number EERE-2013-BT-STD-0033 and/or regulatory information number (RIN) number 1904-AD02. Comments may be submitted using any of the following methods:

1. Federal eRulemaking Portal: www.regulations.gov. Follow the instructions for submitting comments.
2. E-mail: PortableAC2013STD0033@ee.doe.gov. Include the docket number and/or RIN in the subject line of the message. Submit electronic comments in WordPerfect, Microsoft Word, PDF, or ASCII file format, and avoid the use of special characters or any form of encryption.
3. Postal Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
4. Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., Room 6094, Washington, DC, 20024. Telephone: (202) 586-2945. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

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

Written comments regarding the burden-hour estimates or other aspects of the collection-of-information requirements contained in this proposed rule may be submitted to Office of Energy Efficiency and Renewable Energy through the methods listed above and by e-mail to Chad_S_Whiteman@omb.eop.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 before [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**]. Please indicate in the "Subject" line of your e-mail the title and Docket Number of this rulemaking notice.

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

A link to the docket webpage can be found at: https://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/79. This webpage will contain a link to the docket for this proposed rulemaking on the www.regulations.gov site. The www.regulations.gov webpage contains simple instructions on how to access all documents, including public comments, in the docket. See section VIII, "Public Participation," for further information on how to submit comments through www.regulations.gov.

FOR FURTHER INFORMATION CONTACT:

Mr. Bryan Berringer, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies, EE-5B, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202) 586-0371. E-mail: portable_ACs@ee.doe.gov

Ms. Sarah Butler, U.S. Department of Energy, Office of the General Counsel, Mailstop GC-33, 1000 Independence Ave., SW, Washington, D.C. 20585-0121. Telephone: 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 public meeting, contact Ms. Brenda Edwards at (202) 586-2945 or by e-mail: Brenda.Edwards@ee.doe.gov.

SUPPLEMENTARY INFORMATION:

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I. Synopsis of the Proposed Rule

Title III, Part B[1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Pub. L. 94-163 (42 U.S.C. 6291–6309, as codified), established the Energy

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

Conservation Program for Consumer Products Other Than Automobiles.[2] In addition to specifying a list of covered residential products and commercial equipment, EPCA contains provisions that enable the Secretary of Energy to classify additional types of consumer products as covered products. (42 U.S.C. 6292(a)(20)) In a final determination of coverage published in the Federal Register on April 18, 2016 (the "April 18, 2016 final coverage determination"), DOE classified portable ACs as covered consumer products under EPCA. 81 FR 22514.

Pursuant to EPCA, any new or amended energy conservation standard must be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) Furthermore, the new or amended standard must result in a significant conservation of energy. (42 U.S.C. 6295(o)(3)(B))

In accordance with these and other statutory provisions discussed in this proposed rule, DOE proposes new energy conservation standards for portable ACs. The proposed standards, which correspond to trial standard level (TSL) 2 (described in section V.A), are minimum allowable combined energy efficiency ratio (CEER) standards, which are expressed in British thermal units (Btu) per watt-hour (Wh), are shown in Table I.1. These proposed standards, if adopted, would apply to all single-duct portable ACs and

[2] All references to EPCA in this document refer to the statute as amended through the Energy Efficiency Improvement Act of 2015, Pub. L. 114-11 (Apr. 30, 2015).

dual-duct portable ACs that are manufactured in, or imported into, the United States starting on the date five years after the publication of the final rule for this rulemaking.[3]

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

Portable Air Conditioner Product Class	Minimum CEER (Btu/Wh)
Single-duct and dual-duct portable air conditioners	$1.14 \times \frac{SACC}{(2.7447 \times SACC^{0.6829})}$
Seasonally Adjusted Cooling Capacity (SACC) in Btu/h determined in accordance with Appendix CC	

A. Benefits and Costs to Consumers

Table I.2 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of portable ACs, as measured by the average life-cycle cost (LCC) savings and the payback period (PBP).[4] The average LCC savings are positive and the PBP is less than the average lifetime for portable ACs, which is approximately 10 years (see section IV.F.6).

Table I.2 Impacts of Proposed Energy Conservation Standards on Consumers of Portable Air Conditioners

Consumer Type	Average LCC Savings (2014$)	Simple Payback Period (years)
Residential	144	2.2
Commercial	292	1.2
All	162	2.1

[3] For more information regarding portable ACs for which DOE is not proposing energy conservation standards in this NOPR, see section IV.A.1 and section IV.A.2 of this notice.
[4] The average LCC savings 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 standards (see section IV.F.9). The simple PBP, which is designed to compare specific efficiency levels, is measured relative to the baseline model (see section IV.C.1.a).

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

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 (2016 to 2050). Using a real discount rate of 6.60 percent,[5] DOE estimates that the INPV for manufacturers of portable ACs is $725.5 million.[6] Under the proposed standards, DOE expects that manufacturers may lose up to 30.6 percent of their INPV, which is approximately $221.7 million over the 35 years of the analysis period. DOE also recognizes there may be additional compliance burden for those manufacturers of portable ACs that also produce other appliances which are currently regulated by DOE. DOE has identified existing or pending Federal energy conservation standards for three other appliance categories with compliance dates that will take effect 3 years before or after the anticipated 2021 compliance date of the portable AC rule. This cumulative regulatory burden is described in more detail in section V.B.2.e of this notice. However, based on DOE's interviews with the manufacturers of portable ACs, DOE does not expect significant impacts on domestic manufacturing capacity or loss of employment for the industry as a whole to result from the proposed standards for portable ACs.

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

[5] The real discount rate is the weighted-average cost of capital derived from industry financials and modified based on feedback received during confidential interviews with manufacturers.
[6] All monetary values in this section are expressed in 2014 dollars; discounted values are discounted to 2015 unless explicitly stated otherwise.

C. National Benefits and Costs

DOE's analyses indicate that the proposed energy conservation standards for portable ACs would save a significant amount of energy. Relative to the case without new standards, the lifetime energy savings for portable ACs purchased in the 30-year period that begins in the anticipated year of compliance with the new standards (2021–2050) amount to 0.53 quadrillion Btu (quads).[7] This represents a savings of 8.6 percent relative to the energy use of these products in the case without new standards (referred to as the "no-new-standards case").

The cumulative net present value (NPV) of total consumer costs and savings of the proposed standards for portable ACs ranges from $2.15 billion (at a 7-percent discount rate) to $5.20 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 portable ACs purchased in 2021–2050.

In addition, the proposed standards for portable 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

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

37.7 million metric tons (Mt)[8] of carbon dioxide (CO_2), 20.2 thousand tons of sulfur dioxide (SO_2), 69.6 thousand tons of nitrogen oxides (NO_X), 165.3 thousand tons of methane (CH_4), 0.4 thousand tons of nitrous oxide (N_2O), and 0.07 tons of mercury (Hg).[9] The cumulative reduction in CO_2 emissions through 2030 amounts to 6.7 Mt, which is the equivalent to the emissions resulting from the annual electricity use of over 900,000 homes.

The value of the CO_2 reductions is calculated using a range of values per metric ton of CO_2 (otherwise known as the "Social Cost of Carbon", or SCC) developed by a Federal interagency working group.[10] The derivation of the SCC values is discussed in section IV.L. Using discount rates appropriate for each set of SCC values (see Table I.3), DOE estimates the present monetary value of the CO_2 emissions reduction (not including CO_2 equivalent emissions of other gases with global warming potential) is between \$0.3 billion and \$3.6 billion, with a value of \$1.2 billion using the central SCC case represented by \$40.0/t in 2015. DOE also estimates the present monetary value of the NO_X emissions reduction to be \$0.05 billion at a 7-percent discount rate and \$0.12 billion at a 3-percent discount rate.[11]

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

[9] DOE calculated emissions reductions relative to the no-new-standards case, which reflects key assumptions in the Annual Energy Outlook 2015 (AEO 2015) Reference case. AEO 2015 generally represents current legislation and environmental regulations for which implementing regulations were available as of October 31, 2014.

[10] Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, Interagency Working Group on Social Cost of Carbon, United States Government (May 2013; revised July 2015) (Available at: https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf).

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

Table I.3 summarizes the national economic benefits and costs expected to result from the proposed standards for portable ACs. Table I.4 presents the impacts to manufacturers and consumers expected to result from these proposed standards.

Table I.3 Summary of National Economic Benefits and Costs of Proposed Energy Conservation Standards for Portable Air Conditioners (TSL 2) 2021−2050*

Category	Present Value Billion 2014$	Discount Rate
Benefits		
Consumer Operating Cost Savings	2.4	7%
	5.7	3%
CO_2 Reduction Monetized Value ($12.2/t case)**	0.3	5%
CO_2 Reduction Monetized Value ($40.0/t case)**	1.2	3%
CO_2 Reduction Monetized Value ($62.3/t case)**	1.9	2.5%
CO_2 Reduction Monetized Value ($117/t case)**	3.6	3%
NO_X Reduction Monetized Value†	0.05	7%
	0.12	3%
Total Benefits††	3.6	7%
	7.0	3%
Costs		
Consumer Incremental Installed Costs	0.27	7%
	0.51	3%
Total Net Benefits		
Including CO_2 and NO_X Reduction Monetized Value††	3.4	7%
	6.5	3%

* This table presents the costs and benefits associated with portable ACs shipped in 2021−2050. These results include benefits to consumers which accrue after 2050 from the products purchased in 2021−2050. The costs account for the incremental variable and fixed costs incurred by manufacturers due to the standard, some of which may be incurred in preparation for the rule.

** The CO_2 values represent global monetized values of the SCC, in 2014$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. The SCC time series incorporate an escalation factor. The value for NO_X is the average of high and low values found in the literature.

† The $/ton values used for NO_X are described in section IV.L.

†† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to average SCC with 3-percent discount rate ($40.0/t case).

Table I.4 Manufacturer (2016–2050) and Consumer (2021–2050) Impacts from Proposed Energy Conservation Standards for Portable Air Conditioners (TSL 2)

Manufacturer Impacts	
Industry NPV (2014$ millions) (Base Case INPV = 725.5)	503.8 to 521.7
Industry NPV (% change)	(30.6%)* to (28.1%)*
Consumer Average LCC Savings (2014$)	
Residential	144
Commercial	292
All	162
Consumer Simple PBP (years)	
Residential	2.2
Commercial	1.2
All	2.1
% of Consumers that Experience Net Cost	
Residential	13
Commercial	2
All	12

* Parentheses indicate negative (-) values.

The benefits and costs of the proposed standards, for portable ACs sold in 2021–2050, can also be expressed in terms of annualized values. The monetary values for the total annualized net benefits are the sum of: (1) the national economic value of the benefits in reduced operating costs, minus (2) the increase in product purchase prices and installation costs, plus (3) the value of the benefits of CO_2 and NO_X emission reductions, all annualized.[12]

Although the values of operating cost savings and CO_2 emission reductions are both important, two issues are relevant. First, the national operating savings are domestic

[12] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2015, the year used for discounting the NPV of total consumer costs and savings. For the benefits, DOE calculated a present value associated with each year's shipments in the year in which the shipments occur (e.g., 2020 or 2030), and then discounted the present value from each year to 2015. The calculation uses discount rates of 3 and 7 percent for all costs and benefits except for the value of CO_2 reductions, for which DOE used case-specific discount rates, as shown in Table I.3. Using the present value, DOE then calculated the fixed annual payment over a 30-year period, starting in the compliance year that yields the same present value.

U.S. consumer monetary savings that occur as a result of market transactions, whereas the value of CO_2 reductions is based on a global value. Second, the assessments of operating cost savings and CO_2 savings are performed with different methods that use different time frames for analysis. The national operating cost savings is measured for the lifetime of portable ACs shipped in 2021–2050. Because CO_2 emissions have a very long residence time in the atmosphere,[13] the SCC values in future years reflect future CO_2-emissions impacts that continue beyond 2100.

Estimates of annualized benefits and costs of the proposed standards are shown in Table I.5. The results under the primary estimate are as follows. Using a 7-percent discount rate for benefits and costs other than CO_2 reduction (for which DOE used a 3-percent discount rate along with the average SCC series that has a value of $40.0/t in 2015),[14] the estimated cost of the standards proposed in this rule is $30 million per year in increased equipment costs, while the estimated annual benefits are $273 million in reduced equipment operating costs, $70 million in CO_2 reductions, and $ 5.4 million in reduced NO_X emissions. In this case, the net benefit amounts to $318 million per year. Using a 3-percent discount rate for all benefits and costs and the average SCC series that has a value of $40.0/t in 2015, the estimated cost of the proposed standards is $30 million per year in increased equipment costs, while the estimated annual benefits are $338

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

[14] DOE used a 3-percent discount rate because the SCC values for the series used in the calculation were derived using a 3-percent discount rate (see section IV.L).

million in reduced operating costs, \$70 million in CO_2 reductions, and \$7.2 million in reduced NO_X emissions. In this case, the net benefit amounts to \$385 million per year.

Table I.5 Annualized Benefits and Costs of Proposed Energy Conservation Standards for Portable Air Conditioners (TSL 2) 2021−2050

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*,‡	High Net Benefits Estimate*
		million 2014$/year		
Benefits				
Consumer Operating Cost Savings	7%	273	125	296
	3%	338	153	371
CO_2 Reduction Value ($12.2/t case)**	5%	21	10	23
CO_2 Reduction Value ($40.0/t case)**	3%	70	33	75
CO_2 Reduction Value ($62.3/t case)**	2.5%	102	48	109
CO_2 Reduction Value ($117/t case)**	3%	213	100	228
NO_X Reduction Monetized Value†	7%	5.4	3	12.9
	3%	7.2	3	17.4
Total Benefits††	7% plus CO_2 range	300 to 492	137 to 227	331 to 537
	7%	348	160	383
	3% plus CO_2 range	366 to 558	167 to 256	411 to 616
	3%	415	189	463
Costs				
Consumer Incremental Installed Product Costs	7%	30	31	27
	3%	30	31	26
Net Benefits				
Total††	7% plus CO_2 range	269 to 462	106 to 196	304 to 510
	7%	318	129	357
	3% plus CO_2 range	336 to 528	135 to 225	385 to 590
	3%	385	158	437

* This table presents the annualized costs and benefits associated with portable ACs shipped in 2021−2050. These results include benefits to consumers which accrue after 2050 from the products purchased in 2021−2050. The results account for the incremental variable and fixed costs incurred by manufacturers due to the standard, some of which may be incurred in preparation for the rule. The Primary, Low Benefits, and High Benefits Estimates utilize projections of energy prices from the EIA's AEO 2015 Reference case, Low Economic Growth case, and High Economic Growth case, respectively. In addition, incremental product costs reflect a medium decline rate in the Primary Estimate, a low decline rate in the Low Benefits Estimate, and a high decline rate in the High Benefits Estimate. The methods used to derive projected price trends are explained in section IV.H.

** The CO_2 values represent global monetized values of the SCC, in 2014$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. The SCC time series incorporate an escalation factor.

† The $/ton values used for NO_X are described in section IV.L.

†† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to the average SCC with a 3-percent discount rate ($40.0/t case). In the rows labeled "7% plus CO_2 range" and "3% plus CO_2 range," the operating cost and NO_X benefits are calculated using the labeled discount rate, and those values are added to the full range of CO_2 values.
‡ In addition to the AEO 2015 Low Economic Growth case, the Low Net Benefits Estimate reflects a 50 percent reduction in the number of operating hours. Details of the sensitivity analysis can be found in appendix 8F.

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

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. DOE further notes that products achieving these standard efficiency levels are already commercially available for the products covered by this proposal. Based on the analyses described above, DOE has tentatively concluded that the benefits of the proposed standards to the Nation (energy savings, positive NPV of consumer benefits, consumer LCC savings, and emission reductions) would outweigh the burdens (loss of INPV for manufacturers and LCC increases for some consumers).

DOE also considered more stringent energy efficiency levels as 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 proposed rule and related information collected and analyzed during the course of this rulemaking effort, DOE may adopt energy efficiency levels presented in this proposed rule 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 portable ACs.

A. Authority

Title III, Part B of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Pub. L. 94-163 (codified as 42 U.S.C. 6291–6309) established the Energy Conservation Program for Consumer Products Other Than Automobiles, a program covering most major household appliances (collectively referred to as "covered products").

EPCA, as amended, grants DOE authority to prescribe an energy conservation standard for any type (or class) of covered products of a type specified in 42 U.S.C.

6292(a)(19)[15] if the requirements of 42 U.S.C. 6295(o) and (p) are met and the Secretary determines that–

(1) the average per household energy use within the United States by products of such type (or class) exceeded 150 kilowatt-hours (kWh) (or its Btu equivalent) for any 12-month period ending before such determination;

(2) the aggregate household energy use within the United States by products of such type (of class) exceeded 4,200,000,000 kWh (or its Btu equivalent) for any such 12-month period;

(3) Substantial improvement in the energy efficiency of products of such type (or class) is technologically feasible; and

(4) the application of a labeling rule under 42 U.S.C. 6294 to such type (or class) is not likely to be sufficient to induce manufacturers to produce, and consumers and other persons to purchase, covered products of such type (or class) which achieve the maximum energy efficiency which is technologically feasible and economically justified. (42 U.S.C. 6295(l)(1))

DOE has determined that portable ACs meet the four criteria outlined in 42 U.S.C. 6295(l)(1) to prescribe energy conservation standards for new covered products. Specifically, DOE has determined that the average per household energy use within the United States by portable ACs exceeded 150 kWh for a 12-month period ending before such determination (see chapter 7 of the NOPR technical support document (TSD)). DOE

[15] On April 18, 2016, DOE published a final coverage determination in which DOE determined that portable ACs qualify as a covered product because classifying products of such type as covered products is necessary or appropriate to carry out the purposes of EPCA, and the average U.S. household energy use for portable ACs is likely to exceed 100 kilowatt-hours per year. 81 FR 22514.

has also determined that the aggregate household energy use within the United States by portable ACs exceeded 4,200,000,000 kWh (or its Btu equivalent) for such a 12-month period (see chapter 10 of the NOPR TSD). Further, DOE has determined that substantial improvement in the energy efficiency of portable ACs is technologically feasible (see section IV.C of this NOPR and chapter 5 of the NOPR TSD), and has determined that the application of a labeling rule under 42 U.S.C. 6294 to portable ACs is not likely to be sufficient to induce manufacturers to produce, and consumers and other persons to purchase, portable ACs that achieve the maximum energy efficiency which is technologically feasible and economically justified (see chapter 17 of the NOPR TSD).

Pursuant to EPCA, DOE's energy conservation program consists essentially of four parts: (1) testing, (2) labeling, (3) the establishment of Federal energy conservation standards, and (4) certification and enforcement procedures. The Federal Trade Commission (FTC) is primarily responsible for labeling, and DOE implements the remainder of the program. Subject to certain criteria and conditions, DOE is required to develop test procedures to measure the energy efficiency, energy use, or estimated annual operating cost of each covered product. (42 U.S.C. 6295(o)(3)(A) and (r)) Manufacturers of covered products must use the prescribed DOE test procedure as the basis for certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA and when making representations to the public regarding the energy use or efficiency of those products. (42 U.S.C. 6293(c) and 6295(s)) Similarly, DOE must use these test procedures to determine whether the products comply with standards adopted pursuant to EPCA. (42 U.S.C. 6295(s)) The DOE test procedure for portable ACs was recently established in a Final Rule issued on April 26, 2016 (the "April 26, 2016 TP Final Rule"), and appears at title 10 of the Code of Federal Regulations (CFR) part 430, subpart B, appendix CC (appendix CC).

DOE must follow specific statutory criteria for prescribing new or amended standards for covered products, including portable ACs. Any new or amended standard for a covered product must be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) 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 portable ACs, if no test procedure has been established for the product, or (2) if DOE determines by rule that the proposed standard is not technologically feasible or economically justified. (42 U.S.C. 6295(o)(3)(A)–(B)) In deciding whether a proposed standard is economically justified, DOE must determine whether the benefits of the standard exceed its burdens. (42 U.S.C. 6295(o)(2)(B)(i)) DOE must make this determination after receiving comments on the proposed standard, and by considering, to the greatest extent practicable, the following seven statutory factors:

(1) The economic impact of the standard on manufacturers and consumers of the products subject to the standard;

(2) The savings in operating costs throughout the estimated average life of the covered products in the type (or class) compared to any increase in the price, initial

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

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

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

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

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

(7) Other factors the Secretary of Energy (Secretary) considers relevant.

(42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

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

EPCA states that 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. 6294(q)(1)) In determining whether a performance-related feature justifies a different standard for a group of products, DOE must consider such factors as the utility 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))

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

Finally, pursuant to the amendments contained in the Energy Independence and Security Act of 2007 (EISA 2007), Pub. L. 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 recently established test procedures for portable ACs address standby mode and off mode energy use. In this rulemaking, DOE proposes to adopt a single energy conservation standard that addresses active, off, and standby modes.

B. Background

DOE has not previously conducted an energy conservation standards rulemaking for portable ACs. Consequently, there are currently no Federal energy conservation standards for portable ACs.

Under the authority established in EPCA, DOE published the April 18, 2016 final coverage determination that portable ACs qualify as a covered product because classifying products of such type as a covered product is necessary or appropriate to carry out the purposes of EPCA, and the average U.S. household energy use for portable ACs is likely to exceed 100 kWh per year. 81 FR 22514 (April 18, 2016).

DOE published a notice of data availability (NODA) on May 9, 2014 (the May 2014 NODA), reviewing various industry test procedures for portable ACs and presenting results from its investigative testing. DOE requested comment and additional information regarding the results and potential methodologies. 79 FR 26639. Comments received on the May 2014 NODA helped DOE identify issues related to the provisional analyses, as well as informed the analysis for the test procedure rulemaking.

On February 27, 2015, DOE published an energy conservation standards notice of public meeting and notice of availability of preliminary TSD for portable ACs (February 2015 Preliminary Analysis). In the preliminary analysis, DOE conducted in-depth technical analyses in the following areas: (1) engineering; (2) markups to determine product price; (3) energy use; (4) life-cycle cost and payback period; and (5) national impacts. The preliminary TSD that presented the methodology and results of each of these analyses is available at http://www.regulations.gov/#!documentDetail;D=EERE-2013-BT-STD-0033-0007.

DOE also conducted, and included in the preliminary TSD, several other analyses that supported the major analyses or were expanded upon for this NOPR. These analyses included: (1) the market and technology assessment; (2) the screening analysis, which contributes to the engineering analysis; and (3) the shipments analysis,[16] which contributes to the LCC and PBP analysis and national impact analysis (NIA). In addition to these analyses, DOE began preliminary work on the manufacturer impact analysis and

[16] Industry data track shipments from manufacturers into the distribution chain. Data on national unit retail sales are lacking, but are presumed to be close to shipments under normal circumstances.

identified the methods to be used for the consumer subgroup analysis, the emissions analysis, the employment impact analysis, the regulatory impact analysis, and the utility impact analysis. 80 FR 10628 (Feb. 27, 2015).

DOE held a public meeting on March 18, 2015, to discuss the analyses and solicit comments from interested parties regarding the preliminary analysis it conducted. The meeting covered the analytical framework, models, and tools that DOE uses to evaluate potential standards; the results of preliminary analyses performed by DOE for this product; the potential energy conservation standard levels derived from these analyses that DOE could consider for this product; and any other issues relevant to the development of energy conservation standards for portable ACs.

Interested parties discussed at the public meeting and followed up with written comments regarding the following major issues: rulemaking schedule with respect to the test procedure availability and timing; covered product configurations; product classes and impacts on consumer utility; technology options; efficiency levels (ELs); incremental costs; sources of data; and cumulative regulatory burden.

Comments received in response to the February 2015 Preliminary Analysis helped DOE identify and resolve issues related to the preliminary analysis. After reviewing these comments, DOE gathered additional information, held further discussions with manufacturers, and completed and revised the various analyses described in the preliminary analysis. The results of these analyses are presented in this NOPR.

III. General Discussion

DOE developed this proposed rule after considering verbal 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 to the consumer of the feature and other factors DOE determines are appropriate. (42 U.S.C. 6295(q))

In the February 2015 Preliminary Analysis, DOE did not consider energy conservation standards for portable ACs other than single-duct or dual-duct protable ACs, as the test procedure proposed at that time did not include provisions for testing other portable ACs, and DOE did not separate portable ACs into multiple product classes following a determination that there is no unique utility associated with single-duct or dual-duct portable ACs.

In this NOPR, DOE maintains the proposals from the February 2015 Preliminary Analysis to consider standards for one product class for all single-duct and dual-duct portable ACs . Comments received relating to the scope of coverage and product classes are discussed in section IV.A of this proposed rule.

B. Test Procedure

DOE initiated a test procedure rulemaking by publishing the May 2014 NODA to request feedback on potential testing options. In the May 2014 NODA, DOE discussed various industry test procedures and presented results from its investigative testing that evaluated existing methodologies and alternate approaches adapted from these methodologies that could be incorporated in a future DOE test procedure, should DOE determine that portable ACs are covered products. 79 FR 26639 (May 9, 2014).

On February 25, 2015, DOE published a NOPR (hereinafter referred to as "February 2015 TP NOPR") in which it proposed to establish test procedures for single-duct and dual-duct portable ACs. The proposed test procedures were based upon industry methods to determine energy consumption in active modes, off-cycle mode, standby modes, and off mode, with certain modifications to ensure the test procedures are repeatable and representative. 80 FR 10211.

On November 27, 2015, DOE published a supplemental notice of proposed rulemaking (SNOPR) (hereinafter referred to as "November 2015 TP SNOPR"), in which it proposed revisions to the test procedure proposed in the February 2015 TP NOPR, to improve repeatability, reduce test burden, and ensure the test procedure is representative of typical consumer usage. 80 FR 74020.

On April 26 2016, DOE issued the April 2016 TP Final Rule that established appendix CC. CITE. DOE based its analysis in this proposed rule on capacities and CEERs determined according to the appendix CC test procedure.

DOE received comments expressing concern about the timing of the portable AC test procedure rulemaking in relation to the February 2015 Preliminary Analysis and this NOPR.

The Association of Home Appliance Manufacturers (AHAM) expressed concern that the preliminary analysis was developed in the absence of a final test procedure, which it expected would be published around the same time as this NOPR. AHAM stated that if a test procedure is not finalized in a sufficient period of time before a proposed rule is issued, interested parties will not have sufficient opportunity to evaluate design options and proposed standard levels. AHAM commented that the industry is unable to determine and provide market representative performance data to DOE without a final test procedure, and that DOE's test and teardown sample of units may not be suitable to inform appropriate baseline and higher efficiency levels representative of the majority of products currently on the market. However, AHAM believes that once the final test procedure is published, manufacturers would be more willing to test their products and determine performance according to the DOE portable AC test procedure. Therefore, AHAM urged DOE to release the final test procedure before it continues with its standards analysis and manufacturer interviews. (AHAM, Public Meeting Transcript, No.

11 at pp. 9–11, 21–22, 57; AHAM, No. 16 at pp. 1–4) [17, 18] De' Longhi Appliances s.r.l. (De' Longhi) agreed that energy conservation standards can only be developed when a test procedure has been completely defined. (De' Longhi, Public Meeting Transcript, No. 11 at p. 5; De' Longhi, No. 12 at p. 1)

As described previously in this section, on April 26, 2016 DOE issued the April 26, 2016 TP Final Rule to establish the portable AC test procedure in appendix CC. April 2016 issued TP Final Rule. Manufacturers may use appendix CC to test their products and evaluate the standard levels proposed in this NOPR.

Other comments that DOE received from interested parties related to specific provisions of the portable AC test procedure were addressed in that rulemaking. For further information, please see the docket for test procedures for portable ACs: http://www.regulations.gov/#!docketDetail;D=EERE-2014-BT-TP-0014. In this NOPR analysis, all presented product capacities and efficiencies are consistent with the appendix CC test procedures.

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[17] A notation in the form "AHAM, Public Meeting Transcript, No. 11 at pp. 9–11, 21–22, 57" identifies an oral comment that DOE received on March 18, 2015 during the Preliminary Analysis public meeting, was recorded in the public meeting transcript in the docket for this test procedure rulemaking (Docket No. EERE-2013-BT-STD-0033). This particular notation refers to a comment (1) made by the Association of Home Appliance Manufacturers (AHAM) during the public meeting; (2) recorded in document number 11, which is the public meeting transcript that is filed in the docket of this test procedure rulemaking; and (3) which appears on pages 9 through 11, 21 through 22, and 57 of document number 11.

[18] A notation in the form "AHAM, No. 16 at pp. 1–4" identifies a written comment: (1) made by AHAM; (2) recorded in document number 16 that is filed in the docket of this standards rulemaking (Docket No. EERE–2013– BT–TP–0033) and available for review at www.regulations.gov; and (3) which appears on pages 1 through 4 of document number 16.

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. 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(i).

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; and (3) adverse impacts on health or safety. 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(ii)–(iv). Additionally, it is DOE policy not to include in its analysis any proprietary technology that is a unique pathway to achieve a certain efficiency level. Section IV.B of this proposed rule discusses the results of the screening analysis for portable 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 a new or 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 portable 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.b of this proposed rule and in chapter 5 of the NOPR TSD.

D. Energy Savings

1. Determination of Savings

For each TSL, DOE projected energy savings at the TSL for portable ACs purchased in the 30-year period that begins in the year of compliance with the proposed standards (2021–2050).[19] The savings are measured over the entire lifetime of portable ACs purchased in the above 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

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

energy consumption that reflects how the market for a product would likely evolve in the absence of any energy conservation standards.

DOE used its NIA spreadsheet model to estimate energy savings from potential new standards for portable ACs. The NIA spreadsheet model (described in section IV.H of this proposed rule) calculates savings in site energy, which is the energy directly consumed by products at the locations where they are used. Based on the site energy, DOE calculates national energy savings (NES) in terms of primary energy savings at the site or at power plants, and also 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.[20] 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 proposed rule.

2. Significance of Savings

To adopt any new or amended standards for a covered product, DOE must determine that such action would result in "significant" energy savings. (42 U.S.C. 6295(o)(3)(B)) Although the term "significant" is not defined in the Act, 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

[20] 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).

“significant” energy savings in the context of EPCA to be savings that were not “genuinely trivial.” The energy savings for all of the TSLs considered in this rulemaking, including the proposed standards (presented in section V.B.3.a), are nontrivial, and, therefore, DOE considers them “significant” within the meaning of section 325 of EPCA.

E. Economic Justification

1. Specific Criteria

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

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

b. Savings in Operating Costs Compared to Increase in Price

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 standards. The LCC savings for the considered efficiency levels are calculated relative to the case that reflects projected market trends in the absence of standards. DOE's LCC and PBP analysis is discussed in further detail in section IV.F.

c. Energy Savings

Although significant conservation of energy is a separate statutory requirement for 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, DOE uses the NIA spreadsheet models to project national energy savings.

d. Lessening of Utility or Performance of Products

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 proposed rule would not reduce the utility or performance of the products under consideration in this rulemaking. For more information on consumer utility and product performance of portable ACs, see section IV.A.2 and section IV.C of this proposed rule.

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))

To assist the Attorney General in making such determination, DOE will provide the Department of Justice (DOJ) with copies of the NOPR and NOPR TSD for review. DOE will consider DOJ's comments on the proposed rule in preparing the final rule, and DOE will publish and respond to DOJ's comments in that document. 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 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.

The proposed standards also are likely to result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases (GHGs) associated with energy production and use. DOE conducts an emissions analysis to estimate how potential standards may affect these emissions, as discussed in section IV.K; the emissions impacts are reported in section V.B.3 of this proposed rule. DOE also estimates the economic value of emissions reductions resulting from the considered TSLs, as discussed in section IV.L.

g. Other Factors

EPCA allows the Secretary of Energy, in determining whether a standard is economically justified, to consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6295(o)(2)(B)(i)(VII)) To the extent interested parties submit any relevant information regarding economic justification that does not fit into the other categories described above, 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 proposed rule.

IV. Methodology and Discussion

This section addresses the analyses DOE has performed for this rulemaking with regard to portable 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 LCC savings and PBP of potential new energy conservation standards. The national impact analysis uses a second spreadsheet set that provides shipments forecasts and calculates national energy savings and net present value of total consumer costs and savings expected to result from potential 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: https://www1.eere.energy.gov/buildings/appliance_standards/rulemaking.aspx/ruleid/76. Additionally, DOE used output from the latest version of Energy Information Administration (EIA)'s Annual Energy Outlook (AEO), a widely known energy forecast for the United States, for the emissions and utility impact analyses.

A. Market and Technology Assessment

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 that could improve the energy efficiency of portable ACs. The key findings of DOE's market assessment are summarized below. See chapter 3 of the NOPR TSD for further discussion of the market and technology assessment.

1. Definition and Scope of Coverage

DOE conducted the February 2015 Preliminary Analysis based on the portable AC definition proposed in the February 2015 Test Procedure NOPR, which stated that a portable AC is an encased assembly, other than a "packaged terminal air conditioner," "room air conditioner," or "dehumidifier," that is designed as a portable unit to deliver cooled, conditioned air to an enclosed space. A portable AC is powered by single-phase power and may rest on the floor or elevated surface. It includes a source of refrigeration and may include additional means for air circulation and heating. 80 FR 10212, 10215 (Feb. 25, 2015).

In the April 18, 2016 final coverage determination, DOE codified this definition at 10 CFR 430.2, with minor editorial revisions that do not modify the intent or scope of the definition:

A portable encased assembly, other than a "packaged terminal air conditioner," "room air conditioner," or "dehumidifier," that delivers cooled, conditioned air to an enclosed space, and is powered by single-phase electric current. It includes a source of refrigeration and may include additional means for air circulation and heating.

81 FR 22514.

The Pacific Gas and Electric Company (PG&E), Southern California Gas Company (SCGC), Southern California Edison (SCE), and San Diego Gas and Electric Company (SDG&E) (hereinafter the "California IOUs"), AHAM, and De' Longhi supported the analysis of portable ACs for future energy conservation standards. (California IOUs, No. 15 at p. 1; AHAM, No. 16 at pp. 1–2; De' Longhi, Public Meeting Transcript, No. 11 at p. 5; De' Longhi, No. 12 at p. 1)

DENSO expressed concern about defining covered products on the basis of supply power, noting that some commercial/industrial portable ACs are powered by single-phase power. According to DENSO, commercial units may be differentiated from residential ones on the basis of more rugged construction and the tendency to be larger and heavier for a given cooling capacity. (DENSO, No. 13 at pp. 3–4)

DOE notes that the definition for "portable air conditioner" in 10 CFR 430.2 excludes units that could not be normally used as a consumer product. Therefore, a product that requires three-phase power, a requirement that is not appropriate for consumer products, is not covered under the definition of portable AC. Conversely, any product with single-phase power that otherwise meets the definition for a portable AC would be considered by DOE to be such a covered product regardless of the manufacturer-intended application or installation location. DOE also recognized that certain portable ACs that exhaust condenser air within the conditioned space ("spot coolers") do not provide net cooling to the typical conditioned consumer space. In addition, spot coolers incorporate different design features and a wider variety of installation types and usage patterns than single-duct and dual-duct portable ACs. For these reasons, DOE did not identify a test procedure that would measure representative performance of spot coolers. DOE instead established a test procedure for single-duct and dual-duct portable ACs in its recent rulemaking that established appendix CC (80 FR 10211, 10213, 10214–10215 (Feb. 25, 2015); [April 2016 issued TP Final Rule]), and correspondingly is proposing standards only for single-duct and dual-duct portable ACs in this NOPR. DOE welcomes comment on this decision and its rationale for proposing standards for single-duct and dual-duct portable ACs.

2. Product Classes

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 a different standard. In making a determination whether a performance-related feature justifies a different standard, DOE must consider such factors as the utility to the consumer of the feature and other factors DOE determines are appropriate. (42 U.S.C. 6295(q))

Portable ACs only recently became a covered product when DOE issued the April 18, 2016 final coverage determination, and therefore do not have previous energy conservation standards or product class divisions. 81 FR 22515

a. Preliminary Analysis Proposals

Following an evaluation of the portable AC market in preparation of the February 2015 Preliminary Analysis, DOE determined that there are three types of duct configurations that affect product performance: single-duct, dual-duct, and spot cooler. DOE noted in the February 2015 Preliminary Analysis that the DOE test procedure proposed in the February 2015 Test Procedure NOPR did not include measures of spot cooler performance, and therefore as discussed previously, DOE did not consider standards for spot coolers. See chapter 3 of the preliminary TSD for more information.

DOE further evaluated if there was any consumer utility associated with the single-duct and dual-duct configurations under consideration. As detailed in chapter 3 of the preliminary TSD, DOE investigated installation locations and noise levels, and found that duct configuration had no impact on either of these key consumer utility variables. Therefore, DOE determined in the February 2015 Preliminary Analysis that a single product class is appropriate for portable ACs.

b. Comments and Responses

Spot Coolers

DENSO supported the exclusion of spot coolers from potential energy conservation standards. It commented that its spot coolers, which may also be operated with optional adapters to configure them as single-duct or dual-duct portable ACs, are typically installed in commercial applications such as a warehouses, auto repair shops, or similar businesses, and are not appropriate for a typical retail commercial establishment or residential application. DENSO believes that these units should therefore be exempt from the rulemaking, particularly due to the low market volume compared to other currently covered products. According to DENSO, annual shipments of spot coolers are approximately 15,000 units, or about 1.6 percent of the DOE-estimated portable AC market. DENSO further commented that there is little differentiation in energy efficiency ratio (EER) across all spot coolers on the market with capacities ranging from 12,000 to 60,000 Btu/hr. (DENSO, No. 13 at pp. 1, 5, 9) DENSO expressed concern regarding the features that DOE proposed to distinguish commercial and industrial portable ACs from residential portable ACs. According to DENSO, it is presumed to be mutually agreed that units powered from a three-phase power source are commercial/industrial units, but there are some units powered by single-phase power which are clearly commercial/industrial products. (DENSO, No. 13 at pp. 3–4)

The California IOUs urged DOE to include spot coolers in the energy conservation standards rulemaking analyses and to adopt active mode test procedures for spot coolers utilizing existing industry test procedures such as ANSI/ASHRAE Standard 128–2011. The California IOUs noted that 321 of the 427 spot cooler models in the California Energy Commission (CEC) Appliance Efficiency Database have cooling capacities below 14,000 Btu/hr and as low as 4,000 Btu/hr. Assuming this distribution is an indicator of widespread market availability of products below 14,000 Btu/hr, the California IOUs urged DOE to adopt test procedures and performance standards for spot coolers. (California IOUs, No. 15 at p. 2)

While the portable AC definition excludes products with a 3-phase power supply, DOE agrees with DENSO that certain spot coolers that operate with a single-phase power supply would meet the portable AC definition. Because spot coolers with a single-phase power supply could be used as a consumer product, DOE is maintaining the approach in the February 2015 Preliminary Analysis in which such spot coolers would be included as covered products. As discussed in section IV.A.1, however, DOE has established a test procedure for single-duct and dual-duct portable ACs at this time and is proposing energy conservation standards only for these portable ACs in this NOPR. DOE further notes that, upon review of the spot cooler entries in the CEC Appliance Efficiency Database,[21] it concludes that a number of listed products would meet DOE's definitions of single-duct or dual-duct portable ACs.

Single Product Class

The Appliance Standards Awareness Project (ASAP), Alliance to Save Energy (ASE), American Council for an Energy-Efficient Economy (ACEEE), National Consumer Union (CU), and Northwest Energy Efficiency Alliance (NEEA) (hereinafter the "Joint Commenters") and the California IOUs agreed with DOE that there is no

[21] The CEC Appliance Efficiency Database is accessible at: https://cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx.

unique consumer utility associated with duct configuration and support establishing a single product class for portable ACs. The California IOUs noted that the negative pressure within a room created by a single-duct portable AC can lead to more infiltration air from outside the conditioned space, which can result in lower efficiencies than for dual-duct units. The California IOUs, therefore, asserted that adopting performance standards for a single product class that includes both single-duct and dual-duct portable ACs would incentivize manufacturers to produce higher efficiency units. (ASAP, Public Meeting Transcript, No. 11 at p. 17; Joint Commenters, No. 14 at p. 1; California IOUs, No. 15 at pp. 1–2)

AHAM and De' Longhi commented that duct configuration warrants separate product classes. They believe that single-duct portable ACs offer unique consumer utility in terms of smaller size and slimmer profiles, greater portability and versatility, and easier installation. AHAM stated that portability and size are a key issue for consumers, and that consumers indicate to manufacturers that they prefer slimmer designs. According to AHAM, maintaining smaller unit sizes can impact a manufacturer's ability to improve efficiency because of limitations on air flow, which in turn impact performance. AHAM further commented that if manufacturers are required to improve efficiency while maintaining smaller, more portable units, then noise would increase, thereby impacting consumer utility. AHAM further stated that single-duct and dual-duct portable ACs may have different applications. For example, dual-duct units are more often used in commercial applications, such as computer server rooms. AHAM suggested that without separate product classes, single-duct portable ACs would likely be eliminated from the market. (AHAM, No. 16 at p. 2; De' Longhi, No. 12 at p. 2)

DOE reviewed the comments and, with the input from manufacturer interviews and additional research, further analyzed the differences between single-duct and dual-duct portable ACs. DOE recognizes that the additional duct for dual-duct units results in shipping packages that are slightly larger than for single-duct units, with a corresponding impact on shipping costs and consumer portability prior to unpacking. However, the size differences do not significantly impact product availability or consumer utility during operation. Additionally, DOE found that window mounting brackets are typically the same size, regardless of whether they are configured for one or two ducts, and therefore a mounting bracket for two ducts would not reduce consumer utility. Further, DOE estimates from its engineering analysis that a dual-duct portable AC would be less than 5 pounds heavier than a comparable single-duct unit with the same capacity, and with wheels on all units, portability of a dual-duct unit is not reduced when relocating the unit within the home. DOE also determined that many portable AC profiles and chassis sizes are a function of the heat exchanger dimensions rather than the number of ducts. The potential standards that DOE is contemplating would impose no restrictions on what side of the unit a duct should be located, and therefore manufacturers are free to determine the form factor of their portable ACs to suit customer preferences. Noise is a concern for consumers when operating all portables ACs, but DOE did not find a substantive difference in noise levels between the two duct configurations. DOE believes that insulation and case sealing to reduce infiltration air would offset any additional noise associated with the increased fan power of a dual-duct portable AC. DOE received feedback from manufacturers during interviews indicating that their customers are not typically aware of any functional difference between single-duct and dual-duct units, and that consumer preference hinges primarily on the aesthetics of the product, rated cooling capacity, and purchase price. Additionally, DOE is not aware of any significant difference between the typical applications of single-duct and dual-duct portable ACs. Therefore, DOE has found no unique consumer utility associated with the number of ducts for portable ACs that would warrant a division of single-duct and dual-duct units into separate product classes. Furthermore, as described in section IV.C, testing according to the test procedure in appendix CC results in no significant performance differences between single-duct and dual-duct portable ACs. Therefore, due to the lack of consumer utility differences and lack of energy efficiency differentiation, DOE has determined that separate product classes for single-duct and dual-duct portable ACs are not warranted.

The definitions established in the April 26, 2016 TP Final Rule for single-duct and dual-duct portable ACs describe the various duct configurations based on differences in air flow patterns. DOE further established, in the April 26, 2016 TP Final Rule, that single-duct and dual-duct portable ACs distributed in commerce with multiple duct configuration options must be tested in each applicable configuration and the performance in each tested configuration must comply with any applicable energy conservations standards. April 2016 issued TP Final Rule. This NOPR analysis was performed in accordance with appendix CC established by the issuedApril 2016 TP Final Rule.

c. NOPR Proposals

In summary, DOE proposes to maintain the February 2015 Preliminary Analysis approach, in which only single-duct and dual-duct portable ACs would be considered, and would be classified as one product class, for the purposes of energy conservation standards. For portable ACs that can be optionally configured in both single-duct and dual-duct configurations, DOE further proposes that operation with both duct configurations be certified under any future portable AC energy conservation standards.

3. Technology Options

In the preliminary market analysis and technology assessment, DOE identified 16 technology options in four different categories that would be expected to improve the efficiency of portable ACs, as shown in the following Table IV.1:

Table IV.1 Technology Options for Portable Air Conditioners – Preliminary Analysis

Increased Heat-Transfer Surface Area
1. Increased frontal coil area
2. Increased depth of coil (add tube rows)
3. Increased fin density
4. Add subcooler to condenser coil
Increased Heat-Transfer Coefficients
5. Improved fin design
6. Improved tube design
7. Spray condensate onto condenser coil
8. Microchannel heat exchangers
Component Improvements
9. Improved compressor efficiency
10. Improved blower/fan efficiency
11. Low-standby-power electronic controls
12. Ducting insulation
13. Improved duct connections
14. Case insulation
Part-Load Technology Improvements
15. Variable-speed compressors
16. Thermostatic or electronic expansion valves

AHAM commented that the Significant New Alternatives Policy (SNAP) final rule, published by the Environmental Protection Agency (EPA) on April 10, 2015, approved the use of propane (R-290) and R-32 for portable ACs. 80 FR 19454. AHAM asserted that these refrigerants would result in capacity and efficiency improvements, compared with the common refrigerants currently in use. AHAM suggested that DOE consult with manufacturers regarding their plans to use these refrigerants in future designs and determine the associated performance improvements. (AHAM, No. 16 at p. 9) DOE observes that propane refrigerant is widely used for portable ACs manufactured and sold internationally, and that R-32 is being introduced in some markets outside the United States for portable and room ACs, albeit primarily because it is has a low global warming potential (GWP). Based on this product availability and discussions with manufacturers, DOE agrees that propane and possibly other alternative refrigerants could improve portable AC efficiencies. Accordingly, DOE has included alternative refrigerants as a potential technology option in the technology assessment.

DOE also notes that a potential means of improving portable AC efficiencies, air flow optimization, was not included as a technology option in the February 2015 Preliminary Analysis. DOE did, however, consider optimized air flow in the engineering analysis in both the February 2015 Preliminary Analysis and has addressed this technology further in this NOPR. Accordingly, DOE has included it as a technology option in the technology assessment. Therefore, in addition to the technology options considered in the preliminary analysis, DOE additionally considered alternative refrigerants and air flow optimization when conducting this NOPR analysis, as shown in Table IV.2.

Table IV.2 Technology Options for Portable Air Conditioners – NOPR Analysis

Increased Heat-Transfer Surface Area
1. Increased frontal coil area
2. Increased depth of coil (add tube rows)
3. Increased fin density
4. Add subcooler to condenser coil
Increased Heat-Transfer Coefficients
5. Improved fin design
6. Improved tube design
7. Spray condensate onto condenser coil
8. Microchannel heat exchangers
Component Improvements
9. Improved compressor efficiency
10. Improved blower/fan efficiency
11. Low-standby-power electronic controls
12. Ducting insulation
13. Improved duct connections
14. Case insulation

Part-Load Technology Improvements
15. Variable-speed compressors
16. Thermostatic or electronic expansion valves
Alternative Refrigerants
17. Propane and R-32
Reduced Infiltration Air
18. Air flow Optimization

After identifying all potential technology options for improving the efficiency of portable ACs, DOE performed a screening analysis (see section IV.B of this proposed rule and chapter 4 of the NOPR TSD) to determine which technologies merited further consideration in the engineering analysis.

B. Screening Analysis

DOE uses the following four 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 of safety. If it is determined that a technology would have significant adverse impacts on health or safety, it will not be considered further.

   (10 CFR part 430, subpart C, appendix A, 5(b))

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

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

Ducting Insulation

In the February 2015 Preliminary Analysis, DOE identified duct insulation as a potential means for improving portable AC efficiency, as less heat from the condenser air would be transferred through the duct wall and would instead be transferred out of the conditioned space. During interviews, manufacturers indicated that they have considered insulated ducts to improve performance but have not identified any insulated ducts that are collapsible for packaging and shipping. No portable AC in DOE's teardown sample for the engineering analysis included insulated ducts. In the absence of a collapsible design, such an insulated duct would need to be packaged for shipment in its fully expanded configuration, significantly increasing the package size. Because of this significantly increased packaging size for non-collapsible insulated ducts and unavailability on the market of collapsible designs, DOE determined that insulated ducts are not technologically feasible, are impractical to manufacture and install, and would impact consumer utility. Therefore, DOE screened out insulated ducts as a design option for portable ACs in the February 2015 Preliminary Analysis. DOE received no feedback on this tentative proposal and maintains this approach for the NOPR analysis.

Alternative Refrigerants

The SNAP rule limits the maximum allowable charge of alternative refrigerants in portable ACs to 300 grams for R-290 (propane), 2.45 kilograms for R-32, and 330 grams for R-441A. The SNAP rule limits were consistent with those included for portable room ACs in Underwriter's Laboratories (UL) Standard 484, "Standard for Room Air Conditioners" (UL 484), eighth edition. However, the most recent version of UL 484, the ninth edition, reduces the allowable amount of flammable refrigerant (e.g., propane and R-441A) to less than 40 percent of the SNAP limits. Manufacturers informed DOE that the new UL charge limits for portable ACs are not feasible for providing the necessary minimum cooling capacity, and therefore it would not be feasible to manufacture a portable AC with an alternative refrigerant for the U.S. market while complying with the UL safety standard. DOE reviewed propane refrigerant charges for portable ACs available internationally and found a typical charge of 300 grams. DOE also investigated other similar AC products that utilize propane refrigerant and found that the minimum charge for capacities in a range expected for portable ACs was 265 grams, which is still above the maximum allowable propane charge for portable ACs in the ninth edition of UL 484. Therefore, although portable ACs are currently available internationally with amounts of flammable refrigerants acceptable under the SNAP rule, manufacturers are unable to sell those products in the U.S. market while complying with the ninth edition of UL 484. In addition, DOE is aware of very few portable or room ACs available commercially in other markets that utilize the mildly flammable R-32. Therefore, DOE screened out alternative refrigerants as a design option for portable ACs as they are not practicable to manufacture at this time while meeting all relevant safety standards. DOE invites comment on the determination that alternative refrigerants should be screened out as a design option for portable ACs.

2. Additional Comments

Improved Compressor Efficiency

DENSO suggested that the portable AC industry is too small to drive compressor efficiencies. DENSO further stated that there is little efficiency improvement available associated with compressors. (DENSO, No. 13 at p. 7) AHAM commented that improved compressor efficiency would increase the stack height of the compressor motor, increasing the size and weight of the portable AC. (AHAM, No. 16 at p. 8) DOE notes that the units in its teardown sample implemented compressors with a range of efficiencies and capacities (see chapter 5 of the NOPR TSD for additional information regarding DOE’s test sample and teardown observations). DOE further researched the maximum efficiency of compressors available on the market with capacities suitable for portable ACs. As discussed further in section IV.C.1.b, DOE considered compressor improvements associated with the compressor types currently implemented in portable ACs up to the maximum available efficiency on the market or those compressor types that may be implemented in portable ACs in the foreseeable future, which would not impact the size or weight of the portable ACs to the extent that consumer utility would be significantly affected. Accordingly, DOE did not eliminate compressor efficiency improvements from further consideration in the NOPR analysis.

Increased Heat-Transfer Surface Area

AHAM and DENSO stated that larger heat exchangers, fans with higher air flow rates, and larger ducting components would increase efficiency, but size and noise would limit the extent those design options could be implemented. They further commented that increasing the frontal coil area, depth of the coil, and fin density would increase product sizes, due to larger heat exchangers or fans. In addition, AHAM and DENSO believe that increased fin density may cause reliability and safety concerns because it would result in increased dust and dirt accumulation. (AHAM, No. 16 at p. 8; DENSO, No. 13 at p. 6) DOE agrees that increased heat exchanger areas may require an increase in enclosure size. For that reason, the heat exchanger changes that DOE considered in the February 2015 Preliminary Analysis were limited to a 10-percent increase at the highest efficiency level. In this NOPR analysis, DOE considered further heat exchanger area increases, up to 20 percent of the existing heat exchanger area for the units in DOE's test sample, discussed in section IV.C.1.b and in chapter 5 of the NOPR TSD. DOE observed in its test sample that heat exchanger areas varied significantly from unit to unit. Additionally, DOE observed a significant range in heat exchanger area among the units in its test sample. The range in observed heat exchanger area suggests that manufacturers have more latitude to increase heat exchanger areas for a substantial number of units than DOE had estimated in the February 2015 Preliminary Analysis. Based on the range of observed heat exchanger areas in its test sample and the strong correlation between heat exchanger area and cooling capacity, DOE determined that a 20-percent increase in area is a more appropriate limit. See chapter 5 of the NOPR TSD for additional details regarding the 20-percent threshold. DOE considered all subsequent component and chassis size increases related to this heat exchanger size increase. Accordingly, while there may be some increase in product sizes with increased heat exchanger area, DOE did not eliminate this technology option from further consideration because consumer utility could be maintained. DOE did not screen out increased fin density due to reliability concerns from dirt or dust accumulation because these issues could potentially be prevented with better inlet air filtering. However, increased fin density is not a design option that DOE assumed manufacturers would pursue to reach higher efficiencies because, as discussed further in chapter 5 of the NOPR TSD, other design options are more effective in achieving efficiency improvements.

Improved Blower/Fan Efficiency

DENSO expressed concern that improved blower motor efficiency would require an electronically commutated motor (ECM), which, according to DENSO, would add substantial cost and control complexity. (DENSO, Public Meeting Transcript, No. 11 at pp. 34–35; DENSO, No. 13 at p. 7) As discussed in chapter 3 of the NOPR TSD, DOE considered blower motor efficiency improvements associated with substituting an ECM, with efficiencies as high as 80 percent, for the typical permanent split capacitor (PSC) motor with efficiencies ranging from 60 to 65 percent. Although an ECM is more expensive than a PSC motor, this is not a criteria for screening out a particular technology option. Therefore, DOE has retained this technology option in its NOPR analysis. DOE has factored the incremental cost associated with the ECM and its controls into the engineering analysis (see section IV.C of this NOPR and chapter 5 of the NOPR TSD).

Variable-Speed Compressors

AHAM observed that any efficiency improvement due to variable-speed compressors would not be captured under the proposed test procedure because portable ACs would be tested at the maximum fan speed and therefore commented that DOE should not consider variable-speed compressors in its analysis for proposed standards. (AHAM, No. 16 at p. 8) DOE notes that variable-speed compressors offer the highest efficiencies available in the capacity range appropriate for portable ACs whether operating at single or variable speeds. Because this technology option meets the screening criteria set forth in 10 CFR part 430, subpart C, appendix A, 4, DOE has retained it for consideration in the engineering analysis for this NOPR.

3. Remaining Technologies

Through a review of each technology, DOE tentatively concludes that all of the identified technologies, with the exception of insulated ducts and alternative refrigerants, as discussed in section IV.B.1, met all four screening criteria to be examined further as design options in DOE's NOPR analysis, as shown in Table IV.3. For additional details, see chapter 4 of the NOPR TSD.

Table IV.3 Remaining Design Options for Portable Air Conditioners

Increased Heat-Transfer Surface Area
1. Increased frontal coil area
2. Increased depth of coil (add tube rows)
3. Increased fin density
4. Add subcooler to condenser coil
Increased Heat-Transfer Coefficients
5. Improved fin design
6. Improved tube design
7. Spray condensate onto condenser coil
8. Microchannel heat exchangers
Component Improvements

9. Improved compressor efficiency
10. Improved blower/fan efficiency
11. Low-standby-power electronic controls
12. Improved duct connections
13. Case insulation
Part-Load Technology Improvements
14. Variable-speed compressors
15. Thermostatic or electronic expansion valves
Reduced Infiltration Air
16. Air flow Optimization

C. Engineering Analysis

In the engineering analysis DOE establishes the relationship between the manufacturer production cost (MPC) and improved portable AC efficiency. This relationship serves as the basis for cost-benefit calculations for individual consumers, manufacturers, and the Nation. DOE typically structures the engineering analysis using one of three approaches: (1) design option; (2) efficiency level; or (3) reverse engineering (or cost assessment). The design-option approach involves adding the estimated cost and associated efficiency of various efficiency-improving design changes to the baseline to model different levels of efficiency. The efficiency-level approach uses estimates of costs and efficiencies of products available on the market at distinct efficiency levels to develop the cost-efficiency relationship. The reverse-engineering approach involves testing products for efficiency and determining cost from a detailed bill of materials (BOM) derived from reverse engineering representative products.

In the preliminary engineering analysis, DOE used a hybrid approach of the design-option and reverse-engineering approaches described above. This approach involved physically disassembling commercially available products, reviewing publicly available cost information, and modeling equipment cost. From this information, DOE estimated the MPCs for a range of products available at that time on the market. DOE then considered the steps manufacturers would likely take to improve product efficiencies. In its analysis, DOE determined that manufacturers would likely rely on certain design options to reach higher efficiencies. From this information, DOE estimated the cost and efficiency impacts of incorporating specific design options at each efficiency level.

For this NOPR, DOE followed the same general approach as for the preliminary engineering analysis, but modified the analysis based on the newly established appendix CC test procedure, comments from interested parties, and the most current available information. This section provides more detail on how DOE selected the efficiency levels used for its analysis and developed the MPC at each level. Chapter 5 of the NOPR TSD contains further description of the engineering analysis.

1. Efficiency Levels

a. Baseline Efficiency Levels

A baseline unit typically just meets current energy conservation standards and provides basic consumer utility. Because there are no existing energy conservation standards for portable ACs, DOE observed whether units tested with lower efficiencies incorporated similar design options or features, and considered these features when defining a baseline configuration. To determine energy savings that will result from a new energy conservation standard, DOE compares energy use at each of the higher efficiency levels to the energy consumption of the baseline unit. Similarly, to determine the changes in price to the consumer that will result from an energy conservation standard, DOE compares the price of a unit at each higher efficiency level to the price of a unit at the baseline.

DOE noted in chapter 5 of the preliminary analysis TSD that the air flow pattern through a portable AC has a significant effect on measured cooling capacity and energy efficiency ratio. For units that draw air from the conditioned space over the condenser and then exhaust it outside of the conditioned space, an equivalent amount of infiltration air must enter the conditioned space due to the net negative pressure differential that is created between the conditioned and unconditioned spaces. Because the test conditions proposed in the February 2015 Test Procedure NOPR (the current proposal at the time of the preliminary analysis) specify that infiltration air would be at a higher temperature than the conditioned air, the infiltration air offsets a portion of the cooling provided by the portable AC. The greater the amount of infiltration air, the lower the overall cooling capacity will be. Based on the measured condenser exhaust air flow rates and the corresponding calculated magnitudes of the infiltration air heating effect, DOE determined in the February 2015 Preliminary Analysis that single-duct units (i.e., units that draw all of the condenser intake air from within the conditioned space and exhaust to the unconditioned space via a duct) would represent the baseline efficiency level for portable ACs.

After the February 2015 Preliminary Analysis, DOE established the portable AC test procedure in appendix CC, which incorporates two cooling mode test conditions and weighting factors to determine overall performance. Because the additional test condition is at a lower outdoor temperature and has a significantly larger weighting factor than the original test condition, the impact of infiltration air on overall performance is greatly reduced. Therefore, the approach of considering a baseline unit to be a single-duct portable AC with typical system components is no longer valid for this rulemaking. DOE instead pursued an alternate analysis approach in this NOPR, which utilizes the results from all units in DOE's test sample, including 24 portable ACs (one test sample was tested in both a single-duct and dual-duct configuration) covering a range of configurations, product capacities, and efficiency as tested according the DOE test procedure in appendix CC.

DOE developed a relationship between cooling mode power and seasonally adjusted cooling capacity (SACC), which is a measure of cooling capacity that weights the performance at each of the cooling mode test conditions in appendix CC, using a best fit curve. DOE then used this relationship to develop an equation to determine nominal CEER for a given SACC based on the results of DOE's testing according to the test procedure in appendix CC, shown below.

$$Nominal\ CEER = \frac{SACC}{(2.7447 \times SACC^{0.6829})}$$

DOE assessed the relative efficiency of each unit in the test sample by comparing the measured CEER from testing to the nominal CEER as defined by the equation above (DOE will refer to this ratio of actual CEER to nominal CEER as the performance ratio (PR) for a given unit). DOE proposes to define baseline performance as a PR of 0.72, which is based on the minimum PR observed for units in the test sample. Additional details on the baseline units may be found in chapter 5 of the NOPR TSD DOE invites comment on the baseline performance level proposal and the determination based on the minimum PR observed in DOE's test sample.

b. Higher Energy Efficiency Levels

Preliminary Analysis Proposal

For the February 2015 Preliminary Analysis, DOE developed incremental efficiency levels based on the design options manufacturers would likely use to improve portable AC efficiency. Recognizing that the presence of infiltration air has a large impact on unit performance, DOE expected that when improving efficiencies beyond the baseline, manufacturers would first make improvements to incrementally reduce the amount of infiltration air. While certain technology options identified in Table IV.1 of this NOPR and discussed in chapter 3 of the preliminary analysis TSD meet all the screening criteria and may produce energy savings in certain real-world situations, DOE did not further consider them in the preliminary analysis because specific efficiency gains were either not clearly defined or the DOE test procedure would not capture those potential improvements. Thus, DOE did not expect manufacturers to rely on these features to meet higher efficiency levels. Such technology options included: (1) adding a subcooler or condenser coil, (2) increasing the heat transfer coefficients, (3) improving duct connections, (4) improving case insulation, and (5) implementing part-load technologies. Further discussion of these technology options and the reasons why DOE tentatively concluded that they would be unlikely to be implemented to improve efficiency can be found in chapter 5 of the preliminary analysis TSD.

The first efficiency level beyond the baseline in the February 2015 Preliminary Analysis, Efficiency Level 1 (EL 1), represented the first improvement a manufacturer would make for a single-duct unit. This efficiency level assumed manufacturers would convert single-duct units to a dual-duct configuration, although the units would still have infiltration air flow equal to half of the total air flow over the condenser (i.e., half of the condenser air flow is from the conditioned space, and the other half is from the unconditioned space via the condenser inlet duct). This amount of infiltration air flow was approximately equal to the average value observed for the dual-duct units in DOE's test sample.

Efficiency Level 2 (EL 2) in the February 2015 Preliminary Analysis represented dual-duct units with infiltration air flow reduced to 25 percent of the total condenser air flow. Efficiency Level 3 (EL 3) represented a dual-duct unit that is perfectly sealed with no infiltration air, such that 100 percent of the condenser air flow is drawn from outside the conditioned space. DOE noted in the preliminary analysis that it did not observe units with zero infiltration air in its test sample, but included such a configuration in the analysis because DOE tentatively concluded it is technically feasible and would result in a significant increase in efficiency.

Efficiency Level 4 (EL 4) in the February 2015 Preliminary Analysis corresponded to the max-tech level as determined by DOE. This level combined the ideal dual-duct air flow configuration described for EL 3 with additional design option changes to improve efficiency. Although DOE did not observe any portable ACs in its sample with these additional design options, DOE regarded each of them as options that manufacturers would likely consider incorporating to achieve the highest possible efficiencies. At EL 4, units would incorporate more efficient compressors and blower motors, larger heat exchangers, and low-standby-power electronic controls. Similar to EL 3, DOE's test sample did not include any portable ACs incorporating all of the design options associated with EL 4, but DOE estimated the potential performance improvements for products incorporating these design changes based on available information and modeling described in chapter 5 of the preliminary analysis TSD.

From this data, DOE derived relationships between cooling capacity[22] and cooling mode energy efficiency ratio, EER_{cm}, at each of the efficiency levels. DOE presented the following general relationship in the February 2015 Preliminary Analysis, based on observed trends at each efficiency level:

[22] DOE notes that the cooling capacity analyzed in the preliminary analysis is equal to the adjusted cooling capacity (ACC) as proposed in the February 2015 Test Procedure NOPR.

$$EER_{cm} = \frac{Cooling\ Capacity}{(A \times Cooling\ Capacity + B)}$$

Table IV.4 below provides the coefficients A, in Wh/Btu, and B, in watts (W), for each analyzed efficiency level in the February 2015 Preliminary Analysis that would be used to determine EER_{cm} in Btu/Wh. Figure IV-1 plots each efficiency level curve for cooling capacities from 0 to 10,000 Btu/h. DOE noted that the cooling capacity and EER_{cm} were based upon how products would be expected to perform under the test procedure proposed in the February 2015 TP NOPR, and thus the range of values for each metric in DOE's analysis did not necessarily correspond to manufacturer-advertised ratings or data in the CEC Appliance Efficiency Database.

Table IV.4 Portable Air Conditioner Efficiency Level Equation Coefficients – Preliminary Analysis

Efficiency Level	A Coefficient (Wh/Btu)	B Coefficient (W)
Baseline	0.113	855.5
EL1	0.1201	685.4
EL2	0.1222	566.3
EL3	0.1256	426.9
EL4	0.1205	355.1

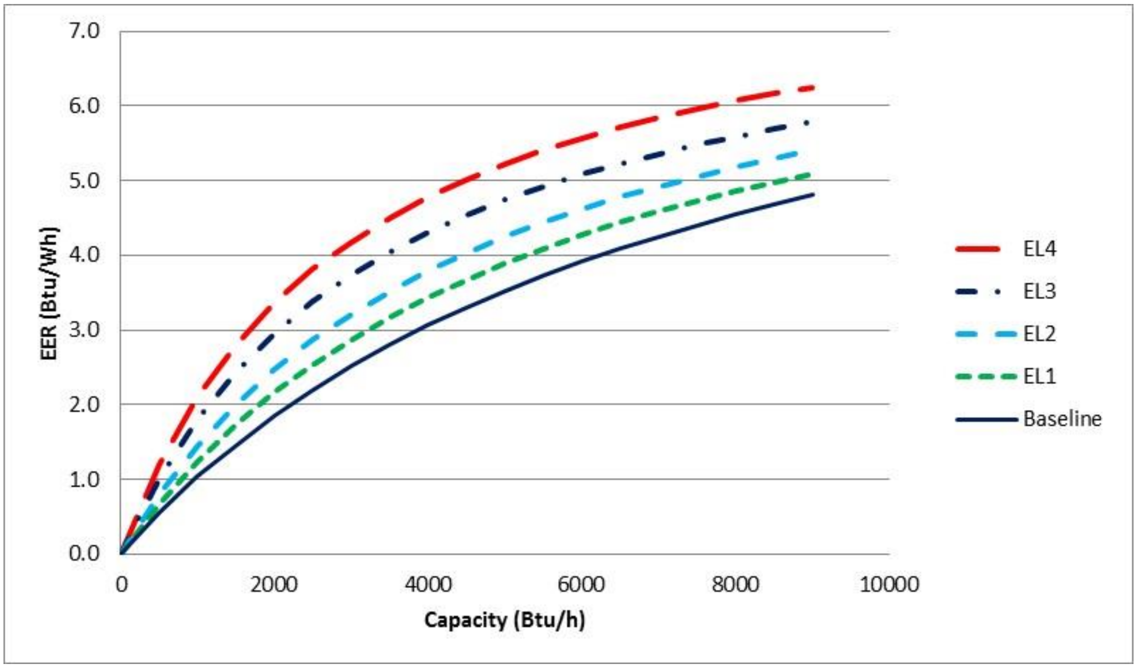

Figure IV-1 Portable Air Conditioner Efficiency Level Curves – Preliminary Analysis

Comments and Responses

1. Efficiency versus Capacity Relationship

In response to the February 2015 Preliminary Analysis, DOE received multiple comments regarding its proposal to define efficiency levels as a function of cooling capacity.

The Joint Commenters, California IOUs, and AHAM agreed that DOE's test data showed a relationship between capacity and efficiency for units in the test sample when measured by the proposed DOE test procedure. However, these commenters did not agree that there is an inherent relationship between capacity and efficiency for all portable ACs, variously citing the following reasons:

(1) both metrics are sensitive to infiltration air and other heating effects;

(2) other product features or configurations may contribute to efficiency, including improved air flow and compressor or blower motor efficiency;

(3) the observed trend between efficiency and capacity is specific only to DOE's test sample and is not representative of the market in its entirety; and

(4) this trend is atypical of heating and cooling equipment, which typically show a general decline in efficiency with increased cooling capacity.

The California IOUs stated that portable ACs with lower capacities may be capable of increasing EER via design options that do not affect capacity, so that lower standard levels for these units may fail to capture technologically feasible energy savings. The Joint Commenters noted that while the current standards for dehumidifiers (refrigeration-based products similar to portable ACs with comparable capacities) are higher for units with higher capacities, the difference in required efficiency for small-capacity and large-capacity dehumidifiers is significantly less than the range of efficiencies within each proposed portable AC efficiency level curve. According to the Joint Commenters, the availability of dehumidifiers with capacities as low as 25 pints/day that meet the current ENERGY STAR specification (which specifies the same energy factor for all dehumidifiers with capacities up to 75 pints/day) also suggests that there may not be an inherent relationship between capacity and efficiency for portable ACs. Accordingly, the Joint Commenters and the California IOUs urged DOE to consider portable AC standards that would require the same minimum efficiency level for all units. DENSO recommended that DOE evaluate the trends in room AC efficiency as a function of capacity because the engineering analysis in the February 2015

Preliminary Analysis was based in part on room ACs. (ASAP, Public Meeting Transcript, No. 11 at pp. 17–18, 40; Joint Commenters, No. 14 at pp. 2–4; California IOUs, No. 15 at pp. 2–3, AHAM, No. 16 at p. 5; DENSO, No. 13 at p. 5)

DOE's test sample included 24 portable ACs covering a range of configurations and product capacities. Although this sample represents only a portion of the portable AC market, DOE observed little substantive variation in the design and construction between the test units and expects that all units available on the market use similar technologies. Therefore, DOE expects that the results from this test sample likely reflect typical performance of the overall portable AC market.

Although DOE expected that manufacturers would rely on air flow optimization to reach higher efficiency levels as part of the February 2015 Preliminary Analysis, DOE agrees that certain design options would increase efficiency at a relatively constant capacity. However, for the preliminary analysis, DOE estimated that air flow optimization was the most cost-effective pathway for manufacturers to move to higher efficiency levels. In this NOPR analysis, DOE based its analysis on the portable AC test procedure in appendix CC. Under this test procedure, air flow optimization does not have a significant impact on efficiency. Accordingly, DOE has revised its engineering analysis to reflect primarily a component-based approach to achieving higher efficiencies.

DOE notes that although room ACs have similar components as portable ACs, the efficiency versus capacity trends for room ACs do not necessarily apply to portable ACs due to the significant chassis size constraints on room ACs. Therefore, each product must be analyzed separately due to unique consumer use, installation, and component configuration. Similarly, although dehumidifiers and portable ACs utilize many of the same internal components, the configuration of these components significantly impacts the resulting functionality and delivered benefit to consumers. Dehumidifiers are arranged in a configuration to optimize latent heat transfer or removal of condensate, while portable ACs are configured to provide sensible cooling, with latent heat removal as a secondary function. Further, the two products are tested with different test procedures that produce incomparable capacity and efficiency metrics. Therefore, although they share many components, dehumidifier trends in efficiency versus capacity do not necessarily inherently apply to portable ACs.

DENSO commented that efficiency levels should be based on inherent product characteristics and not on performance related to installation. DENSO stated this would be consistent with packaged central ACs, which are typically installed as ducted units but are tested unducted, with the rating based on unit performance with a modest allowance for ducting. (DENSO, No. 13 at p. 4) The efficiency levels developed for this NOPR analysis are based on testing in accordance with the DOE test procedure for portable ACs in appendix CC. The DOE test procedure, which incorporates industry standards, establishes a repeatable test setup and method to determine representative and repeatable measure of portable AC performance that is comparable among single-duct and dual-duct configurations. DOE further notes that packaged central ACs differ from portable ACs in that the duct exhausting the hot condenser air is outside the conditioned space, and it is only the cooler evaporator ducts that interface with the conditioned space. Therefore, the impacts of duct heat transfer to the conditioned space would be significantly different for portable ACs than for packaged central ACs, and the general approach for testing packaged central ACs is not applicable to portable ACs.

2. Efficiency Level Equations

Several commenters expressed concern about the distillation of DOE's data points into discrete efficiency levels. The Joint Commenters[23] stated that modeled EER_{cm} values do not all fall along the efficiency level curves. For example, they commented that units in DOE's sample with cooling capacities at EL 4 ranging from about 3,500 to 9,500 Btu/h achieve modeled EER_{cm} values as high as approximately 7 Btu/Wh, but, the EL 4 curve does not exceed 6.5 Btu/Wh for cooling capacities up to 10,000 Btu/h. The Joint Commenters asserted, therefore, that it is inappropriate to use average values in determining the efficiency levels, particularly the max-tech EL 4. (ASAP, Public Meeting Transcript, No. 11 at pp. 48–49; Joint Commenters, No. 14 at pp. 4–5) DENSO suggested that the R-squared value for the curve fits may be low, and therefore the equations may not represent the data accurately. (DENSO, Public Meeting Transcript, No. 11 at pp. 43–45)

DOE notes that because there are currently no energy conservation standards for portable ACs, the limited data that are available are not necessarily measured on a

[23] For some issues, the Appliance Standards Awareness Project submitted substantively similar comments both individually and as a signatory to the Joint Commenters' submission. In those instances, DOE provides citations to both comments.

consistent basis. DOE therefore conducted testing and modeling to characterize the performance of portable ACs on the market. For the February 2015 Preliminary Analysis, DOE's modeling of air flow optimization resulted in a range of product efficiencies. To minimize potential impacts of outliers or error in the modeling, DOE used best-fit curves to characterize the efficiency versus capacity trends for each corresponding design option. For the NOPR analysis, DOE determined efficiency levels based on the range of observed and modeled performance according to appendix CC for units in its test sample. The baseline efficiency level represents the lowest observed efficiency and the max-tech efficiency level represents the highest modeled efficiency. Accordingly, the efficiency levels for the NOPR analysis span the range of observed and modeled data and no longer rely on best-fit trends for a set of data points at a given efficiency level.

The Joint Commenters encouraged DOE to ensure that units with negative cooling capacities would not be able to meet potential efficiency standards. They noted that at negative cooling capacities, the EER_{cm} values for all efficiency levels above the baseline are lower than the baseline values, and the units tested by DOE that have negative cooling capacities have EER_{cm} values that are higher than all of the efficiency levels evaluated. (ASAP, Public Meeting Transcript, No. 11 at pp. 46–48; Joint Commenters, No. 14 at pp. 7–8) The data presented in the February 2015 Preliminary Analysis showed the potential for negative efficiencies and cooling capacities. However, the preliminary analysis was based on the test procedure proposed in the February 2015 TP NOPR. The newly established test procedure in appendix CC incorporates a lower-temperature outdoor condition and weights performance under this condition heavily in the final performance calculations. As a result, DOE does not expect any negative SACC or CEER results, and is not proposing standards that would account for these negative values.

3. Design Approaches for Higher Efficiency Levels

AHAM and De' Longhi expressed concern about basing higher efficiency levels on reduced or zero infiltration air, pointing out that DOE did not find any portable ACs with zero infiltration air. De' Longhi suggested that completely sealed dual-duct portable ACs should not be considered as an efficiency level because these units are hypothetical and only included in the analysis based on their technical feasibility. (AHAM, No. 16 at p. 4; De' Longhi, No. 12 at pp. 2–3, 5–6; De' Longhi, Public Meeting Transcript, No. 11 at pp. 6, 38, 42)

As discussed previously in section IV.C.1.a of this NOPR, DOE revised its analysis for this NOPR, including updated efficiency levels based on the newly established test procedure in appendix CC. Under testing according to appendix CC, air flow optimization that would lead to zero infiltration air is no longer associated with improved efficiencies.

The Joint Commenters stated that, in general, portable ACs with higher cooling capacities typically employ higher-capacity compressors, larger heat exchangers, and more powerful fans than units with lower cooling capacities. The Joint Commenters objected to DOE not including these design options at higher capacities. They also noted that units in DOE's test sample may include various design features that impact efficiency, some of which may not be captured in DOE's modeling of design options. For example, they referred to DOE's finding in the February 2015 TP NOPR that uninsulated ducts and leaks in duct connections contributed 460 to 1,300 Btu/h in its test sample, which correlated to percentages of uninsulated cooling capacity ranging from 18 to 199 percent. 80 FR 10212, 10227 (Feb. 25, 2015). The Joint Commenters asserted that these data suggest that some current designs are more effective than others at minimizing duct heat transfer and leakage. (ASAP, Public Meeting Transcript, No. 11 at pp. 48–49; Joint Commenters, No. 14 at pp. 4–5)

The California IOUs recommended that DOE consider product component improvements, including increased heat exchanger area, improved compressor efficiency, improved blower motor efficiency, and low-standby-power electronic controls for all efficiency levels and not just the max-tech EL 4. Because DOE's analysis did not show a significant increase in capacity when moving from EL 3 to EL 4, the California IOUs believe that these component improvements may increase EER_{cm} without affecting product capacity. By not limiting these component improvements to the max-tech level, DOE would ensure that these technology options would be considered for potential standards. (California IOUs, No. 15 at p. 3) In the February 2015 Preliminary Analysis, DOE expected that when improving efficiencies beyond the single-duct baseline, manufacturers would first make improvements to incrementally reduce the amount of infiltration air. Those changes would likely be made prior to component changes, such as more efficient compressors or blower motors or larger heat exchangers, due to their lower cost and significant improvement in capacity and efficiency. Although DOE no longer considered duct configuration and air flow optimization in the development of efficiency levels, DOE maintained the component improvement approach for this NOPR analysis, wherein increasing heat exchanger area, compressor efficiency, and blower motor efficiency all result in improved portable AC efficiencies. The estimated MPCs associated with these changes at each efficiency level are discussed in section IV.C.2 of this proposed rule. DOE also notes that, depending upon their current product designs, manufacturers may choose to achieve higher efficiencies using combinations of component improvements that may vary from the expected component improvements for the units in DOE's test sample.

The Joint Commenters questioned DOE's approach to use an industry average for the max-tech efficiency level (EL 4). ASAP and AHAM were concerned about DOE's use of modeling to determine the max-tech efficiency level, which is higher than the efficiencies observed in the limited test sample. (Joint Commenters, No. 14 at pp. 4–5; ASAP, Public Meeting Transcript, No. 11 at pp. 49–50; AHAM, No. 16 at p. 3) Although DOE used an average-performance approach to define each efficiency level in the February 2015 Preliminary Analysis, DOE has revised its efficiency level construction in this NOPR. DOE based the NOPR analysis efficiency levels on the performance of units in its test sample. The baseline level is established by the least efficient unit in the test sample, EL 2 corresponds to the maximum available efficiency that can be achieved across a range of capacities, EL 3 represents an incremental improvement above EL 2 and is the single most efficient unit in DOE's test sample, and EL 4, the max-tech level, is a theoretical level representing the maximum modeled efficiency after applying additional component improvements to EL 3. EL 1 represents an intermediate gap-fill level within the range of tested efficiencies.

De' Longhi commented that increased heat exchanger sizes at EL 4 may significantly impact portability, in terms of both larger product dimensions and heavier weight. (De' Longhi, No. 12 at p. 3) DOE limited its preliminary analysis to a 10-percent increase in heat exchanger size, the maximum heat exchanger size increase that it deemed acceptable without impacting consumer utility. However, for this NOPR analysis, DOE has increased the maximum heat exchanger size increases to 20 percent. As described in chapter 5 of the NOPR TSD, DOE observed in its test sample that heat exchanger areas varied significantly from unit to unit. DOE determined the relationship between SACC and heat exchanger area, and observed that the heat exchangers areas for units in the test sample ranged from approximately 20 percent below to 20 percent above the average trend. The range in observed heat exchanger areas suggests that manufacturers have an opportunity to increase heat exchanger areas beyond what DOE had estimated for the February 2015 Preliminary Analysis. Based on the range of observed heat exchanger areas in its test sample and the strong correlation between heat exchanger area and cooling capacity, DOE determined that a 20-percent increase in heat exchanger area is a more appropriate limit. DOE does not expect this increase in heat exchanger size, and the resulting increase in case size, to impact product portability, in part because all single-duct and dual-duct portable ACs that DOE identified incorporate wheels. DOE is not aware of any significant changes in a consumer's ability to move, install, or store the product if the case dimensions were to change to accommodate a 20-percent larger heat exchanger.

The Joint Commenters encouraged DOE to consider room AC efficiencies in evaluating efficiency levels for portable ACs. They noted that the current CEER standards for room ACs are 1.7 to 2.3 times higher than the max-tech EER_{cm} values at EL 4 that DOE proposed for portable ACs for a similar range of cooling capacities, and that the difference in calculating CEER and EER_{cm} are not substantive. Similarly, the Joint Commenters noted that the CEER values for room ACs in the ENERGY STAR 4.0 specification are 1.9 to 2.5 times higher than the max-tech portable AC EER_{cm} values. They noted that the primary difference between room ACs and portable ACs is that room ACs do not use ducts. However, they do not believe that this difference fully explains the gap in performance between the two types of cooling equipment. The Joint Commenters also noted that the difference between the two products may be due to DOE’s use of average values in determining each efficiency level. Therefore, they encourage DOE to consider the efficiency levels of room ACs in evaluating the achievable efficiency of portable ACs and to investigate whether the achievable efficiency levels of portable ACs may be higher than the EL 4 in the preliminary analysis. (Joint Commenters, No. 14 at pp. 5–6) De’ Longhi stated that data from room ACs are not relevant for this analysis. (De’ Longhi, No. 12 at p. 3)

Although room ACs and portable ACs incorporate similar components, the DOE room AC test procedure (10 CFR part 430, subpart B, appendix F) differs substantively from that in appendix CC for portable ACs. Notably, portable ACs are tested under two different outdoor conditions while room ACs only use a single condition. Additionally, the impacts of infiltration air and duct heat transfer affect portable AC cooling capacity and CEER, but are not applicable to room ACs. Therefore, the two product types would not necessarily be able to achieve the same efficiency for a given cooling capacity. Each product must be analyzed independently to determine appropriate efficiency levels for potential standards based on the design options and their subsequent impacts on capacity and efficiency as determined by the relevant test procedures.

The Joint Commenters and California IOUs encouraged DOE to consider additional component efficiency improvements beyond those considered at EL 4. The Joint Commenters further stated that additional heat exchanger increases would be feasible, and that DOE neglected to incorporate microchannel heat exchangers (found to increase coefficient of performance (COP) by 6 to 10 percent, as discussed in chapter 3 of the preliminary analysis TSD) and permanent magnet motors in the preliminary engineering analysis. These commenters also noted that the design options incorporated in the 2011 final rule for room ACs, including increased heat transfer surface area, microchannel heat exchangers, improved compressor and fan motor efficiency, and standby power reductions, resulted in a 24 to 33-percent increase in CEER relative to the baseline. The Joint Commenters note that for portable ACs, the max-tech EL 4 represents an increase in EER_{cm} of only about 10 percent over the EER_{cm} at EL 3. They believe that because portable ACs are not currently subject to energy conservation standards, greater improvements in efficiency, similar to those from the 2011 room AC final rule, would be expected from component efficiency improvements. (Joint Commenters, No. 14 at pp. 6–7; California IOUs, No. 15 at p. 3)

DOE noted in the February 2015 Preliminary Analysis that manufacturers do not currently implement microchannel designs in existing heat exchangers, and there is limited data on the potential efficiency improvements for portable ACs. DOE therefore did not consider that design option in the preliminary engineering analysis. DOE emphasizes that efficiency and capacity gains associated with specific design options for other related products do not necessarily translate to portable ACs due to variations in installation and typical consumer usage that are reflected in their respective test procedures. DOE incorporated the other mentioned design options, improved compressor and fan motor efficiency and standby power reductions, in its preliminary analysis at EL 4.

NOPR Proposal

For the NOPR analysis, DOE updated the efficiency levels to reflect performance based on the newly established DOE test procedure for portable ACs in appendix CC, which was modified from the test procedure proposal that was the basis of the February 2015 Preliminary Analysis. Appendix CC includes a second cooling mode outdoor test condition for dual-duct units and infiltration air condition for both single-duct and dual-duct units, modifying the CEER metric for both single-duct and dual-duct units to address performance at the two cooling mode test conditions. Appendix CC also no longer includes provisions from the test procedure NOPR for measuring case heat transfer, which substantively affected this NOPR analysis. Issued April 2016 TP Final Rule.

As discussed in the February 2015 Preliminary Analysis, although the initial test procedure proposal included a CEER metric that combined energy use in cooling mode with that in heating mode and various low-power modes, the preliminary analysis was conducted using EER_{cm} as the basis for energy conservation standards instead of CEER. DOE analyzed EER_{cm} because cooling is the primary function for portable ACs, and DOE expected that manufacturers would likely focus on improving efficiency in this mode to achieve higher CEERs. Because the test procedure established in appendix CC does not include a heating mode test and includes a second cooling mode test condition, the CEER metric as codified combines the performance at both cooling mode test conditions with energy use in the low-power modes. Accordingly, DOE utilized CEER as the basis for its proposed portable AC energy conservation standards in this NOPR. DOE also based the NOPR analysis on the SACC measured in appendix CC, a weighted combination of the adjusted cooling capacities at the two cooling mode test conditions.

The two cooling mode test conditions in appendix CC are weighted based on the percentage of annual hours for each test condition, on average, for geographical locations that correspond to expected portable AC ownership. The majority (80 percent) of the total hours were estimated to relate to the lower of the two outdoor temperatures, 83 degrees Fahrenheit (°F) dry-bulb. Because at this lower outdoor temperature, there is only a 3 °F dry-bulb temperature differential and subsequent 0.38 Btu per pounds of dry air enthalpy differential between the indoor and outdoor air, the potential impact of infiltration air heating effects on the overall CEER metric is substantially reduced. For this reason, DOE now finds no significant relationship between duct configuration or air flow optimization and improved efficiency, and therefore alternatively considered component efficiency improvements as the primary means to increase CEER. Accordingly, in this NOPR DOE has defined its efficiency levels, other than the max-tech, based on the performance observed in its test sample, independent of duct configuration or level of air flow optimization.

As discussed previously in section IV.C.1.a, DOE characterized and compared performance among all portable ACs in its test sample and determined a relationship between SACC and a general representation of expected CEER as follows:

$$Nominal\ CEER = \frac{SACC}{(2.7447 \times SACC^{0.6829})}$$

As discussed in section IV.C.1.a, DOE assessed individual unit performance relative to this CEER relationship and identified a baseline efficiency level at PR = 0.72, with PR defined as the ratio of actual CEER to nominal CEER.

For EL 2, DOE determined the PR that corresponded to the maximum available efficiency across a full range of capacities (1.14), and then selected an intermediate efficiency level for EL 1 based on a PR between the baseline and EL 2 (0.94). For EL 3, DOE identified the PR for the single highest efficiency unit observed in its test sample (1.31).

Due to the variations in performance among units in DOE's test sample, DOE conducted additional performance modeling to augment its test data when estimating efficiency and manufacturing costs at each efficiency level. DOE numerically modeled component improvements for each of the 21 out of 24 test units for which detailed component information were available to estimate potential efficiency improvements to existing product configurations. The component improvements were performed in three steps for each unit.

The first incremental improvement for each unit included a 10-percent increase in heat exchanger frontal area and raising the compressor energy efficiency ratio (EER) to 10.5 Btu/Wh, the maximum compressor efficiency identified at the time of the February 2015 Preliminary Analysis.

The second incremental component efficiency improvement step for each unit included a 15-percent increase in heat exchanger frontal area from the original test unit and an improvement in compressor efficiency to an EER of 11.1 Btu/Wh, which DOE identified as the maximum efficiency for currently available single-speed R-410A rotary compressors of the type typically found in portable ACs and other similar products. As with the 10-percent heat exchanger area increase, DOE expects that a chassis size and weight increase would be necessary to fit a 15-percent increased heat exchanger, but believes portability and consumer utility would not be significantly impacted.

DOE included all available design options in the third efficiency improvement step for each unit, including a 20-percent increase in heat exchanger frontal area from the original test unit, more efficient ECM blower motor(s), and a variable-speed compressor with an EER of 13.7 Btu/Wh. DOE believes that a 20-percent increase in heat exchanger size is the maximum allowable increase for consumer utility and portability to be retained. DOE also improved standby controls efficiency in this final step, adjusting the standby power for each test unit to the minimum observed standby power of 0.46 W in its test sample. With these design options modeled for units in its test sample, DOE found that the single, theoretical maximum-achievable efficiency among all modeled units corresponded to a PR of 1.75, which DOE defined as EL 4.

Table IV.5 summarizes the specific improvements DOE made to model the performance of higher efficiency design options applied to each test unit.

Table IV.5 Component Improvements Summary

Heat Exchanger Area (% increase)	**Compressor EER** (Btu/Wh)	**Blower Motor** (Type)	**Standby** (Watts)
10%	10.5 (single-speed)	-[1]	-
15%	11.1 (single-speed)	-	-
20%	13.7 (variable-speed)	ECM (variable-speed)	0.46

[1] No blower motor or standby power changes were applied to the first two incremental steps.

Table IV.5 does not necessarily represent the design options associated with each efficiency level beyond the baseline. Baseline through EL 3 are defined by the range of test data, while EL 4 is defined by the maximum theoretical PR after modeling all design options listed in Table IV.5.

In this NOPR, DOE analyzed efficiency levels based on test samples and modeled performance according to the following equation and the PR values listed in Table IV.6:

$$Minimum\ CEER = PR \times \frac{SACC}{(2.7447 \times SACC^{0.6829})}$$

Table IV.6 Portable Air Conditioner Efficiency Levels and Performance Ratios – NOPR Analysis

Efficiency Level	**Efficiency Level Description**	**Performance Ratio (PR)**
Baseline	Minimum Observed	0.72
EL 1	Intermediate Level	0.94
EL 2	Maximum Available for All Capacities	1.14
EL 3	Maximum Observed	1.31
EL 4	Max-Tech (Maximum of Modeled Component Improvements)	1.75

Figure IV-2 plots each efficiency level curve for SACCs from 50 to 10,000 Btu/h, based on the nominal CEER curve scaled by the PR assigned to each efficiency level.

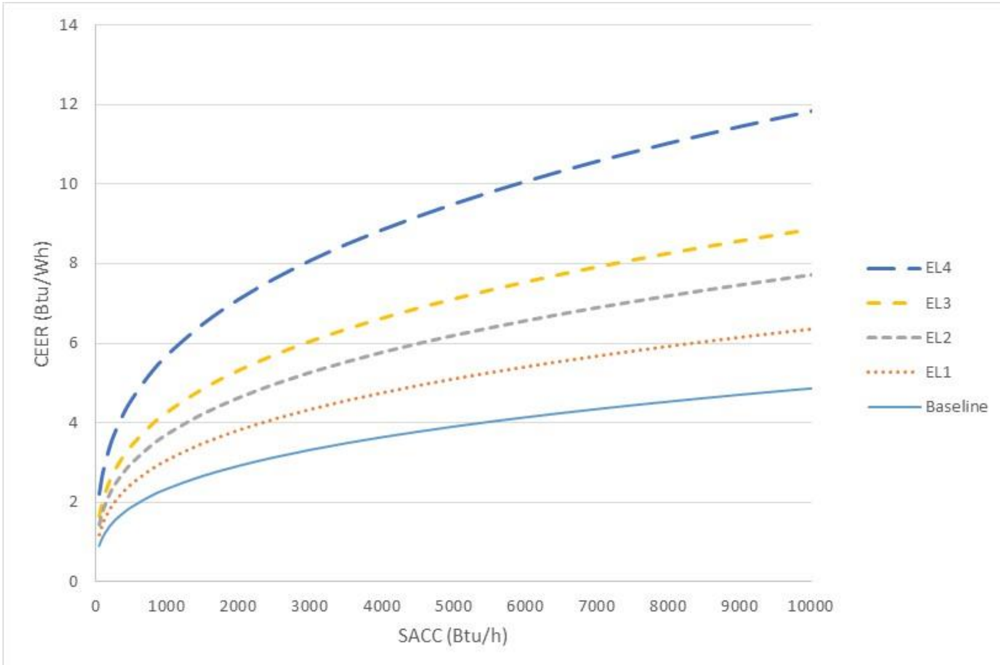

Figure IV-2 Portable Air Conditioner Efficiency Level Curves – NOPR Analysis

Additional details on the selection of efficiency levels may be found in chapter 5 of the NOPR TSD.

2. Manufacturer Production Cost Estimates

Based on product teardowns and cost modeling conducted in the preliminary analysis, DOE developed overall cost-efficiency relationships for each considered efficiency level. DOE selected products covering the range of efficiencies available on the market for the teardown analysis. During the teardown process, DOE created detailed BOMs that included all components and processes used to manufacture the products. DOE used the BOMs from the teardowns as an input to a cost model, which calculated the MPC for products covering the range of efficiencies available on the market. The MPC accounts for labor, material, overhead, and depreciation costs that a manufacturer would incur in producing a specific portable AC.

For the preliminary analysis, DOE estimated that the costs for these products reflected the costs for typical units at their respective efficiency levels, consistent with the efficiency-level approach. DOE then used the design-option approach to apply the technology options it determined manufacturers were most likely to incorporate, air flow optimization and improved component efficiencies, to evaluate the necessary changes to each unit in DOE's teardown sample and the associated capacity and efficiency changes at each efficiency level. DOE constructed cost-efficiency curves for each unit and then averaged the costs for all units at each efficiency level to determine the industry-representative incremental MPC. Table IV.7 shows the incremental MPCs developed in the preliminary analysis for each product class at each of the analyzed efficiency levels compared to the baseline MPC. For the preliminary analysis, EL 1 through EL 3 represented changes to the air flow to reduce or eliminate infiltration air by means of a dual-duct configuration. The small incremental costs at these efficiency levels represented the cost for an additional duct and larger blower motor. At EL 4, the incremental MPC was significantly higher due to higher-cost design options incorporated at this level, including larger heat exchangers (and the additional cost of a larger case and other internal component adjustments) and more efficient compressors and blower motors. The incremental MPCs were presented in 2013 dollars (2013$), which reflected the year in which the preliminary analysis teardowns and modeling were performed.

Table IV.7 Portable Air Conditioner Incremental Manufacturer Production Costs (2013$) – Preliminary Analysis

Efficiency Level	Incremental MPC (2013$)
Baseline	$ -
EL1	$ 4.09
EL2	$ 4.67
EL3	$ 5.26
EL4	$ 47.76

Chapter 5 of the preliminary analysis TSD contains additional details on the analysis conducted in support of developing these MPC estimates.

DOE received several comments from interested parties on the MPC estimates developed for the preliminary analysis. AHAM commented that it would attempt to provide DOE with MPC data. (AHAM No. 16 at p. 8) DOE did not receive any manufacturer cost information from AHAM for consideration in the NOPR analysis.

DENSO questioned what capacity was used to determine the incremental costs, since an incremental efficiency improvement at lower capacities would entail different MPCs than the same efficiency improvement at higher capacities. (DENSO, Public Meeting Transcript, No. 11 at p. 52) The incremental costs presented in the preliminary analysis were an average across all of the units in DOE's test sample. The sample included units covering the range of available capacities, and therefore the incremental MPCs reflected the average of all costs associated with units of varying capacities. Additional information can be found in chapter 5 of the preliminary TSD.

For the NOPR analysis, DOE updated the incremental MPC estimates from the preliminary analysis based on the changes to the efficiency levels detailed above in section IV.C.1, and also based on feedback from interested parties and on information gathered in additional manufacturer interviews. When assigning costs to efficiency levels in this analysis, DOE considered all units that performed between two efficiency levels as representative of the lower of the two efficiency levels. DOE determined an average baseline MPC based on the units in DOE's test sample with a CEER below EL 1 (PR = 0.94). Six units in the test sample tested below EL 1. DOE expects the average MPCs from these units to reflect the baseline for the overall portable AC market because the average capacity of these units was within approximately 200 Btu/hr of the overall average capacity for the entire test sample.

DOE subsequently determined the costs for all other torn-down and modeled units, and determined the average costs associated with each incremental component efficiency improvement when moving between efficiency levels. In addition to the costs associated with the improved components themselves, DOE also considered the increased costs associated with other related product changes, such as increasing case sizes to accommodate larger heat exchangers.

Although DOE's test and modeled data resulted in a range of PRs from 0.72 to 1.75, DOE observed that not all units in its test sample were capable of reaching higher PRs with the identified design option changes. For example, the modeled max-tech PR represents a unit in the test sample that had a high PR as a starting point (near EL 3).

Modeling increased heat exchanger sizes and a more efficient compressor in this unit resulted in a higher modeled PR than could be achieved theoretically by applying the same design options to baseline units. For these units that start at lower PRs, DOE expects that manufacturers would have to undertake a complete product redesign and optimization to reach higher PRs, rather than just apply the identified design options. As a result, manufacturers of these units would incur higher MPCs to reach the higher efficiency levels and also significant conversion costs associated with updating their product lines. These conversion costs are discussed further in sections IV.J and V.B.2 of this proposed rule and chapter 12 of the NOPR TSD.

With this approach, DOE found that only three units in the teardown sample would be capable of reaching EL 3 without significant product redesign (i.e., the one unit that tested at EL 3 and two units that could theoretically achieve EL 3 with highest efficiency single-speed compressors and increasing the heat exchanger area no more than 20 percent). At EL 4 (max-tech), DOE expects all products to require redesigns. EL 4 represents the maximum modeled efficiency with a 20-percent increase in heat exchanger area and the most efficient variable-speed compressor. DOE expects that manufacturers would undertake a product redesign when switching from a single-speed to a variable-speed compressor. Additionally, DOE notes that the ability of a product to reach EL 3 or EL 4 would be dependent on the availability of the most efficient components. However, compressor availability for portable ACs is largely driven by the room AC industry, so the most efficient single-speed and variable-speed compressors may not be available over the entire range of capacities necessary for all portable AC product capacities. As a result, moving to EL 3 or EL 4 may necessitate manufacturers to remove certain portable AC cooling capacities from the market.

Products that would require a redesign to reach a certain efficiency level with the identified design options would subsequently incur additional incremental MPCs to achieve any improvement beyond that efficiency. Although DOE does not expect manufacturers to actually implement the associated design changes for the reasons discussed below, DOE included them for completeness to estimate MPCs representative of the full capacity range at all efficiency levels. To estimate increased material costs after manufacturers undertake a product redesign, DOE allowed the heat exchanger area to increase beyond the 20-percent limit where necessary, resulting in higher costs for the heat exchangers and associated case changes. Similarly, DOE modeled compressors with efficiencies higher than those that it is aware of on the market to simulate the increased component costs after a product redesign (i.e., DOE used the price premium associated with more efficient compressors to estimate the costs associated with other component changes that would be made in a product redesign). While DOE's estimates related to product redesigns resulted in increased MPCs at the higher efficiency levels, the more significant financial impact of a redesign would be associated with the conversion costs incurred by manufacturers, as described in sections IV.J and V.B.2 of this NOPR and in chapter 12 of the NOPR TSD.

DOE calculated all MPCs in 2014$, the most recent year for which full-year data was available at the time of this NOPR analysis. Table IV.8 presents the updated MPC estimates DOE developed for this NOPR.

Table IV.8 Portable Air Conditioner Incremental Manufacturer Production Costs (2014$) – NOPR Analysis

Efficiency Level	Incremental MPC (2014$)
Baseline	$ -
EL1	$ 29.78
EL2	$ 45.13
EL3	$ 60.35
EL4	$ 108.99

Additional details on the development of the incremental cost estimates may be found in chapter 5 of the NOPR TSD.

D. Markups Analysis

The markups analysis develops appropriate markups (e.g., retailer markups, distributor markups, contractor markups) in the distribution chain and sales taxes to convert the manufacturer selling price (MSP) estimates derived in the engineering analysis to consumer prices, which are then used in the LCC and PBP analysis and in the MIA. At each step in the distribution channel, companies mark up the price of the product to cover business costs and profit margin. For portable ACs, the main parties in the distribution chain are manufacturers, retailers, and consumers.

The manufacturer markup converts MPC to MSP. 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 portable ACs.

For retailers, DOE developed separate markups for baseline products (baseline markups) and for the incremental cost of more-efficient products (incremental markups). Incremental markups are coefficients that relate the change in the MSP of higher-efficiency models to the change in the retailer sales price. DOE relied on economic data from the U.S. Census Bureau to estimate average baseline and incremental markups.

AHAM objected to DOE's reliance on the concept of incremental markups, stating that this theory has been disproved and it is in contradiction to empirical evidence. (AHAM, No. 16 at p. 8) In an attachment to AHAM's comment, Shorey Consulting, Inc. stated that (1) DOE requires a strong form of economic theory, since it is saying that something will happen solely because theory says it should; and (2) an a priori resort to economic theory without clear empirical support is highly problematic. Shorey Consulting interviewed a sample of local/regional and national appliance retailers and reported that, with very few exceptions, they reacted to the DOE concept that percentage margins will be lower in a post-standards situation with incredulity. It concluded that DOE needs to abandon the incremental margin approach and revert to the average margin approach that corresponds to actual industry practice. (AHAM, No. 16 at pp. A-10–11)

DOE disagrees that the theory behind the concept of incremental markups has been disproved. The concept is based on a simple notion: an increase in profitability, which is implied by keeping a fixed markup when the product price goes up, is not likely to be viable over time in a business that is reasonably competitive. DOE agrees that empirical data on markup practices would be desirable, but such information is closely held and difficult to obtain.

Regarding the interviews with appliance retailers, it is difficult for DOE to evaluate the characterization of the responses without knowing what questions were posed to the retailers. DOE's analysis necessarily considers a very simplified version of the world of appliance retailing: namely, a situation in which nothing changes except for those changes in appliance offerings that occur in response to new standards. DOE implicitly asks: Assuming the product cost increases while the other costs remain constant (no change in labor, material and operating costs), are retailers still able to keep the same markup over time as before? DOE recognizes that retailers are likely to seek to maintain the same markup on appliances if the price they pay goes up as a result of appliance standards, but DOE believes that over time adjustment is likely to occur due to competitive pressures. Other retailers may find that they can gain sales by reducing the markup and maintaining the same per-unit operating profit. The incremental markup approach embodies the same perspective as the "preservation of per-unit operating profit markup scenario" used in the MIA (see section IV.J of this document).

In summary, DOE acknowledges that its approach to estimating retailer markup practices after new standards take effect is an approximation of real-world practices that are both complex and varying with business conditions. However, DOE continues to believe that its assumption that standards do not facilitate a sustainable increase in profitability is reasonable. DOE welcomes information that could support improvement in its methodology.

Chapter 6 of the NOPR TSD provides details on DOE's development of markups for portable ACs.

E. Energy Use Analysis

The purpose of the energy use analysis is to determine the annual energy consumption of portable ACs at different efficiencies in representative U.S. homes.[24] The energy use analysis estimates the range of energy use of portable 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 savings in consumer operating costs that could result from adoption of amended or new standards.

DOE determined a range of annual energy use consumption of portable ACs as a function of the unit's annual operating hours to meet the cooling demand, which depends

[24] DOE estimated that 12 percent of portable ACs are used in used retail or office buildings, and it also estimated energy use by these consumers. The percentage is equivalent to the market distribution of residential and commercial installations of residential room AC products.

on the efficiency of the unit, power (watts) of three modes of operation (cooling, fan, and standby), and the percentage of time in each mode.

EIA's Residential Energy Consumption Survey (RECS) provides information on whether households use a room AC. Because portable ACs and room ACs often serve a similar function[25], DOE developed a sample of households that use room ACs from RECS 2009, which is the latest available RECS.[26] DOE selected the subset of RECS 2009 records that met relevant criteria.[27]

To estimate the cooling operating hours of room ACs, DOE used the same method as was used in the 2011 direct final rule for room ACs. 76 FR 22454 (Apr. 21, 2011). For each sample household, RECS provides the estimated energy use for cooling by room ACs. After assigning an efficiency and capacity to the room AC, DOE could then estimate its operating hours in cooling mode. DOE then adjusted the operating hours in cooling mode to account for the likelihood that improvement in building shell efficiency would reduce the cooling load and operating hours.[28] The estimated average cooling operating hours for a room AC is 585 hours/year.

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[25] It is assumed that portable ACs may perform supplemental cooling to a particular space, but that the cooling loads between room ACs and portable ACs are similar. For example, a portable AC may be used to provide cooling to a single room in place of a central AC to cool an entire home. For the purposes of estimating energy use, DOE assumed that portable ACs are operated under similar cooling loads as room ACs, given their similar cooling capacities.

[26] U.S. Department of Energy–Energy Information Administration. Residential Energy Consumption Survey. 2009. <http://www.eia.gov/consumption/residential/data/2009/>

[27] RECS household use criteria: (1) At least one room AC was present in the household; (2) The energy consumption of the room AC was greater than zero; (3) The capacity of the room AC was less than 14,000 Btu/hr (a cooling capacity comparable to portable ACs as measured by industry test methods); and (4) The room being cooled measured no more than 1,000 square feet.

[28] To account for increased building efficiency at the time that the proposed standard would take effect, DOE used the 2021 building shell index factor of 0.97 for space cooling in all residences from the EIA's

The annual operating hours of the existing room AC were used as a proxy for the operating hours of a baseline portable AC. DOE then estimated what the operating hours would be if portable ACs of higher efficiency units were used instead. Generally, higher efficiency reduces the operating hours required to meet a given cooling demand.

To estimate the number of hours in fan-only mode, DOE utilized a field metering analysis of a sample of portable ACs in 19 homes.[29] The survey provided data on cooling-mode and fan-only mode hours of operation. DOE derived a distribution of the ratio of fan-only mode hours to cooling-mode hours, and used this distribution to randomly assign a ratio to each of the sample households, which allows estimation of fan-only mode hours of operation. DOE assumed portable ACs would only be plugged in during months with 5 or more cooling degree days. The annual hours in standby mode were derived by subtracting the cooling-mode and fan-only mode hours of operation from the total number of hours in a months with 5 or more cooling degree days.

To estimate the operating hours of portable ACs used in commercial settings, DOE developed a building sample from the 2003 Commercial Buildings Energy Consumption Survey (CBECS),[30] again using the operating hours of room ACs as a

Annual Energy Outlook. (Energy Information Administration. Annual Energy Outlook 2014 with Projections to 2014. April 2014.)

[29] Burke, Thomas, et al. 2014. Using Field-Metered Data to Quantify Annual Energy Use of Portable Air Conditioners. http://www.osti.gov/scitech/servlets/purl/1166989

[30] U.S. Department of Energy–Energy Information Administration. Commercial Buildings Energy Consumption Survey. 2003. http://www.eia.gov/consumption/commercial/data/2003/.

proxy. The method is described in chapter 7 of the NOPR TSD. DOE invites comment on the energy use methodology and data sources/studies described here and in Chapter 7.

Commenting on the preliminary TSD, AHAM asserted that DOE's energy use analysis is based on insufficient and inaccurate data. AHAM noted that consumers use portable ACs and room ACs differently, including the time of year and frequency of use. AHAM expressed concern that DOE is reliant on RECS data that are appropriate for room ACs, but do not include data specific to portable ACs. (AHAM, No. 16 at pp. 5–6) DENSO also questioned the accuracy of DOE's energy use assumptions. (DENSO, No. 13 at p. 8)

DOE believes that portable ACs are used similarly to room ACs and assumes that in some residential and commercial scenarios, portable ACs may perform supplemental cooling to central ACs. DOE has based the NOPR energy use analysis on room AC usage data as DOE believes such data is the closest proxy available. To account for any potential differences between consumer use of portable ACs and room ACs, DOE also conducted a sensitivity analysis which assumes lower annual hours of use for portable ACs in comparison to room ACs. Specifically, in this sensitivity analysis for use differences between products, DOE scaled the room AC cooling mode hours of use by 50 percent while maintaining the assumption that portable ACs are used during the same time of year as room ACs, since the use of both types of cooling equipment is likely to be consistent seasonally. The results of this sensitivity analysis estimate half the energy bill savings relative to the primary estimate. More details are presented in appendix 8F and appendix 10E of the NOPR TSD. DOE welcomes any specific data on operation of portable ACs that could inform further analysis on consumer use.

DENSO commented that room AC operating hours are not representative of industrial portable AC (I-PAC) operating hours. DOE is not analyzing industrial products (including I-PACS) in this rulemaking.

OceanAire inquired whether DOE's estimate for "commercial" referred to portable ACs in commercial settings or commercial units. (DENSO, No. 13 at pp. 7–8; OceanAire, Public Meeting Transcript, No. 11 at p. 62) The proposed rule applies to single-duct and dual-duct portable ACs that meet the definitions in 10 CFR 430.2, and DOE considered such units that operate in light commercial settings, such as food service, office and retail buildings.

Chapter 7 of the NOPR TSD provides details on DOE's energy use analysis for portable 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 portable 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 (life-cycle cost) is the total consumer expense of an appliance or product over the life of that product, consisting of total installed cost (manufacturer selling price, distribution chain markups, sales tax, and installation costs) plus operating costs (expenses for energy use, maintenance, and repair). To compute the operating costs, DOE discounts future operating costs to the time of purchase and sums them over the lifetime of the product.

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

For a given efficiency level, DOE calculates LCC savings as the change in LCC in a standards case relative to the LCC in the no-new-standards case, which reflects the estimated efficiency distribution of portable 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 that use portable ACs. DOE used the EIA's 2009 RECS to develop household samples for portable ACs based on households that use room ACs. DOE also used the EIA's 2003 CBECS to develop a sample of commercial buildings that use portable ACs, again based on buildings that use room ACs. For each sample household or commercial building, DOE determined the energy consumption for the portable ACs and the appropriate electricity price. By developing a representative sample of households, the analysis captured the variability in energy consumption and energy prices associated with the use of portable 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. Note in the case of portable ACs, DOE assumed that installation costs would not change with efficiency. So the difference of installation cost between the baseline and higher efficiency levels is then $0. 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 and discount rates with probabilities attached to each value, to account for their uncertainty and variability. Sales tax and electricity prices are tied to the geographic locations of purchasers drawn from the residential and commercial samples.

The 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 simulation randomly samples input values from the probability distributions and portable

AC user samples. The model calculated the LCC and PBP for products at each efficiency level for 10,000 housing units or commercial buildings per simulation run.

DOE calculated the LCC and PBP for all consumers as if each were to purchase a new product in the expected year of compliance with new standards. Any new standards would apply to portable ACs manufactured 5 years after the date on which any new standard is published. (42 U.S.C. 6295(l)(2)) At this time, DOE estimates publication of a final rule in 2016. Therefore, for purposes of its analysis, DOE used 2021 as the first year of compliance with any new standards.

Table IV.9 summarizes the approach and data DOE used to derive inputs to the LCC and PBP calculations. The subsections that follow provide further discussion. For energy use, RECS and CBECS were used for number of hours of use. A field metering report provided information regarding the fan-mode of portable ACs.[31] 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.

[31] Burke, Thomas, et al. 2014. Using Field-Metered Data to Quantify Annual Energy Use of Portable Air Conditioners. http://www.osti.gov/scitech/servlets/purl/1166989

Table IV.9 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. Producer Price Index (PPI) series for small household electronics fit to an exponential model.
Installation Costs	Assumed no installation costs with baseline unit and no cost with efficiency level.
Annual Energy Use	Power in each mode multiplied by the hours per year in each mode. Average number of hours based on 2009 RECS, 2003 CBECS, and field metering data. Variability: Based on the 2009 RECS and 2003 CBECS.
Energy Prices	Electricity: Based on 2014 average and marginal electricity price data from the Edison Electric Institute. Variability: Marginal electricity prices vary by season, U.S. region, and baseline electricity consumption level.
Energy Price Trends	Based on AEO 2015 price forecasts. Trends are dependent on census divisions.
Repair and Maintenance Costs	Assumed no change with efficiency level.
Product Lifetime	Weibull distribution using parameters from room ACs.
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	2021

* 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 above (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.[32] DOE used the most representative Producer Price Index (PPI) series for portable ACs to fit to an exponential model to develop an experience curve. DOE obtained historical PPI data for "small electric household appliances, except fans" from the Labor Department's Bureau of Labor Statistics (BLS) for 1983 to 2014.[33] Although this PPI series encompasses more than portable ACs, no PPI data specific to portable ACs were available. The PPI data reflect nominal prices, adjusted for changes in product quality. DOE calculated an inflation-adjusted (deflated) price index by dividing the PPI series by the Gross Domestic Product Chained Price Index.

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous materials and parts needed to install the product. Available evidence indicated that no installation costs would be incurred for baseline installation or be impacted with increased efficiency levels.

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[32] Taylor, M. and Fujita, K.S. Accounting for Technological Change in Regulatory Impact Analyses: The Learning Curve Technique. LBNL-6195E. Lawrence Berkeley National Laboratory, Berkeley, CA. April 2013. http://escholarship.org/uc/item/3c8709p4#page-1

[33] U.S. Department of Labor Bureau of Labor Statistics. /Producer Price Index for 1983–2013/. PPI series ID: PCU33521033521014. (Last accessed September 8, 2014.) http://www.bls.gov/ppi/

3. Annual Energy Consumption

For each sampled household and building, DOE determined the energy consumption for a portable AC at different efficiency levels using the approach described in section IV.E of this proposed rule.

4. Energy Prices

DOE used average prices (for baseline products) and marginal prices (for higher-efficiency products) which vary by season, region, and baseline electricity consumption level for the LCC. DOE estimated these prices using data published with the Edison Electric Institute (EEI) Typical Bills and Average Rates reports for summer and winter 2014.[34] For the residential sector each report provides, for most of the major investor-owned utilities (IOUs) in the country, the total bill assuming household consumption levels of 500, 750, and 1,000 kWh for the billing period. For the commercial sector the report provides typical bills for several combinations of monthly electricity peak demand and total consumption.

For both the residential and commercial sectors, DOE defined the average price as the ratio of the total bill to the total electricity consumption. For the residential sector, DOE used the EEI data to also define a marginal price as the ratio of the change in the bill to the change in energy consumption. For the commercial sector, marginal prices

[34] Edison Electric Institute. Typical Bills and Average Rates Report. Winter 2014 published April 2014, Summer 2014 published October 2014. See http://www.eei.org/resourcesandmedia/products/Pages/Products.aspx.

cannot be estimated directly from the EEI data, so DOE used a different approach, as described in chapter 8 of the NOPR TSD.

Regionally weighted-average values for each type of price were calculated for the nine census divisions and four large states (CA, FL, NY and TX). Each EEI utility in a division was assigned a weight based on the number of consumers it serves. Consumer counts were taken from the most recent EIA Form 861 data (2012).[35] DOE adjusted these regional weighted-average prices to account for systematic differences between IOUs and publicly-owned utilities, as the latter are not included in the EEI data set.

DOE assigned seasonal average and marginal prices to each household or commercial building in the LCC sample based on its location and its baseline monthly electricity consumption for an average summer or winter month. For a detailed discussion of the development of electricity prices, see appendix 8F of the NOPR TSD.

To estimate future prices, DOE used the projected annual changes in average residential and commercial electricity prices in the Reference case projection in AEO 2015. The AEO price trends do not distinguish between marginal and average prices, so DOE used the same trends for both. DOE reviewed the EEI data for the years 2007 to 2014 and determined that there is no systematic difference in the trends for marginal vs. average prices in the data.

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[35] U. S. Department of Energy, Energy Information Administration. Form EIA-861 Annual Electric Power Industry Database. http://www.eia.doe.gov/cneaf/electricity/page/eia861.html

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. Based on available data and low product purchase prices, DOE concluded that repair frequencies are low and do not increase for higher-capacity or higher-efficiency units. DOE assumed a zero cost for all efficiency levels.

6. Product Lifetime

The product lifetime is the age at which the product is retired from service. Given similar mechanical components and uses, DOE considered that the lifetime distribution of portable ACs is the same as that of room ACs, as estimated for the 2011 direct final rule. 76 FR 22454 (April 21, 2011). The average lifetime is 10 years. Chapter 8 of the NOPR TSD provides details on DOE's development of lifetimes for portable ACs.

DENSO noted that DOE had limited data regarding portable AC lifetimes and stated that since portable ACs are used less frequently than room ACs, the lifetime should reflect the usage difference. (DENSO, No. 13 at p. 7) DOE acknowledges that lower usage of portable ACs compared to room ACs could lead to longer lifetimes for portable ACs. However given limited supporting data, DOE is concerned that using a longer lifetime could bias upwards the LCC savings from higher efficiency. Therefore, for this analysis, DOE continued to use room AC lifetime as a proxy for portable AC lifetime.

7. Discount Rates

In the calculation of LCC, DOE applies discount rates appropriate to households to estimate the present value of future operating costs. DOE estimated a distribution of residential and commercial discount rates for portable ACs based on consumer financing costs and opportunity cost of funds related to appliance energy cost savings and maintenance costs.

To establish residential discount rates for the LCC analysis, DOE identified all relevant household debt or asset classes to approximate a consumer's opportunity cost of funds related to appliance energy cost savings. DOE 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[36] (SCF) for 1995, 1998, 2001, 2004, 2007, and 2010. Using the SCF and other sources[37], 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 new standards would take effect. DOE assigned each sample household a specific discount rate drawn from one of the distributions. The average rate across all types of household debt and equity and income groups, weighted by the shares of each type, is 4.63 percent. See chapter 8 of the NOPR TSD for further details on the development of consumer discount rates.

[36] The Federal Reserve Board, SCF 1989, 1992, 1995, 1998, 2001, 2004, 2007, 2010. http://www.federalreserve.gov/pubs/oss/oss2/scfindex.html

[37] Federal Reserve Board time-series data, Cost of Savings Index data, annual returns on the Standard and Poor's. See the reference section of chapter 8 of the NOPR TSD for on-line data locations.

To establish commercial discount rates for the LCC analysis, DOE estimated the cost of capital for companies that purchase a portable AC. The weighted average cost of capital is commonly used 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 their cost of capital is the weighted average of the cost to the firm of equity and debt financing as estimated from financial data for publicly traded firms in the sectors that purchase computers. For this analysis, DOE used Damadoran[38] online as the source of information about company debt and equity financing. The average rate across all types of companies, weighted by the shares of each type, is 4.9 percent. See chapter 8 of the NOPR TSD for further details on the development of commercial discount rates.

8. 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 in the no-new-standards case (i.e., the case without amended or new energy conservation standards). For the preliminary analysis, to estimate the efficiency distribution of portable ACs, DOE summed the number of portable AC models available from online retailers to obtain the percentages of single-duct and dual-duct models. The single-duct models were allocated to the baseline efficiency level. The dual-duct models were split between EL 1 and EL 2. For the NOPR analysis, DOE estimated the no-new standards case based on 24

[38] Damodaran, A. Cost of Capital by Sector. January 2014. (Last accessed September 25, 2014.) New York, NY. http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/wacc.htm.

portable AC units tested in development of the engineering analysis (chapter 5 of this NOPR TSD). DOE assumed that the efficiency distribution of units tested is representative of the market as a whole.

Commenting on the preliminary analysis, De' Longhi wondered how efficiency distribution was tied to product duct configuration. (De' Longhi, No. 11 at p. 73) Based on the engineering analysis, DOE found that gains in efficiency were achieved by utilizing more efficient components in existing test units. DOE used product component characteristics to estimate the current efficiency distribution of portable ACs on the market. As discussed above, DOE based EL 1, EL2, and EL 3 on the performance observed in its test sample. Therefore, DOE estimated a share of 29 percent at the baseline, 50 percent for EL 1, 21 percent for EL 2, and no share at EL 3. EL 3 represents the maximum performance observed in DOE's test sample; however, the test unit representing EL 3 performed significantly better than the next most efficient units, and does not represent the maximum available across a full range of capacities that would comprise a significant portion of the market. Accordingly, DOE has not assigned any market share to this efficiency level. The estimated market shares for the no-new-standards case for portable ACs and the average EER and CEER values for each efficiency level are shown in Table IV.10. See chapter 8 of the NOPR TSD for further information on the derivation of the efficiency distributions.

Table IV.10 Portable Air Conditioner No-New-Standards Case Efficiency Distribution

Efficiency Level	EER	CEER	Market Share %
Baseline	5.09	5.07	29
1	5.99	5.97	50
2	7.20	7.19	21
3	8.48	8.47	0
4	10.54	10.52	0

9. Payback Period Analysis

The PBP is the amount of time it takes the consumer to recover the additional installed cost of more-efficient products, compared to baseline products, through energy cost savings. PBPs are expressed in years. PBPs 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 applied.

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

G. Shipments Analysis

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

In the preliminary analysis for portable ACs, DOE used a model with two market segments to estimate shipments of portable ACs: replacement of existing products and first-time owners. AHAM stated that DOE's assumption that portable ACs account for approximately ten percent of the total shipments of room air conditioners is not accurate. Based on AHAM room AC shipment data for 2012–2014, the percentage assumed in the preliminary analysis for portable ACs is not consistent and, therefore, room AC shipments do not appear to be an accurate proxy for portable AC shipments. (AHAM, No. 16 at p. 7) DENSO also objected to DOE's use of room AC shipments to derive portable AC shipments. (DENSO, No. 13 at p. 9)

Subsequent to the preliminary analysis, DOE received data on portable AC shipments in 2014 from manufacturer interviews, so it was not necessary to use room AC shipments data as a proxy for portable AC shipments for the NOPR analysis. DOE also used information obtained in manufacturer interviews which suggested that the average annual growth in portable AC shipments between 2004 and 2013 was 30 percent. To estimate historical shipments prior to 2004, DOE interpolated between 1985 (the date that portable ACs were introduced to the residential market) and 2004.

To project future shipments, DOE estimated a saturation rate to project shipments of portable ACs. DOE assumed that the portable AC saturation rate would be no greater than half the current room AC saturation rate (based on RECS 2009) by the end of the analysis period, i.e., 2050. For each year of the projection period, the saturation rate of portable ACs was determined from a combination of the total stock of the product and total housing stock. The total stock of portable ACs was based on product lifetime and the survival function developed in the LCC analysis. DOE used total housing stock from AEO 2015. Based on this revised approach, DOE estimated that the shipments of portable ACs would increase from 1.32 million in 2014 to 1.67 million in 2050 at an annual growth rate of 0.65 percent.

For the NOPR analysis, DOE applied price and efficiency elasticity parameters to estimate the effect of new standards on portable AC shipments. DOE estimated the price and efficiency elasticity parameters from a regression analysis that incorporated shipments, purchase price, and efficiency data specific to several residential appliances during 1989–2009. Based on evidence that the price elasticity of demand is significantly different over the short run and long run for other consumer goods (i.e., automobiles), DOE assumed that these elasticities decline over time. DOE estimated shipments in each standards case using the price and efficiency elasticity along with the change in the product price and operating costs between a standards case and the no-new-standards case.

For details on the shipments analysis, see chapter 9 of the NOPR TSD for further information.

H. National Impact Analysis

The NIA assesses the NES and the national NPV from a national perspective of total consumer[39] costs and savings that would be expected to result from new or amended standards at specific efficiency levels.[40] DOE calculates the NES and NPV 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 forecasted the energy savings, operating cost savings, product costs, and NPV of consumer benefits over the lifetime of portable ACs sold from 2021 through 2050.

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

[39] "Consumer" in this context refers to consumers of the product being regulated.
[40] The NIA accounts for impacts in the 50 States and the U.S. territories.

characterizes energy use and consumer costs for each product class in the absence of new 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 if DOE adopted new or amended standards at specific energy efficiency levels (i.e., the TSLs or standards cases). For the standards cases, DOE considers how a given standard would likely affect the market shares of products with efficiencies greater than the standard.

DOE uses a spreadsheet model to calculate the energy savings and the national consumer costs and savings from each TSL. Interested parties can review DOE's analyses by changing various input quantities on the Input and Summary worksheet within the spreadsheet. https://www.regulations.gov/#!docketDetail;D=EERE-2013-BT-STD-0033 The NIA spreadsheet model uses typical values (as opposed to probability distributions) as inputs.

Table IV.11 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.11 Summary of Inputs and Methods for the National Impact Analysis

Inputs	**Method**
Shipments	Annual shipments from shipments model.
Compliance Date of Standard	2021.
Efficiency Trends	No-new-standards case: Annual increase in efficiency of 0.25 percent between 2021 and 2050. Standards cases: Roll-up plus shift scenario.
Annual Energy Consumption per Unit	Annual weighted-average values are a function of energy use at each TSL.
Total Installed Cost per Unit	Annual weighted-average values are a function of cost at each TSL. Incorporates projection of future product prices based on historical data.
Annual Energy Cost per Unit	Annual weighted-average values as a function of the annual energy consumption per unit and energy prices.
Repair and Maintenance Cost per Unit	Annual values do not change with efficiency level.
Energy Prices	Average and marginal electricity prices for residential and commercial sectors from life-cycle cost and payback period analysis.
Energy Price Trend	AEO 2015 forecasts (to 2040) and extrapolation through 2050 for residential and commercial sectors
Energy Site-to-Primary and FFC Conversion	A time-series conversion factor based on AEO 2015.
Discount Rate	Three and seven percent.
Present Year	2015.

1. Product Efficiency Trends

A key component of the NIA is the trend in energy efficiency projected for the forecast period. To project the trend in efficiency for portable ACs over the entire shipments projection period, DOE used as a starting point the shipments-weighted cooling energy efficiency ratio ($SWEER_{cm}$) estimated for 2021 in the LCC analysis and assumed an annual increase in efficiency equal to the increase estimated for room AC in the 2011 direct final rule: 0.25 percent between 2021 and 2050. 76 FR 22454 (April 21, 2011).

For the standards cases, DOE used a “roll-up” scenario to establish the shipments-weighted average energy efficiency for 2021. Using this approach, product energy efficiencies in the no-new-standards case that do not meet the standard level under consideration would “roll up” to meet the new standard level. Product energy efficiencies in the no-new-standards case that exceed the standard level under consideration would not be affected. For years after 2021, DOE developed $SWEER_{cms}$ growth trends for each standard level that maintained, throughout the analysis period (2021–2050), the same difference in per-unit average cost as was determined between the no-new-standards case and each standards case in 2021. The approach is further described in chapter 10 of the NOPR TSD.

2. National Energy Savings

The NES analysis involves a comparison of national energy consumption of the considered products in each potential standards case (TSL) with consumption in the case with no-new or new 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 2015. Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

In 2011, in response to the recommendations of a committee on “Point-of-Use and Full-Fuel-Cycle Measurement Approaches to Energy Efficiency Standards” appointed by the National Academy of Sciences, DOE announced its intention to use FFC measures of energy use and GHG and other emissions in the NIA and emissions analyses included in future energy conservation standards rulemakings. 76 FR 51281 (August 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 (August 17, 2012). NEMS is a public domain, multi-sector, partial equilibrium model of the U.S. energy sector[41] that EIA uses to prepare its AEO. The approach used for deriving FFC measures of energy use and emissions is described in appendix 10B of the NOPR TSD.

3. Net Present Value Analysis

The inputs for determining the NPV of the total costs and benefits experienced by consumers are: (1) total annual installed cost; (2) total annual savings in operating costs; and (3) a discount factor to calculate the present value of costs and savings. DOE

[41] For more information on NEMS, refer to The National Energy Modeling System: An Overview, DOE/EIA–0581 (98) (Feb.1998) (Available at: http://www.eia.gov/oiaf/aeo/overview/).

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 forecast period.

As discussed in section IV.F.1 of this proposed rule, DOE developed portable AC price trends based on historical PPI data. DOE applied the same trends to forecast prices at each considered efficiency level. By 2050, which is the end date of the forecast period, the average portable AC price is projected to drop 51 percent relative to 2013. DOE's projection of product prices is described in appendix 10C of the NOPR TSD.

To evaluate the effect of uncertainty regarding the price trend estimates, DOE investigated the impact of different product price forecasts on the consumer NPV for the considered TSLs for portable ACs. In addition to the default price trend, DOE considered two product price sensitivity cases: (1) a high price decline case based on the AEO 2015 deflator for "furniture and appliances"; and (2) a low price decline case based on BLS' inflation-adjusted PPI for small electric household appliances spanning 1998–2014. 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 the appropriate form of energy. To estimate energy prices in future years, DOE multiplied the average regional electricity prices by the forecast of annual national-average residential and commercial electricity price changes in the Reference case from AEO 2015, which has an end year of 2040. To estimate price trends after 2040, DOE used the average annual rate of change in prices from 2020 to 2040. As part of the NIA, DOE also analyzed scenarios that used inputs from the AEO 2015 Low Economic Growth and High Economic Growth cases. Those cases have higher and lower energy price trends compared to the Reference case. NIA results based on these cases are presented in appendix 10C of the NOPR TSD.

In calculating the NPV, DOE multiplies the net savings in future years by a discount factor to determine their present value. For this NOPR, DOE estimated the NPV of consumer benefits using both a 3-percent and a 7-percent real discount rate. DOE uses these discount rates in accordance with guidance provided by the Office of Management and Budget (OMB) to Federal agencies on the development of regulatory analysis.[42] 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.

[42] United States Office of Management and Budget. Circular A-4: Regulatory Analysis," (Sept. 17, 2003), section E (Available at: www.whitehouse.gov/omb/memoranda/m03-21.html).

I. Consumer Subgroup Analysis

In analyzing the potential impact of new or amended standards on consumers, DOE evaluates the impact on identifiable subgroups of consumers that may be disproportionately affected by a new or amended national standard. 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 low-income households and senior-only households for the residential sector and small businesses for the commercial sector. DOE found that low-income households and senior-only households would experience higher LCC savings than would the national population. Chapter 11 in the NOPR TSD describes the consumer subgroup analysis.

J. Manufacturer Impact Analysis

1. Overview

DOE performed an MIA to estimate the financial impacts of new energy conservation standards on manufacturers of portable ACs and to estimate the potential impacts of such standards on employment and manufacturing capacity. The MIA has both quantitative and qualitative aspects and includes analyses of forecasted 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 new energy conservation standards might affect manufacturing employment, capacity, and competition, as well as how standards would 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 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 new energy conservation standards on the portable AC industry by comparing changes in INPV and domestic manufacturing employment between a no-new-standards case and the various TSLs in the standards case. To capture the uncertainty relating to manufacturer pricing strategy following new standards, the GRIM estimates a range of possible impacts under different markup scenarios.

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

DOE conducted the MIA for this rulemaking in three phases. In Phase 1 of the MIA, DOE prepared a profile of the portable AC manufacturing industry based on the market and technology assessment, preliminary manufacturer interviews, and publicly available information. This included a top-down analysis of portable AC manufacturers that DOE used to derive preliminary financial inputs for the GRIM (e.g., revenues; materials, labor, overhead, and depreciation expenses; selling, general, and administrative expenses (SG&A); and R&D expenses). DOE also used public sources of information to further calibrate its initial characterization of the portable AC manufacturing industry, including SEC 10-K filings,[43] Standard & Poor's stock reports,[44] and corporate annual reports released by both public and privately held companies.

In Phase 2 of the MIA, DOE prepared a framework industry cash flow analysis to quantify the impacts of new 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 effective 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: (1) create a need for increased investment; (2) raise production costs per unit; and (3) alter revenue due to higher per-unit prices and changes in sales volumes.

[43] Available online at www.sec.gov.
[44] Available online at www.standardandpoors.com.

In addition, during Phase 2, DOE developed interview guides to distribute to manufacturers of portable 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, manufacturing capacity, 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 for a description of the key issues raised by manufacturers during the interviews. In Phase 3, DOE used manufacturer feedback to qualitatively assess impacts of new standards on manufacturing capacity, direct employment, and cumulative regulatory burden.

Additionally, as part of Phase 3, DOE evaluated subgroups of manufacturers that may be disproportionately impacted by new 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 (LVMs), niche players, and/or manufacturers exhibiting a cost structure that largely differs from the industry average. DOE identified one potential portable AC manufacturer subgroup (small businesses) for which average cost assumptions may not hold.

Based on the size standards published by the Small Business Administration (SBA),[45] to be categorized as a small business manufacturer of portable ACs under North American Industry Classification System (NAICS) code 333415 ("Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing"), a portable AC manufacturer and its affiliates may not employ more than 1,250 employees. The 1,250-employee threshold includes all employees in a business' parent company and any subsidiaries. Using this classification in conjunction with a search of industry databases and the SBA member directory, DOE did not identify any domestic small business manufacturers of single-duct and dual-duct portable ACs that would be subject to the standards proposed in this notice.[46]

The portable AC manufacturer subgroup analysis is discussed in greater detail in chapter 12, of the NOPR TSD and in section V.B.2.d of this proposed rule.

2. Government Regulatory Impact Model (GRIM)

DOE uses the GRIM to quantify the changes in industry cash flows resulting from new or amended energy conservation standards. The GRIM uses manufacturer costs, markups, shipments, and industry financial information to arrive at a series of no-new-standards case annual cash flows absent new or amended standards, beginning with the present year, 2016, and continuing through 2050. The GRIM then models changes in

[45] 65 FR 30836 (May 15, 2000), as amended at 65 FR 53533, 53544 (Sept. 5, 2000).
[46] In the February 2015 TP NOPR, DOE estimated that there was one small business that manufactured portable ACs. DOE subsequently determined that this small business no longer manufactures portable ACs and, therefore, DOE estimates that there are no domestic manufacturers that meet the SBA's definition of "small business" that currently manufacture products covered by this rulemaking.

costs, investments, shipments, and manufacturer margins that may result from new or amended energy conservation standards and compares these results against those in the base-case forecast of annual cash flows. The primary quantitative output of the GRIM is the INPV, which DOE calculates by summing the stream of annual discounted cash flows over the full analysis period. For manufacturers of portable ACs, DOE used a real discount rate of 6.60 percent, the weighted-average cost of capital derived from industry financials and modified based on feedback received during confidential interviews with manufacturers.

The GRIM calculates cash flows using standard accounting principles and compares changes in INPV between the no-new-standards case and the various TSLs. The difference in INPV between the no-new-standards case and a standards case represents the financial impact of the new standard on manufacturers at that particular TSL. As discussed previously, DOE collected the necessary information to develop key GRIM inputs from a number of sources, including publicly available data and interviews with manufacturers (described in the next section). The GRIM results are shown in section V.B.2.a of this proposed rule. Additional details about the GRIM can be found in chapter 12 of the NOPR TSD.

a. Government Regulatory Impact Model Key Inputs

<u>Manufacturer Production Costs</u>

Manufacturing a higher efficiency product is typically more expensive than manufacturing a baseline product due to the use of more complex and typically more costly components. The changes in the MPCs of the analyzed products can affect the revenues, gross margins, and cash flow of the industry, making product cost data key GRIM inputs for DOE's analysis. For each efficiency level, DOE used the MPCs developed in the engineering analysis, as described in section IV.C.2 of this proposed rule and further detailed in chapter 5 of the NOPR TSD. Additionally, DOE used information from its teardown analysis, described in section IV.C of this proposed rule, to disaggregate the MPCs into material and labor costs. These cost breakdowns and equipment markups were validated with manufacturers during interviews.

No-New-Standards Case Shipments Forecast

The GRIM estimates manufacturer revenues based on total unit shipment forecasts and the distribution of shipments by efficiency level. Changes in sales volumes and efficiency mix over time can significantly affect manufacturer finances. For this analysis, the GRIM used the NIA's annual shipment forecasts derived from the shipments analysis from 2016 (the base year) to 2050 (the end of the analysis period). See chapter 9 of the NOPR TSD for additional details on the shipments analysis.

Standards Case Shipments Forecast

For each standards case, the GRIM assumes a small, constant percentage shift in shipments to higher efficiency levels, reflecting the idea that some efficiency improvements will occur independent of new standards. The GRIM also assumes all remaining shipments of products below the projected minimum standard levels would roll up (i.e., be added) to the standard levels in response to an increase in energy conservation standards. The GRIM also assumes that demand for higher-efficiency equipment (that is, above the minimally compliant level) is a function of price, and is independent of the standard level.

Product and Capital Conversion Costs

New energy conservation standards may cause manufacturers to incur one-time conversion costs to bring their production facilities and product designs into compliance with the new standards. (See chapter 12 of the NOPR TSD.) For the purpose of the MIA, DOE classified these one-time conversion costs into two major groups: (1) product conversion costs and (2) capital conversion costs. Product conversion costs are one-time investments in research, development, testing, and marketing, focused on making product designs comply with the new energy conservation standard. Capital conversion expenditures are one-time investments in property, plant, and equipment to adapt or change existing production facilities so that new product designs can be fabricated and assembled.

Stranded Assets

If new or amended energy conservation standards require investment in new manufacturing capital, there also exists the possibility that they will render existing manufacturing capital obsolete. If the obsolete manufacturing capital is not fully depreciated at the time new or amended standards go into effect, these assets would be stranded and the manufacturer would have to write-down the residual value that had not yet been depreciated.

DOE used multiple sources of data to evaluate the level of product and capital conversion costs and stranded assets manufacturers would likely face to comply with new energy conservation standards. DOE used manufacturer interviews to gather data on the level of investment anticipated at each proposed efficiency level and validated these assumptions using estimates of capital requirements derived from the product teardown analysis and engineering model described in section IV.C of this proposed rule. These estimates were then aggregated and scaled to derive total industry estimates of product and capital conversion costs and to protect confidential information.

In general, DOE assumes that all conversion-related investments occur between the year the final rule is published and the year by which manufacturers must comply with the new or amended standards. The investment figures used in the GRIM can be found in section V.B.2 of this proposed rule. For additional information on the estimated product conversion and capital conversion costs, see chapter 12 of the NOPR TSD.

b. Government Regulatory Impact Model Scenarios

No-New-Standards Case Markup

As discussed in section IV.D of this proposed rule, MSPs include direct manufacturing production costs (i.e., labor, material, overhead, and depreciation estimated in DOE's MPCs) and all non-production costs (i.e., SG&A, R&D, and interest), along with profit. To calculate the MSPs in the GRIM, DOE applied manufacturer markups to the MPCs estimated in the engineering analysis. Based on publicly available financial information for manufacturers of portable ACs and comments from manufacturer interviews, DOE assumed the industry average no-new-standards case markup on production costs to be 1.42. This markup takes into account the two sourcing structures that characterize the portable AC market. Single-duct and dual-duct portable ACs sold in the United States are manufactured by overseas original equipment manufacturers (OEMs) either for sale by contract to an importer or for direct sale to retailers and builders. The engineering analysis, as detailed in chapter 5 of the NOPR TSD, estimates the cost of manufacturing at the OEM. For the OEM to importer sourcing structure, this production cost is marked up once by the OEM and again by the contracting the company who imports the product and sells it to retailers.

Markup Scenarios

Modifying the aforementioned base-case markups in the standards case yields different sets of impacts on manufacturers. For the MIA, DOE modeled two standards-case markup scenarios to represent the uncertainty regarding the potential impacts on prices and profitability for manufacturers following the implementation of new energy conservation standards: (1) a preservation of gross margin[47] (percentage) scenario; and (2) a preservation of per-unit operating profits scenario. These scenarios lead to different markup values that, when applied to the MPCs, result in varying revenue and cash flow impacts.

The preservation of gross margin as a percentage of revenues markup scenario assumes that the baseline markup of 1.42 is maintained for all products in the standards case. Typically, this scenario represents the upper bound of industry profitability as manufacturers are able to fully pass through additional costs due to standards to their customers under this scenario.

The preservation of per-unit operating profits markup scenario is similar to the preservation of gross margin as a percentage of revenues markup scenario with the exception that in the standards case, minimally compliant products lose a fraction of the baseline markup. Typically, this scenario represents the lower bound profitability and a more substantial impact on the industry as manufacturers accept a lower margin in an attempt to offer price competitive entry level products while maintaining the same level of absolute operating profits, on a per-unit basis, that they saw prior to new or amended standards. Under this scenario, gross margin as a percentage decreases in the standards case.

[47] "Gross margin" is defined as revenues minus cost of goods sold. On a unit basis, gross margin is selling price minus manufacturer production cost. In the GRIMs, markups determine the gross margin because various markups are applied to the manufacturer production costs to reach manufacturer selling price.

3. Manufacturer Interviews

To inform the MIA, DOE interviewed manufacturers with an estimated combined market share of 65 to 70 percent. These confidential interviews provided information that DOE used to evaluate the impacts of new energy conservation standards on manufacturer cash flows, manufacturing capacities, and employment levels in the portable AC industry.

During the interviews, DOE asked manufacturers to describe the major issues they anticipate to result from the energy conservation standards proposed in this rulemaking. DOE notes that manufacturer comments and concerns expressed during these interviews (and outlined below) relate to the engineering analysis presented in the February 2015 Preliminary Analysis. Information gained during these interviews helped to inform the updated analysis and proposal reflected in this NOPR.[48] The following sections describe the most significant issues identified by manufacturers relating to DOE's preliminary analysis, some of which have been addressed by the updated analysis in this NOPR. These concerns are also presented in chapter 12 of the NOPR TSD.

Ramifications of a Single Product Class

Most manufacturers interviewed expressed concerns over the classification of single-duct and dual-duct portable ACs as in one product class for the purpose of DOE's analysis of proposed standards for portable ACs, as this means that the two inherently different product configurations will be required to meet the same standard level. Manufacturers stated that DOE should create multiple product classes defined by

[48] Section IV.C of this NOPR describes the updated engineering analysis based on the test procedure in Appendix CC.

different product configurations and capacity ranges, similar to DOE's treatment of room ACs and dehumidifiers. Manufacturers' justification for multiple product classes related to differences in product utility between single-duct and dual-duct portable ACs, and the potential cost burden associated with having to redesign single-duct portable AC platforms to accommodate an additional condenser duct.

Manufacturers stated that the lower price point for single-duct units offers a distinct utility relative to more expensive dual-duct portable ACs. Most manufacturers agreed that U.S. portable AC consumers are intolerant to price changes. They think that a 5 to 20-percent increase in price will significantly harm the portable AC industry overall, with customers instead purchasing room ACs if price increases necessitated by standards become intolerable. Additionally, some manufacturers claimed that single-duct products are less complex, easier to use, more portable, and take up less space. Other manufacturers stated that the two product types are intended and used for different applications. Single-duct units are intended to cool a zone, rather than an entire space, and are well-suited for placement in garages and warehouses when localized cooling is desired. Conversely, dual-duct products are able to cool entire spaces and can be used similarly to room ACs.

However, some of the same manufacturers also commented that consumers typically do not understand the difference between single-duct and dual-duct products. These manufacturers stated that consumers buy single-duct units expecting to be able to cool an entire space, and that the lack of such capability has led to product returns. No manufacturer could identify a situation in which a dual-duct portable AC could not be installed in the same location as a single-duct portable AC.

Manufacturers indicated that there would be substantial conversion costs related to redesigning single-duct platforms to accommodate an additional condenser duct. At a minimum, this change would require manufacturers to retool the back of the case, which would require significant upfront investments.

DOE responds to similar concerns expressed in public comments in section IV.A.2.b of this proposed rule. Details regarding DOE's updated engineering analysis approach can be found in section IV.C of this proposed rule.

Feasibility of Design Options

Besides the cost burdens associated with adding a second duct to single-duct portable ACs, some manufacturers commented that reaching zero-percent infiltration air is not feasible using existing assembly lines, and would require an increased duct diameter in order to overcome the static pressure.

DOE's updated engineering approach no longer assumed manufacturers would rely on airflow optimization to improve efficiency. Details regarding DOE's updated engineering analysis approach can be found in section IV.C of this proposed rule.

Test Procedure

All of the manufacturers interviewed stated that a standardized test procedure that would establish a consistent rating system for portable AC capacity and efficiency is vital for the industry. Manufacturers commented that, as a result of the lack of standardized test procedure, some portable AC manufacturers have been able to misrepresent the capacity of their products.

As discussed in section III.B of this proposed rule, the April 2016 issued TP Final Rule established the current portable AC test procedure included in appendix CC. CITE.

Impacts on Small Foreign Businesses

Some manufacturers interviewed believe that small overseas manufacturers producing portable ACs for the U.S. market may not be able to handle the potentially large investments needed to comply with new standards and test procedures. One manufacturer further noted that, at a minimum, to stay competitive, these small manufacturers would have to narrow their product offering to one or two platforms.

DOE outlines the criteria for a manufacturer to be analyzed as a small business in section IV.J.1 of this proposed rule. As discussed in that section, DOE did not identify any domestic small business manufacturers of single-duct or dual-duct portable ACs.

Impact on Shipping

Manufacturers expressed concern that transitioning from manufacturing single-duct to dual-duct units would increase shipping costs. This change would increase the size of the unit packaging and reduce the number of units that can be shipped in a standard shipping container, consequently increasing the shipping cost per unit.

For this NOPR, DOE has revised its engineering analysis approach, and no longer assumes that manufacturers would switch from single-duct to dual-duct configuration to meet any of the considered efficiency levels (the additional duct was the main driver for concerns relating to impacts on shipping costs). Details regarding DOE's updated engineering analysis approach can be found in section IV.C of this proposed rule.

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 GHG, CH_4 and N_2O, as well as the reductions to emissions of all species due to "upstream" activities in the fuel production chain. These upstream activities comprise extraction, processing, and transporting fuels to the site of combustion. The associated emissions are referred to as upstream emissions.

The analysis of power sector emissions uses marginal emissions factors that were derived from data in AEO 2015, as described in section IV.M. The methodology is described in chapter 13 and chapter 15 of the NOPR TSD.

Combustion emissions of CH_4 and N_2O are estimated using emissions intensity factors published by the EPA, GHG Emissions Factors Hub.[49] 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 fuel combustion during 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 MWh or MMBtu of site energy savings. Total emissions reductions are estimated using the energy savings calculated in the NIA.

For CH_4 and N_2O, DOE calculated emissions reduction in tons and also in terms of units of carbon dioxide equivalent (CO_2eq). Gases are converted to CO_2eq by multiplying each ton of gas by the gas' GWP over a 100-year time horizon. Based on the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,[50] DOE used GWP values of 28 for CH_4 and 265 for N_2O.

[49] Available at: http://www2.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub.

[50] Intergovernmental Panel on Climate Change (IPCC), 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y.

The AEO incorporates the projected impacts of existing air quality regulations on emissions. AEO 2015 generally represents current legislation and environmental regulations, including recent government actions, for which implementing regulations were available as of October 31, 2014. DOE's estimation of impacts accounts for the presence of the emissions control programs discussed in the following paragraphs.

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 28 eastern States and D.C. were also limited under the Clean Air Interstate Rule (CAIR). 70 FR 25162 (May 12, 2005). CAIR created an allowance-based trading program that operates along with the Title IV program. In 2008, CAIR was remanded to EPA by the U.S. Court of Appeals for the District of Columbia Circuit, but it remained in effect.[51] In 2011, EPA issued a replacement for CAIR, the Cross-State Air Pollution Rule (CSAPR). 76 FR 48208 (Aug. 8, 2011). On August 21, 2012, the D.C. Circuit issued a decision to vacate CSAPR,[52] and the court ordered EPA to continue administering CAIR. On April 29, 2014, the U.S. Supreme Court reversed the judgment of the D.C. Circuit and remanded

Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Chapter 8.

[51] See North Carolina v. EPA, 550 F.3d 1176 (D.C. Cir. 2008); North Carolina v. EPA, 531 F.3d 896 (D.C. Cir. 2008).

[52] See EME Homer City Generation, LP v. EPA, 696 F.3d 7, 38 (D.C. Cir. 2012), cert. granted, 81 U.S.L.W. 3567, 81 U.S.L.W. 3696, 81 U.S.L.W. 3702 (U.S. June 24, 2013) (No. 12-1182).

the case for further proceedings consistent with the Supreme Court's opinion.[53] On October 23, 2014, the D.C. Circuit lifted the stay of CSAPR. [54] Pursuant to this action, CSAPR went into effect (and CAIR ceased to be in effect) as of January 1, 2015.

EIA was not able to incorporate CSAPR into AEO 2015, so it assumes implementation of CAIR. Although DOE's analysis used emissions factors that assume that CAIR, not CSAPR, is the regulation in force, the difference between CAIR and CSAPR is not relevant for the purpose of DOE's analysis of emissions impacts from energy conservation standards.

The attainment of emissions caps is typically flexible among EGUs and is enforced through the use of emissions allowances and tradable permits. Under existing EPA regulations, any excess SO_2 emissions allowances resulting from the lower electricity demand caused by the adoption of an efficiency standard could be used to permit offsetting increases in SO_2 emissions by any regulated EGU. In past rulemakings, DOE recognized that there was uncertainty about the effects of efficiency standards on SO_2 emissions covered by the existing cap-and-trade system, but it concluded that negligible reductions in power sector SO_2 emissions would occur as a result of standards.

[53] See EPA v. EME Homer City Generation, 134 S.Ct. 1584, 1610 (U.S. 2014). The Supreme Court held in part that EPA's methodology for quantifying emissions that must be eliminated in certain States due to their impacts in other downwind States was based on a permissible, workable, and equitable interpretation of the Clean Air Act provision that provides statutory authority for CSAPR.
[54] See Georgia v. EPA, Order (D. C. Cir. filed October 23, 2014) (No. 11-1302),

Beginning in 2016, however, SO_2 emissions will fall as a result of the Mercury and Air Toxics Standards (MATS) for power plants. 77 FR 9304 (Feb. 16, 2012). In the MATS rule, EPA established a standard for hydrogen chloride as a surrogate for acid gas hazardous air pollutants (HAP), and also established a standard for SO_2 (a non-HAP acid gas) as an alternative equivalent surrogate standard for acid gas HAP. The same controls are used to reduce HAP and non-HAP acid gas; thus, SO_2 emissions will be reduced as a result of the control technologies installed on coal-fired power plants to comply with the MATS requirements for acid gas. AEO 2015 assumes that, in order to continue operating, coal plants must have either flue gas desulfurization or dry sorbent injection systems installed by 2016. Both technologies, which are used to reduce acid gas emissions, also reduce SO_2 emissions. Under the MATS, emissions will be far below the cap established by CAIR, so it is unlikely that excess SO_2 emissions allowances resulting from the lower electricity demand would be needed or used to permit offsetting increases in SO_2 emissions by any regulated EGU.[55] Therefore, DOE believes that energy conservation standards will generally reduce SO_2 emissions in 2016 and beyond.

CAIR established a cap on NO_x emissions in 28 eastern States and the District of Columbia.[56] Energy conservation standards are expected to have little effect on NO_x

[55] DOE notes that the Supreme Court recently determined that EPA erred by not considering costs in the finding that regulation of hazardous air pollutants from coal- and oil-fired electric utility steam generating units is appropriate. See Michigan v. EPA (Case No. 14-46, 2015). The Supreme Court did not vacate the MATS rule, and DOE has tentatively determined that the Court's decision on the MATS rule does not change the assumptions regarding the impact of energy efficiency standards on SO_2 emissions. Further, the Court's decision does not change the impact of the energy efficiency standards on mercury emissions. DOE will continue to monitor developments related to this case and respond to them as appropriate.

[56] CSAPR also applies to NO_X and it supersedes the regulation of NO_X under CAIR. As stated previously, the current analysis assumes that CAIR, not CSAPR, is the regulation in force. The difference between CAIR and CSAPR with regard to DOE's analysis of NO_X emissions is slight.

emissions in those States covered by CAIR because excess NO_x emissions allowances resulting from the lower electricity demand could be used to permit offsetting increases in NO_x emissions from other facilities. However, standards would be expected to reduce NO_x emissions in the States not affected by the caps, so DOE estimated NO_x emissions reductions from the standards considered in this NOPR for these States.

The MATS limit mercury emissions from power plants, but they do not include emissions caps and, as such, DOE's energy conservation standards would likely reduce Hg emissions. DOE estimated mercury emissions reduction using emissions factors based on AEO 2015, which incorporates the MATS.

L. Monetizing Carbon Dioxide and Other Emissions Impacts

As part of the development of this proposed rule, DOE considered the estimated monetary benefits from the reduced emissions of CO_2 and NO_X that are expected to result from each of the TSLs considered. In order to make this calculation analogous to the calculation of the NPV of consumer benefit, DOE considered the reduced emissions expected to result over the lifetime of products shipped in the forecast period for each TSL. This section summarizes the basis for the monetary values used for each of these emissions and presents the values considered in this NOPR.

1. Social Cost of Carbon

The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) climate-change-related changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services. Estimates of the SCC are provided in dollars per metric ton of CO_2. A domestic SCC value is meant to reflect the value of damages in the United States resulting from a unit change in CO_2 emissions, while a global SCC value is meant to reflect the value of damages worldwide.

Under section 1(b) of Executive Order 12866, "Regulatory Planning and Review," 58 FR 51735 (Oct. 4, 1993), agencies must, to the extent permitted by law, "assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs." The purpose of the SCC estimates presented here is to allow agencies to incorporate the monetized social benefits of reducing CO_2 emissions into cost-benefit analyses of regulatory actions. The estimates are presented with an acknowledgement of the many uncertainties involved and with a clear understanding that they should be updated over time to reflect increasing knowledge of the science and economics of climate impacts.

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

a. Monetizing Carbon Dioxide Emissions

When attempting to assess the incremental economic impacts of CO_2 emissions, the analyst faces a number of challenges. A report from the National Research Council[57] points out that any assessment will suffer from uncertainty, speculation, and lack of information about: (1) future emissions of GHGs; (2) the effects of past and future emissions on the climate system; (3) the impact of changes in climate on the physical and biological environment; and (4) the translation of these environmental impacts into economic damages. As a result, any effort to quantify and monetize the harms associated with climate change will raise questions of science, economics, and ethics and should be viewed as provisional.

Despite the limits of both quantification and monetization, SCC estimates can be useful in estimating the social benefits of reducing CO_2 emissions. The agency can estimate the benefits from reduced (or costs from increased) emissions in any future year by multiplying the change in emissions in that year by the SCC values appropriate for that year. The NPV of the benefits can then be calculated by multiplying each of these future benefits by an appropriate discount factor and summing across all affected years.

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

The interagency process is committed to updating these estimates as the science and economic understanding of climate change and its impacts on society improves over time. In the meantime, the interagency group will continue to explore the issues raised by this analysis and consider public comments as part of the ongoing interagency process.

b. Development of Social Cost of Carbon Values

In 2009, an interagency process was initiated to offer a preliminary assessment of how best to quantify the benefits from reducing CO_2 emissions. To ensure consistency in how benefits are evaluated across Federal agencies, the Administration sought to develop a transparent and defensible method, specifically designed for the rulemaking process, to quantify avoided climate change damages from reduced CO_2 emissions. The interagency group did not undertake any original analysis. Instead, it combined SCC estimates from the existing literature to use as interim values until a more comprehensive analysis could be conducted. The outcome of the preliminary assessment by the interagency group was a set of five interim values: global SCC estimates for 2007 (in 2006$) of $55, $33, $19, $10, and $5 per metric ton of CO_2. These interim values represented the first sustained interagency effort within the U.S. government to develop an SCC for use in regulatory analysis. The results of this preliminary effort were presented in several proposed and final rules.

c. Current Approach and Key Assumptions

After the release of the interim values, the interagency group reconvened on a regular basis to generate improved SCC estimates. Specially, the group considered public comments and further explored the technical literature in relevant fields. The interagency group relied on three integrated assessment models commonly used to estimate the SCC: the FUND, DICE, and PAGE models. These models are frequently cited in the peer-reviewed literature and were used in the last assessment of the Intergovernmental Panel on Climate Change (IPCC). Each model was given equal weight in the SCC values that were developed.

Each model takes a slightly different approach to model how changes in emissions result in changes in economic damages. A key objective of the interagency process was to enable a consistent exploration of the three models, while respecting the different approaches to quantifying damages taken by the key modelers in the field. An extensive review of the literature was conducted to select three sets of input parameters for these models: climate sensitivity, socio-economic and emissions trajectories, and discount rates. A probability distribution for climate sensitivity was specified as an input into all three models. In addition, the interagency group used a range of scenarios for the socio-economic parameters and a range of values for the discount rate. All other model features were left unchanged, relying on the model developers' best estimates and judgments.

In 2010, the interagency group selected four sets of SCC values for use in regulatory analyses. Three sets of values are based on the average SCC from the three integrated assessment models, at discount rates of 2.5, 3, and 5 percent. The fourth set, which represents the 95th percentile SCC estimate across all three models at a 3-percent discount rate, was included to represent higher-than-expected impacts from climate change further out in the tails of the SCC distribution. The values grow in real terms over time. Additionally, the interagency group determined that a range of values from 7 percent to 23 percent should be used to adjust the global SCC to calculate domestic effects,[58] although preference is given to consideration of the global benefits of reducing CO_2 emissions. Table IV.12 presents the values in the 2010 interagency group report,[59] which is reproduced in appendix 14A of the NOPR TSD.

Table IV.12 Annual SCC Values from 2010 Interagency Report, 2010–2050 (2007$ per metric ton CO_2)

Year	Discount Rate			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
2010	4.7	21.4	35.1	64.9
2015	5.7	23.8	38.4	72.8
2020	6.8	26.3	41.7	80.7
2025	8.2	29.6	45.9	90.4
2030	9.7	32.8	50.0	100.0
2035	11.2	36.0	54.2	109.7
2040	12.7	39.2	58.4	119.3
2045	14.2	42.1	61.7	127.8
2050	15.7	44.9	65.0	136.2

The SCC values used for this proposed rule were generated using the most recent versions of the three integrated assessment models that have been published in the peer-reviewed literature, as described in the 2013 update from the interagency working group

[58] It is recognized that this calculation for domestic values is approximate, provisional, and highly speculative. There is no a priori reason why domestic benefits should be a constant fraction of net global damages over time.

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

(revised July 2015).[60] Table IV.13 shows the updated sets of SCC estimates from the latest interagency update in 5-year increments from 2010 to 2050. The full set of annual SCC values between 2010 and 2050 is reported in appendix 14B of the NOPR TSD. The central value that emerges is the average SCC across models at the 3-percent discount rate. However, for purposes of capturing the uncertainties involved in regulatory impact analysis, the interagency group emphasizes the importance of including all four sets of SCC values.

Table IV.13 Annual SCC Values from 2013 Interagency Update (Revised July 2015), 2010–2050 (2007$ per metric ton CO_2)

Year	Discount Rate			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
2010	10	31	50	86
2015	11	36	56	105
2020	12	42	62	123
2025	14	46	68	138
2030	16	50	73	152
2035	18	55	78	168
2040	21	60	84	183
2045	23	64	89	197
2050	26	69	95	212

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

[60] Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, Interagency Working Group on Social Cost of Carbon, United States Government (May 2013; revised July 2015) (Available at: http://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf).

Council report mentioned previously points out that there is tension between the goal of producing quantified estimates of the economic damages from an incremental ton of carbon and the limits of existing efforts to model these effects. There are a number of analytical challenges that are being addressed by the research community, including research programs housed in many of the Federal agencies participating in the interagency process to estimate the SCC. The interagency group intends to periodically review and reconsider those estimates to reflect increasing knowledge of the science and economics of climate impacts, as well as improvements in modeling.[61]

In summary, in considering the potential global benefits resulting from reduced CO_2 emissions, DOE used the values from the 2013 interagency report (revised July 2015), adjusted to 2014$ using the implicit price deflator for gross domestic product (GDP) from the Bureau of Economic Analysis. For each of the four sets of SCC cases specified, the values for emissions in 2015 were $12.2, $40.0, $62.3, and $117 per metric ton avoided (values expressed in 2014$). DOE derived values after 2050 using the relevant growth rates for the 2040–2050 period in the interagency update.

DOE multiplied the CO_2 emissions reduction estimated for each year by the SCC value for that year in each of the four cases. To calculate a present value of the stream of

[61] In November 2013, OMB announced a new opportunity for public comment on the interagency technical support document underlying the revised SCC estimates. 78 FR 70586. In July 2015 OMB published a detailed summary and formal response to the many comments that were received. https://www.whitehouse.gov/blog/2015/07/02/estimating-benefits-carbon-dioxide-emissions-reductions

monetary values, DOE discounted the values in each of the four cases using the specific discount rate that had been used to obtain the SCC values in each case.

2. Social Cost of Other Air Pollutants

As noted previously, DOE has estimated how the considered energy conservation standards would decrease power sector NO_X emissions in those 22 States not affected by the CAIR. DOE estimated the monetized value of net NO_X emissions reductions resulting from each of the TSLs considered for this NOPR based on estimates developed by EPA for 2016, 2020, 2025, and 2030. The values reflect estimated mortality and morbidity per ton of directly emitted NO_X reduced by electricity generating units. EPA developed estimates using a 3-percent and a 7-percent discount rate to discount future emissions-related costs. The values in 2016 are $5,562/ton using a 3-percent discount rate and $4,920/ton using a 7-percent discount rate (2014$). DOE extrapolated values after 2030 using the average annual rate of growth in 2016–2030. DOE multiplied the emissions reduction (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.

DOE is evaluating appropriate monetization of avoided SO_2 and Hg emissions in energy conservation standards rulemakings. DOE has not included monetization of those emissions in the current analysis.

M. Utility Impact Analysis

The utility impact analysis estimates several effects on the electric power 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 2015. 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. DOE uses published side cases to estimate the marginal impacts of reduced energy demand on the utility sector. These marginal factors are estimated based on the changes to electricity sector generation, installed capacity, fuel consumption and emissions in the AEO 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 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 employees of manufacturers of the products subject to standards, their suppliers, and related service firms. 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 end users on energy; (2) reduced spending on new energy supply by the utility industry; (3) increased consumer spending on new products to which the new standards apply; and (4) the effects of those three factors throughout the economy.

One method for assessing the possible effects on the demand for labor of such shifts in economic activity is to compare sector employment statistics developed by the BLS)[62] 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.[63] 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

[62] Data on industry employment, hours, labor compensation, value of production, and the implicit price deflator for output for these industries are available upon request by calling the Division of Industry Productivity Studies (202-691-5618) or by sending a request by e-mail to dipsweb@bls.gov.
[63] See Bureau of Economic Analysis, Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II), U.S. Department of Commerce (1992).

sector (i.e., the utility sector) to more labor-intensive sectors (e.g., the retail and service sectors). Thus, based on the BLS data alone, DOE believes net national employment may increase due to shifts in economic activity resulting from energy conservation standards.

DOE estimated indirect national employment impacts for the standard levels considered in this NOPR using an input/output model of the U.S. economy called Impact of Sector Energy Technologies version 3.1.1 (ImSET).[64] ImSET is a special-purpose version of the "U.S. Benchmark National Input-Output" (I–O) model, which was designed to estimate the national employment and income effects of energy-saving technologies. The ImSET software includes a computer-based I–O model having structural coefficients that characterize economic flows among 187 sectors most relevant to industrial, commercial, and residential building energy use.

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

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

V. Analytical Results

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

A. Trial Standard Levels

DOE analyzed the benefits and burdens of four TSLs for portable ACs. These TSLs were developed by combining specific efficiency levels for each of the product classes analyzed by DOE. 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, corresponding efficiency levels, and average EERs and CEERs at each level for portable ACs. TSL 4 represents the maximum technologically feasible ("max-tech") energy efficiency. TSL 3 consists of an intermediate efficiency level below the max-tech level, corresponding to the single highest efficiency observed in DOE's test sample. TSL 2 represents the maximum available efficiency across the full range of capacities, and TSL 1 represents an intermediate level between the baseline and TSL 2.

Table V.1 Trial Standard Levels for Portable Air Conditioners

TSL	EL	EER	CEER
1	1	5.99	5.97
2	2	7.20	7.19
3	3	8.48	8.47
4	4	10.54	10.52

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

DOE analyzed the economic impacts on portable AC consumers by looking at the effects potential new standards at each TSL would have on the LCC and PBP. DOE also examined the impacts of potential standards on consumer subgroups. These analyses are discussed below.

a. Life-Cycle Cost and Payback Period

In general, higher-efficiency products affect consumers in two ways: (1) increase of purchase price, and (2) decrease of annual operating costs. Inputs used for calculating the LCC and PBP include total installed costs (i.e., product price plus installation costs), and operating costs (i.e., annual energy use, energy prices, energy price trends, repair costs, and maintenance costs). The LCC calculation also uses product lifetime and a discount rate. Chapter 8 of the NOPR TSD provides detailed information on the LCC and PBP analyses.

Table V.2 through Table V.7 show the LCC and PBP results for the TSL and efficiency levels considered for portable ACs for both sectors, residential, and commercial. The LCC results presented in Table V.2 and Table V.3 combined the results for residential and commercial users, which means that DOE had to assign an appropriate weight to the results for each type of user. Using the weighting from the room AC rulemaking,[65] DOE assumed that 88 percent of shipments are to the residential sector and 12 percent are to the commercial sector. In the first of each pair of tables, the simple payback is measured relative to the baseline product (EL 0). In the second table, the impacts are measured relative to the efficiency distribution in the no-new-standards case in the compliance year (see section IV.F of this proposed rule). 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 EL 0 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.

[65] Room AC Standards Rulemaking, Direct Final Rule, Chapter 8, page 51. April 18, 2011. http://www.regulations.gov/#!documentDetail;D=EERE-2007-BT-STD-0010-0053

Table V.2 Average LCC and PBP Results by Efficiency Level, Residential Setting

TSL	EL	Average Costs 2014$				Simple Payback years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	0	583	125	1,067	1,650		10
1	1	629	110	937	1,565	3.0	10
2	2	652	94	800	1,452	2.2	10
3	3	676	82	697	1,372	2.1	10
4	4	750	67	573	1,324	2.9	10

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 (EL 0) product.

Table V.3 Average LCC Savings Relative to the No-New-Standards Case for Residential Setting

TSL	EL	Average LCC Savings* 2014$	Percent of Consumers that Experience Net Cost
1	1	84	9
2	2	144	13
3	3	194	19
4	4	242	31

* The savings represent the average LCC for affected consumers.

Table V.4 Average LCC and PBP Results by Efficiency Level, Commercial Setting

TSL	EL	Average Costs <u>2014$</u>				Simple Payback <u>years</u>	Average Lifetime <u>years</u>
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	0	583	234	1,881	2,463		10
1	1	629	205	1,648	2,276	1.6	10
2	2	652	175	1,403	2,055	1.2	10
3	3	676	152	1,219	1,895	1.1	10
4	4	750	126	1,008	1,759	1.5	10

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 (EL 0) product.

Table V.5 Average LCC Savings Relative to the No-New-Standards Case for Commercial Setting

TSL	EL	Average LCC Savings* <u>2014$</u>	Percent of Consumers that Experience Net Cost
1	1	188	2
2	2	292	2
3	3	392	3
4	4	528	9

* The savings represent the average LCC for affected consumers.

Table V.6 Average LCC and PBP Results by Efficiency Level, Both Sectors

TSL	EL	Average Costs 2014$				Simple Payback years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	0	583	139	1,165	1,747		10
1	1	629	122	1,022	1,651	2.8	10
2	2	652	104	872	1,524	2.1	10
3	3	676	90	759	1,435	2.0	10
4	4	750	74	626	1,376	2.7	10

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 (EL 0) product.

Table V.7 Average LCC Savings Relative to the No-New-Standards Case for Both Sectors

TSL	EL	Average LCC Savings* 2014$	Percent of Consumers that Experience Net Cost
1	1	97	9
2	2	162	12
3	3	218	17
4	4	276	28

* The savings represent the average LCC for affected consumers.

As discussed in section IV.E, DOE conducted a sensitivity analysis that assumes consumers use portable ACs 50 percent less than room ACs. For the proposed standard, TSL 2, the average LCC savings declines to $60 and 26 percent of consumers experience a net cost under the sensitivity analysis. See appendix 8F of the NOPR TSD for additional information.

b. Consumer Subgroup Analysis

In the consumer subgroup analysis, DOE estimated the impact of the considered TSLs on low-income households, senior-only households, and small businesses. Table V.8 compares the average LCC savings and PBP at each EL for the three consumer subgroups, along with the average LCC savings for the entire sample. In most cases, the average LCC savings and PBP for low-income households and small businesses 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.8 Comparison of LCC Savings and PBP for Consumer Subgroups and All Households Plus Light-Commercial Establishments

	Average Life-Cycle Cost Savings (2014$)				**Simple Payback Period (years)**			
TSL	**Low-income households**	**Senior-only households**	**Small Businesses**	**Both sectors**	**Low-income households**	**Senior-only households**	**Small Businesses**	**Both sectors**
1	115	84	171	97	2.4	3.0	1.6	2.8
2	187	144	267	162	1.8	2.2	1.2	2.1
3	250	194	358	218	1.7	2.1	1.1	2.0
4	324	242	477	276	2.4	2.9	1.5	2.7

c. Rebuttable Presumption Payback

As discussed in section III.E.2, EPCA establishes a rebuttable presumption that an energy conservation standard is economically justified if the increased purchase cost for a product that meets the standard is less than three times the value of the first-year energy savings resulting from the standard. 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 portable ACs. In contrast, the PBPs presented in section V.B.1.a were calculated using distributions for input values, with energy use based on field metering studies and RECS data.

Table V.9 presents the rebuttable-presumption payback periods for the considered TSLs. 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.9 shows the rebuttable presumption PBPs for the considered TSLs for portable ACs.

Table V.9 Portable Air Conditioners: Rebuttable PBPs (years)

	Trial Standard Level			
	1	**2**	**3**	**4**
Residential	2.1	1.5	1.5	2.0
Commercial	2.8	2.1	2.0	2.8
Both sectors	2.2	1.6	1.6	2.1

2. Economic Impacts on Manufacturers

DOE performed an MIA to estimate the impact of new energy conservation standards on portable AC manufacturers. The section below describes the expected impacts on manufacturers at each TSL. Chapter 12 of the NOPR TSD explains the analysis in further detail.

a. Industry Cash Flow Analysis Results

The following tables illustrate the estimated financial impacts (represented by changes in INPV) of new energy conservation standards on portable AC manufacturers, as well as the conversion costs that DOE estimates manufacturers would incur at each TSL. To evaluate the range of cash-flow impacts on the portable AC manufacturing industry, DOE used two different markup scenarios to model the range of anticipated market responses to new energy conservation standards.

To assess the lower (less severe) end of the range of potential impacts, DOE modeled a preservation of gross margin percentage markup scenario, in which a flat markup of 1.42 (i.e., the baseline manufacturer markup) is applied across all efficiency levels. In this scenario, DOE assumed that a manufacturer's absolute dollar markup would increase as production costs increase in the new energy conservation standards case. During interviews, manufacturers have indicated that it is optimistic to assume that they would be able to maintain the same gross margin markup as their production costs increase in response to a new energy conservation standard, particularly at higher TSLs.

To assess the higher (more severe) end of the range of potential impacts, DOE modeled the preservation of per-unit operating profit markup scenario, which assumes that manufacturers would not be able to preserve the same overall gross margin, but instead would cut their markup for minimally compliant products to maintain a cost competitive product offering while maintaining the same overall level of operating profit in absolute dollars as in the no-new-standards case. The two tables below show the range of potential INPV impacts for manufacturers of portable ACs. Table V.10 reflects the lower bound of impacts (higher profitability) and Table V.11 represents the upper bound of impacts (lower profitability).

Each scenario results in a unique set of cash flows and corresponding industry values at each TSL. In the following discussion, the INPV results refer to the sum of discounted cash flows through 2050, the difference in INPV between the no-new-standards case and each standards case, and the total industry conversion costs required for each standards case.

Table V.10 Manufacturer Impact Analysis under the Preservation of Gross Margin Percentage Markup Scenario for Analysis Period (2016 – 2050)

	Units	No-New-Standards Case	Trial Standard Level			
			1	2	3	4
INPV	2014$ Millions	725.5	637.9	521.7	419.1	404.5
Change in INPV	2014$ Millions		(87.6)	(203.8)	(306.2)	(320.9)
	(%)		(12.1%)	(28.1%)	(42.2)	(44.2%)
Free Cash Flow (2020)	2014$ Millions	49.2	(6.8)	(72.2)	(131.7)	(146.4)
Change in Free Cash Flow (2020)	(%)		(113.7%)	(246.7%)	(367.5%)	(397.2%)
Product Conversion Costs	2014$ Millions		53.4	113.9	161.8	170.8
Capital Conversion Costs	2014$ Millions		86.5	188.9	282.0	305.7
Total Conversion Costs	2014$ Millions		139.9	302.8	443.8	476.5

Parentheses indicate negative (-) values.

Table V.11 Manufacturer Impact Analysis under the Preservation of Per-Unit Operating Profit Markup Scenario for Analysis Period (2016 – 2050)

	Units	No-New-Standards Case	Trial Standard Level			
			1	**2**	**3**	**4**
INPV	2014$ Millions	725.5	631.3	503.8	378.6	301.9
Change in INPV	2014$ Millions		(94.2)	(221.7)	(346.8)	(423.5)
	(%)		(13.0%)	(30.6%)	(47.8%)	(58.4%)
Free Cash Flow (2020)	2014$ Millions	49.2	(6.8)	(72.2)	(131.7)	(146.4)
Change in Free Cash Flow (2020)	(%)		(113.7%)	(246.7%)	(367.5%)	(397.2%)
Product Conversion Costs	2014$ Millions		53.4	113.9	161.8	170.8
Capital Conversion Costs	2014$ Millions		86.5	188.9	282.0	305.7
Total Conversion Costs	2014$ Millions		139.9	302.8	443.8	476.5

Parentheses indicate negative (-) values.

Beyond impacts on INPV, 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 new standards take effect to provide perspective on the short-run cash flow impacts in the discussion of the results below.

At TSL 1, DOE estimates the impact on INPV for manufacturers of portable ACs to range from -94.2 million to -$87.6 million, or a decrease in INPV of 13.0 percent to 12.1 percent under the preservation of gross margin percentage markup scenario and the preservation of per-unit operating profit markup scenario, respectively. At this TSL, industry free cash flow is estimated to decrease by approximately 113.7 percent to $6.8

million, compared to the no-new-standards case value of $49.2 million in 2020, the year before the projected compliance date.

At TSL 1, the industry as a whole is expected to incur $53.4 million in product conversion costs attributed to upfront research, development, testing, and certification; as well as $86.5 million in one-time investments in property, plant, and equipment (PP&E) necessary to manufacture updated platforms. The industry conversion cost burden at TSL 1 would be associated with updates for portable ACs sold in the U.S. that are currently at the baseline, approximately 38 percent of platforms and 29 percent of shipments. At TSL 1, roughly half of non-compliant platforms will require some new components, including a higher efficiency heat exchanger (with increases in efficiency ranging from 10 to 20 percent). Higher efficiency heat exchangers are larger and will necessitate larger chassis sizes. The remaining non-compliant portable ACs will likely require a complete platform redesign, necessitating all new components and high associated re-tooling and R&D costs.

At TSL 2, DOE estimates the impact on INPV for manufacturers of portable ACs to range from -$221.7 million to -$203.8 million, or a decrease in INPV of 30.6 percent to 28.1 percent under the preservation of gross margin percentage markup scenario and the preservation of per-unit operating profit markup scenario, respectively. At this TSL, industry free cash flow is estimated to decrease by approximately 246.7 percent to -$72.2 million, compared to the no-new-standards case value of $49.2 million in 2020, the year before the projected compliance date.

At TSL 2, the industry as a whole is expected to incur $113.9 million in product conversion costs associated with the upfront research, development, testing, and certification; as well as $188.9 million in one-time investments in PP&E for products requiring platform updates. The industry conversion cost burden at this TSL would be associated with updates for portable ACs sold in the U.S. that are currently below the efficiency level corresponding to TSL 2, approximately 77 percent of platforms and 79 percent of shipments. At TSL 2, roughly 40 percent of non-compliant platforms will require some new components, including a higher efficiency heat exchanger (with increases in efficiency ranging from 10 to 20 percent). Higher efficiency heat exchangers are larger and will necessitate larger chassis sizes. The remaining non-compliant portable ACs will likely require a complete platform redesign, necessitating all new components and high associated re-tooling and R&D costs.

At TSL 3, DOE estimates the impact on INPV for manufacturers of portable ACs to range from -$346.8 million to -$306.2 million, or a decrease in INPV of 47.8 percent to 42.2 percent under the preservation of gross margin percentage markup scenario and the preservation of per-unit operating profit markup scenario, respectively. At this TSL, industry free cash flow is estimated to decrease by approximately 367.5 percent to -$131.7 million, compared to the no-new-standards case value of $49.2 million in 2020, the year before the projected compliance date.

At TSL 3, the industry as a whole is expected to incur $161.8 million in product conversion costs associated with the upfront research, development, testing, and certification; as well as $282.0 million in one-time investments in PP&E for products requiring platform redesigns. Again, the industry conversion cost burden at this TSL would be associated with updates for portable ACs sold in the U.S. that are currently below the efficiency level corresponding to TSL 3, approximately 100 percent of platforms and 100 percent of shipments. At TSL 3, roughly 16 percent of non-compliant platforms will require some new components, including a higher efficiency heat exchanger (with increases in efficiency ranging from 10 to 20 percent). Higher efficiency heat exchangers are larger and will necessitate larger chassis sizes. The remaining 84 percent of non-compliant portable ACs will likely require a complete platform redesign, necessitating all new components and high associated re-tooling and R&D costs.

At TSL 4, DOE estimates the impact on INPV for manufacturers of portable ACs to range from -$423.5 million to -$320.9 million, or a decrease in INPV of 58.4 percent to 44.2 percent under the preservation of gross margin percentage markup scenario and the preservation of per-unit operating profit markup scenario, respectively. At this TSL, industry free cash flow is estimated to decrease by approximately 397.2 percent to -$146.4 million, compared to the base-case value of $49.2 million in 2020, the year before the projected compliance date.

At TSL 4, the industry as a whole is expected to spend $170.8 million in product conversion costs associated with the research and development and testing and certification, as well as $305.7 million in one-time investments in PP&E for complete platform redesigns. The industry conversion cost burden at this TSL would be associated with updates for portable ACs sold in the U.S. that are currently below the efficiency level corresponding to TSL 4, approximately 100 percent of platforms and 100 percent of shipments. At TSL 4, 100 percent of non-compliant portable ACs will likely require a complete platform redesign, necessitating all new components and high associated re-tooling and R&D costs.

b. Impacts on Employment

DOE used the GRIM to estimate the domestic labor expenditures and number of domestic production workers in the no-new-standards case and at each TSL from 2016 to 2050. DOE used statistical data from the U.S Census Bureau's 2013 Annual Survey of Manufactures, the results of the engineering analysis, and interviews with manufacturers to determine the inputs necessary to calculate industry-wide labor expenditures and domestic employment levels at each TSL. Labor expenditures for the manufacture of a product are a function of the labor intensity of the product, the sales volume, and an assumption that wages in real terms remain constant.

DOE notes that the MIA assessment of impacts on manufacturing employment focuses specifically on the production workers manufacturing the covered products in question, rather than a manufacturer's broader operations. Thus, the estimated number of impacted employees in the MIA is separate and distinct from the total number of employees used to determine whether a manufacturer is a small business for purposes of analysis under the Regulatory Flexibility Act.

The estimates of production workers in this section only cover those up to and including the line-supervisor level that are directly involved in fabricating and assembling a product within the OEM facility. In addition, workers that perform services that are closely associated with production operations are included. Employees above the working-supervisor level are excluded from the count of production workers. Thus, the labor associated with non-production functions (e.g., factory supervision, advertisement, sales) is explicitly not covered.[66] In addition, DOE's estimates only account for production workers that manufacture the specific products covered by this rulemaking. Finally, because DOE does not expect that this standard will impact shipments, this analysis also does not factor in the dependence by some manufacturers on production volume to make their operations viable.

In the GRIM, DOE used the labor content of each product and the manufacturing production costs from the engineering analysis to estimate the annual labor expenditures in the portable AC manufacturing industry. DOE used information gained through interviews with manufacturers to estimate the portion of the total labor expenditures that can be attributed to domestic production labor.

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[66] The U.S. Census Bureau's 2013 Annual Survey of Manufactures provides the following definition: "The 'production workers' number includes workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, product development, auxiliary production for plant's own use (e.g., power plant), recordkeeping, and other services closely associated with these production operations at the establishment covered by the report. Employees above the working-supervisor level are excluded from this item."

Because industry research and manufacturer feedback indicates that there are no single-duct or dual-duct portable ACs produced in the United States, DOE does not provide an estimate of direct employment impacts. Employment impacts in the broader U.S. economy are documented in chapter 16 of the NOPR TSD.

c. Impacts on Manufacturing Capacity

As noted in the previous section, no single-duct or dual-duct portable ACs are manufactured in the United States. Therefore, new energy conservation standards would have no impact on U.S. production capacity.

d. Impacts on Subgroups of Manufacturers

Using average cost assumptions to develop an industry cash flow estimate is not adequate for assessing differential impacts among subgroups of manufacturers. Small manufacturers, niche players, or manufacturers exhibiting a cost structure that differs significantly from the industry average could be affected differently. DOE used the results of the industry characterization to group manufacturers exhibiting similar characteristics.

As previously mentioned, DOE did not identify any domestic small business manufacturers of single-duct or dual-duct portable ACs.

Additional information about the small business analysis is found in chapter 12 of the NOPR TSD and section V.B of this proposed rule.

e. Cumulative Regulatory Burden

One aspect of assessing manufacturer burden is the cumulative impact of multiple DOE standards and the regulatory actions of other Federal agencies and States that affect the manufacturers of a covered product or equipment. 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.

Companies that produce a wider range of regulated products, including those that producecomponents of other products subject to regulation, may be faced with more capital and product development expenditures than their competitors. This can prompt those companies to exit the market or reduce their product offerings, potentially reducing competition. Smaller companies can be especially affected, since they have lower sales volumes over which to amortize the costs of compliance with new regulations.

DOE aims to recognize and seeks to mitigate the overlapping effects on manufacturers of new or revised DOE standards and other regulatory actions affecting the same products, components and other equipment. In addition to DOE's proposed energy conservation regulations for portable ACs, several other existing and pending regulations apply to portable ACs products and other equipment produced by the same manufacturers. DOE evaluates these regulations that could affect portable AC manufacturers that will take effect approximately 3 years before or after the 2021 compliance date of the new energy conservation standards for portable ACs and the associated costs of these rulemakings Additionally, DOE will evaluate its approach to assessing cumulative regulatory burden for use in future rulemakings to ensure that it is effectively capturing the overlapping impacts of its regualtions. In particular, DOE will assess whether looking at rules where any portion of the compliance period potentially overlaps with the compliance period for the subject rulemaking would yield more a more accurate reflection of cumulative regulatory burdens. In this regard, DOE recognizes that if it were to undertake a rulemaking to amend the standards for Consumer Room ACs pursuant to the 6-year look back requirement under 42 U.S.C. 6295(m), that future Consumer Room AC rule could have a cumulative impact with this PACs rule during the portable ACs compliance period. The compliance years and expected industry conversion costs of energy conservation standards that may also impact portable AC manufacturers are indicated in Table V.12. DOE seeks public comment on the cumulative burden to manaufactures associated with the new Portable ACstandards as well as the approach DOE uses to undertake this evalaution, including the timeframes and regulatory dates evaluated, to effectively assess cumulative regaltory effect on manufactueres subject to DOE standards.

Table V.12 Compliance Dates and Expected Conversion Expenses of DOE Federal Energy Conservation Standards Affecting Portable AC Manufacturers

DOE Regulation	Approximate Compliance Dates	Estimated Total Industry Conversion Costs
Microwave Ovens 78 FR 36316 (June 17, 2013)	June 17, 2016	43.1 M (2011$)
Residential Clothes Washers 77 FR 32308 (May 31, 2012)	January 1, 2018	$418.5M (2010$)
Dehumidifiers 80 FR 31646 (June 3, 2015)	June 2019	$50.7M (2013$)[†]

[†] The final rule for this energy conservation standard has not been published. Therefore, the compliance date is an estimate and analysis of conversion costs have not been finalized at this time. If a value is provided for total industry conversion costs, this value represents an estimate from the NOPR.

In addition to other Federal energy conservation standards, manufacturers cited potential restrictions on the use of certain refrigerants and State-level refrigerant recovery regulations as sources of cumulative regulatory burden for portable AC manufacturers. For more details, see chapter 12, section 12.7.3 of the NOPR TSD.

3. National Impact Analysis

a. Significance of Energy Savings

To estimate the energy savings attributable to potential standards for portable 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 new standards (2021-2050). Table V.13 presents DOE's projections of the NES for each TSL considered for portable ACs. The savings were calculated using the approach described in section IV.H.2 of this proposed rule.

Table V.13 Cumulative National Energy Savings for Portable Air Conditioners Shipped in 2021–2050

Savings	Trial Standard Level			
	1	2	3	4
	Quads			
Source Energy Savings	0.21	0.51	0.75	1.10
Full Fuel Cycle Energy Savings	0.22	0.53	0.78	1.15

OMB Circular A-4[67] requires agencies to present analytical results, including separate schedules of the monetized benefits and costs that show the type and timing of benefits and costs. Circular A-4 also directs agencies to consider the variability of key elements underlying the estimates of benefits and costs. For this rulemaking, DOE undertook a sensitivity analysis using nine, rather than 30, years of product shipments. The choice of a nine-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.[68] The review timeframe established in EPCA is generally not synchronized with the product lifetime, product manufacturing cycles, or other factors specific to portable 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 nine-year analytical period are presented in Table

[67] U.S. OMB, "Circular A-4: Regulatory Analysis" (Sept. 17, 2003) (Available at: http://www.whitehouse.gov/omb/circulars_a004_a-4/).

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

V.14. The impacts are counted over the lifetime of portable ACs purchased in 2021–2050.

Table V.14 Cumulative National Energy Savings for Portable Air Conditioners; Nine Years of Shipments (2021–2029)

Savings	**Trial Standard Level**			
	1	**2**	**3**	**4**
	Quads			
Source Energy Savings	0.04	0.14	0.23	0.34
Full-Fuel-Cycle Energy Savings	0.05	0.14	0.24	0.36

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 portable ACs. In accordance with OMB's guidelines on regulatory analysis,[69] DOE calculated NPV using both a 7-percent and a 3-percent real discount rate. Table V.15 shows the consumer NPV results with impacts counted over the lifetime of products purchased in 2021–2050.

Table V.15 Cumulative Net Present Value of Consumer Benefits for Portable Air Conditioners Shipped in 2021–2050

Discount rate	**Trial Standard Level**			
	1	**2**	**3**	**4**
	Billion 2014$			
3 percent	2.08	5.20	7.64	10.64
7 percent	0.81	2.15	3.23	4.46

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

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.16. The impacts are counted over the lifetime of products purchased in 2021–2029. As mentioned previously, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology or decision criteria.

Table V.16 Cumulative Net Present Value of Consumer Benefits for Portable Air Conditioners; Nine Years of Shipments (2021–2029)

Discount rate	**Trial Standard Level**			
	1	**2**	**3**	**4**
	Billion 2014$			
3 percent	0.55	1.78	2.87	4.05
7 percent	0.30	1.01	1.63	2.28

The above results reflect the use of a default trend to estimate the change in price for portable ACs over the analysis period (see section IV.F.1 of this document). DOE also conducted a sensitivity analysis that considered one scenario with a lower rate of price decline than the reference case and one scenario with a higher rate of price decline than the reference case. The results of these alternative cases are presented in appendix 10C of the NOPR TSD. In the high-price-decline case, the NPV of consumer benefits is higher than in the default case. In the low-price-decline case, the NPV of consumer benefits is lower than in the default case.

c. Indirect Impacts on Employment

DOE expects energy conservation standards for portable ACs to reduce energy bills 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 in this rulemaking. DOE understands that there are uncertainties involved in projecting employment impacts, especially changes in the later years of the analysis. Therefore, DOE generated results for near-term timeframes (2021–2050), where these uncertainties are reduced.

The results suggest that the proposed standards are 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

Based on testing conducted in support of this proposed rule, discussed in chapter 5 of the NOPR TSD, DOE has tentatively concluded that the standards proposed in this NOPR would not reduce the utility or performance of the portable ACs under consideration in this rulemaking. Manufacturers of these products currently offer units that meet or exceed the proposed standards.

5. Impact of Any Lessening of Competition

As discussed in section III.E.1.e, 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 any analysis of the nature and extent of such impact. To assist the Attorney General in making such 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, interested parties 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. As a measure of this reduced demand, chapter 15 in the NOPR TSD presents the estimated reduction in generating capacity, relative to the no-new-standards case, for the TSLs that DOE considered in this rulemaking.

Energy conservation resulting from new standards for portable ACs is expected to yield environmental benefits in the form of reduced emissions of air pollutants and GHGs. Table V.17 provides DOE's estimate of cumulative emissions reductions expected to result from the TSLs considered in this rulemaking. The table includes both power sector emissions and upstream emissions. The emissions were calculated using the multipliers discussed in section IV.K. DOE reports annual emissions reductions for each TSL in chapter 13 of the NOPR TSD.

Table V.17 Cumulative Emissions Reduction for Portable Air Conditioners Shipped in 2021–2050

	Trial Standard Level			
	1	2	3	4
Power Sector Emissions				
CO_2 (million metric tons)	14.6	35.7	52.7	77.2
SO_2 (thousand tons)	8.0	19.8	29.3	43.0
NO_X (thousand tons)	16.5	40.2	59.3	86.9
Hg (tons)	0.03	0.07	0.11	0.16
CH_4 (thousand tons)	1.2	2.9	4.2	6.2
N_2O (thousand tons)	0.2	0.4	0.6	0.9
Upstream Emissions				
CO_2 (million metric tons)	0.8	2.1	3.0	4.4
SO_2 (thousand tons)	0.2	0.4	0.6	0.8
NO_X (thousand tons)	12.2	29.4	43.2	63.2
Hg (tons)	0.00	0.00	0.00	0.00
CH_4 (thousand tons)	67.3	162.5	238.8	349.3
N_2O (thousand tons)	0.01	0.02	0.03	0.04
Total FFC Emissions				
CO_2 (million metric tons)	15.5	37.7	55.7	81.6
SO_2 (thousand tons)	8.2	20.2	29.9	43.9
NO_X (thousand tons)	28.7	69.6	102.6	150.1
Hg (tons)	0.03	0.07	0.11	0.16
CH_4 (thousand tons)	68.5	165.3	243.0	355.5
CH_4 (thousand tons CO_2eq)*	1,917	4,629	6,804	9,954
N_2O (thousand tons)	0.2	0.4	0.6	0.9
N_2O (thousand tons CO_2eq)*	45.5	111.8	165.6	242.8

* CO_2eq is the quantity of CO_2 that would have the same GWP.

As part of the analysis for this proposed rule, DOE estimated monetary benefits likely to result from the reduced emissions of CO_2 and NO_X that DOE estimated for each of the considered TSLs for portable ACs. As discussed in section IV.L of this document, for CO_2, DOE used the most recent values for the SCC developed by an interagency process. The four sets of SCC values for CO_2 emissions reductions in 2015 resulting from that process (expressed in 2014$) are represented by $12.2/metric ton (the average value from a distribution that uses a 5-percent discount rate), $41.2/metric ton (the average value from a distribution that uses a 3-percent discount rate), $63.4/metric ton (the average value from a distribution that uses a 2.5-percent discount rate), and $121/metric ton (the 95^{th}-percentile value from a distribution that uses a 3-percent discount rate). The values for later years are higher due to increasing damages (public health, economic and environmental) as the projected magnitude of climate change increases.

Table V.18 presents the global value of CO_2 emissions reductions at each TSL. For each of the four cases, DOE calculated a present value of the stream of annual values using the same discount rate as was used in the studies upon which the dollar-per-ton values are based. DOE calculated domestic values as a range from 7 percent to 23 percent of the global values; these results are presented in chapter 14 of the NOPR TSD.

Table V.18 Estimates of Global Present Value of CO_2 Emissions Reduction for Products Shipped in 2021–2050

TSL	SCC Case*			
	5% discount rate, average	3% discount rate, average	2.5% discount rate, average	3% discount rate, 95th percentile
	Million 2014$			
Power Sector Emissions				
1	96	450	718	1,374
2	241	1,119	1,781	3,411
3	362	1,666	2,648	5,078
4	532	2,445	3,885	7,452
Upstream Emissions				
1	5	26	41	79
2	14	64	102	195
3	20	95	150	288
4	30	139	221	423
Total FFC Emissions				
1	101	476	760	1,453
2	255	1,182	1,882	3,606
3	382	1,761	2,799	5,367
4	562	2,584	4,106	7,875

* For each of the four cases, the corresponding SCC value for emissions in 2015 is $12.2, $41.2, $63.4, and $121 per metric ton (2014$). The values are for CO_2 only (i.e., not CO_{2eq} of other GHGs).

DOE is 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 CO_2 emissions in this rulemaking is subject to change. DOE, together with other Federal agencies, will continue to review various methodologies for estimating the monetary value of reductions in CO_2 and other GHG emissions. This ongoing review will consider the comments on this subject that are part of the public record for this and other rulemakings, as well as other methodological assumptions and issues. However, consistent with DOE's legal obligations, and taking into account the uncertainty involved with this particular issue, DOE has included in this proposed rule the most recent values and analyses resulting from the interagency review process.

DOE also estimated the cumulative monetary value of the economic benefits associated with NO_X emissions reductions anticipated to result from the considered TSLs for portable ACs. The dollar-per-ton value that DOE used is discussed in section IV.L of this document. Table V.19 presents the cumulative present values for NO_X emissions for each TSL calculated using 7-percent and 3-percent discount rates.

Table V.19 Estimates of Present Value of NO_X Emissions Reduction for Portable Air Conditioners Shipped in 2021–2050

TSL	3% discount rate	7% discount rate
	Million 2014$	
Power Sector Emissions		
1	26.6	10.1
2	67.4	27.0
3	101.2	41.4
4	148.8	61.2
Upstream Emissions		
1	21.3	7.9
2	53.5	21.0
3	80.0	32.1
4	117.5	47.4
Total FFC Emissions		
1	47.9	18.0
2	120.9	47.9
3	181.2	73.5
4	266.3	108.6

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

The NPV of the monetized benefits associated with emissions reductions can be viewed as a complement to the NPV of the consumer savings calculated for each TSL considered in this rulemaking. Table V.20 presents the NPV values that result from adding the estimates of the potential economic benefits resulting from reduced CO_2 and

NO_X emissions in each of four valuation scenarios to the NPV of consumer savings calculated for each TSL considered in this rulemaking, at both a 7-percent and 3-percent discount rate. The CO_2 values used in the columns of each table correspond to the four sets of SCC values discussed above.

Table V.20 Net Present Value of Consumer Savings Combined with Present Value of Monetized Benefits from CO_2 and NO_X Emissions Reductions

TSL	Consumer NPV at 3% Discount Rate added with:			
	SCC Case \$12.2/ metric ton and 3% NO_X Value	SCC Case \$41.2/ metric ton and 3% NO_X Value	SCC Case \$63.4/ metric ton and 3% NO_X Value	SCC Case \$121/ metric ton and 3% NO_X Value
	Billion 2014\$			
1	2.2	2.6	2.9	3.6
2	5.6	6.5	7.2	8.9
3	8.2	9.6	10.6	13.2
4	11.5	13.5	15.0	18.8
TSL	Consumer NPV at 7% Discount Rate added with:			
	SCC Case \$12.2/ metric ton and 7% NO_X Value	SCC Case \$41.2/ metric ton and 7% NO_X Value	SCC Case \$63.4/ metric ton and 7% NO_X Value	SCC Case \$121/ metric ton and 7% NO_X Value
	Billion 2014\$			
1	0.9	1.3	1.6	2.3
2	2.5	3.4	4.1	5.8
3	3.7	5.1	6.1	8.7
4	5.1	7.1	8.7	12.4

Two issues are relevant in considering the above results. First, the national operating cost savings are domestic U.S. monetary savings that occur as a result of market transactions, while the value of CO_2 reductions is based on a global value. Second, the assessments of operating cost savings and the SCC are performed with different methods that use different time frames for analysis. The national operating cost savings is measured for the lifetime of products shipped in 2021 to 2050. Because CO_2

emissions have a very long residence time in the atmosphere,[70] the SCC values in future years reflect future CO_2-emissions impacts that continue beyond 2100.

C. Conclusion

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

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

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

To aid the reader as DOE discusses the benefits and/or burdens of each TSL, tables 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, such as low-income households and seniors, who may be disproportionately affected by a national standard (see section V.B.2.d).

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 (that is, renter versus owner; builder versus purchaser). Other literature indicates that with less than perfect foresight and a high degree of uncertainty about the future, consumers may trade off these types of investments at a higher than expected rate between current consumption and uncertain future energy cost savings. This undervaluation suggests that regulation that promotes energy efficiency can produce significant net private gains (as well as producing social gains by, for example, reducing pollution).

In DOE's current regulatory analysis, potential changes in the benefits and costs of a regulation due to changes in consumer purchase decisions are included in two ways. First, if consumers forego a purchase of a product in the standards case, this decreases sales for product manufacturers and the impact on manufacturers attributed to lost revenue is included in the MIA. Second, DOE accounts for energy savings attributable only to products actually used by consumers in the standards case; if a regulatory option decreases the number of products used by consumers, this decreases the potential energy savings from an energy conservation standard. 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.[71]

In its energy use and economic analyses, DOE did not consider product switching as a result of setting portable AC standards. There is no literature informing whether a substitution effect may be occurring between portable ACs or room ACs. Therefore, DOE is requesting input and data from interested parties as to whether product switching is occurring between these different types of cooling products and, if so, whether switching to room or central ACs would be significantly increased due to DOE establishing portable AC standards.

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

DOE did consider the impact of portable AC standards on product utilization through the use of a direct rebound effect. Higher-efficiency portable ACs reduce the operating costs for a consumer, which can lead to greater use of the product. A direct rebound effect occurs when a piece of equipment that is made more efficient is used more intensively, such that the expected energy savings from the efficiency improvement may not fully materialize. For the NOPR analysis, DOE examined a 2009 review of empirical estimates of the rebound effect for various energy-using products.[72] There are relatively few estimates of the direct rebound effect for household cooling. The two studies discussed in the review are relatively old studies, conducted during the period of rising energy prices and using small sample sizes. One shows a short-run rebound effect of 4 percent,[73] while the other reported a wide range of 1-26 percent.[74] In the recent NOPR for residential furnaces, DOE chose to use a rebound effect of 15 percent, which is roughly in the center of the range reported for household cooling. 80 FR 13120, 13148 (May 12, 2015).[75] For consistency, DOE used a rebound effect of 15 percent for portable ACs in all of the estimates in this rulemaking.

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

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[72] Steven Sorrell, et. al, Empirical Estimates of the Direct Rebound Effect: A Review, 37 Energy Pol'y 1356–71 (2009).
[73] Hausman, J. A. Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables. The Bell Journal of Economics. 1979. 10(1): pp. 33–54.
[74] Dubin, J. A., A. K. Miedema, and R. V. Chandran. Price effects of energy-efficient technologies—a study of residential demand for heating and cooling. Rand Journal of Economics. 1976. 17(3): pp. 310–25.
[75] U.S. Department of Energy–Office of Energy Efficiency and Renewable Energy. Federal Register. May 12, 2015. vol. 80, no. 97: pp. 28851–28852. (Last accessed August 12, 2015.) http://www.gpo.gov/fdsys/pkg/FR-2015-05-20/pdf/2015-12218.pdf.

support empirical quantitative tools for improved assessment of the consumer welfare impacts of appliance standards. DOE has posted a paper that discusses the issue of consumer welfare impacts of appliance energy efficiency standards, and potential enhancements to the methodology by which these impacts are defined and estimated in the regulatory process.[76] 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 Trial Standard Levels Considered for Portable ACs

Table V.21 and Table V.22 summarize the quantitative impacts estimated for each TSL for portable ACs. The efficiency levels contained in each TSL are described in section V.A of this proposed rule.

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

Table V.21 Summary of Analytical Results for Portable Air Conditioner TSLs: National Impacts, 2021 - 2050

Category	TSL 1	TSL 2	TSL 3	TSL 4
Cumulative FFC National Energy Savings (quads)				
	0.22	0.53	0.78	1.15
NPV of Consumer Costs and Benefits (2014$ billion)				
3% discount rate	2.08	5.20	7.64	10.64
7% discount rate	0.81	2.15	3.23	4.46
Cumulative FFC Emissions Reduction (Total FFC Emission)				
CO_2 (million metric tons)	15.5	37.7	55.7	81.6
SO_2 (thousand tons)	8.2	20.2	29.9	43.9
NO_X (thousand tons)	28.7	69.6	102.6	150.1
Hg (tons)	0.03	0.07	0.11	0.16
CH_4 (thousand tons)	68.5	165.3	243.0	355.5
CH_4 (thousand tons CO_2eq)*	1,917	4,629	6,804	9,954
N_2O (thousand tons)	0.2	0.4	0.6	0.9
N_2O (thousand tons CO_2eq)*	45.5	111.8	165.6	242.8
Value of Emissions Reduction (Total FFC Emissions)				
CO_2 (2014$ billion)**	0.101 to 1.453	0.255 to 3.606	0.382 to 5.367	0.562 to 7.875
NO_X – 3% discount rate (2014$ million)	47.9 to 109.3	120.9 to 275.6	181.2 to 413.2	266.3 to 607.2
NO_X – 7% discount rate (2014$ million)	18.0 to 40.6	47.9 to 108.1	73.5 to 165.7	108.6 to 244.8

* CO_2eq is the quantity of CO_2 that would have the same GWP.

** Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

Table V.22 Portable Air Conditioner Trial Standard Levels: Manufacturer (2016–2050) and Consumer Impacts (2021–2050)

Category	TSL 1	TSL 2	TSL 3	TSL 4
Manufacturer Impacts				
Industry NPV (2014$ millions) (Base Case INPV = 725.5)	631.3 to 637.9	503.8 to 521.7	378.6 to 419.2	301.9 to 404.5
Industry NPV (% change)	(13.0%) to (12.1%)	(30.6%) to (28.1%)	(47.8%) to (42.2%)	(58.4%) to (44.2%)
Consumer Average LCC Savings (2014$)				
Residential	84	144	194	242
Commercial	188	292	392	528
All	97	162	218	276
Consumer Simple PBP (years)				
Residential	3.0	2.2	2.1	2.9
Commercial	1.6	1.2	1.1	1.5
All	2.8	2.1	2.0	2.7
% of Consumers that Experience Net Cost				
Residential	9	13	19	31
Commercial	2	2	3	9
All	9	12	17	28

Parentheses indicate negative (-) values.

DOE first considered TSL 4, which represents the max-tech efficiency level. TSL 4 would save 1.15 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be $4.46 billion using a discount rate of 7 percent, and $10.64 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 81.6 Mt of CO_2, 43.9 thousand tons of SO_2, 150.1 thousand tons of NO_X, 0.16 tons of Hg, 355.5 thousand tons of CH_4, and 0.9 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 4 ranges from $562 million to $7,875 million.

At TSL 4, the average LCC impact is a savings of $242 for residential, $528 for commercial, and $276 for both sectors. The simple payback period is 2.9 years for residential, 1.5 years for commercial, and 2.7 years for both sectors. The fraction of all consumers experiencing a net LCC cost is 28 percent.

At TSL 4, the projected change in INPV ranges from a decrease of $423.5 million to a decrease of $320.9 million, which correspond to decreases of 58.4 percent and 44.2 percent, respectively. DOE estimates that no portion of the market will meet the efficiency standard specified by this TSL in 2020, the year before the compliance year. As such, manufacturers would have to redesign all products by the expected 2021 compliance date to meet demand. Redesigning all units to meet the max-tech efficiency level would require considerable capital and product conversion expenditures. At TSL 4, the capital conversion costs total as much as $305.7 million, roughly 13.1 times the industry annual ordinary capital expenditure in 2020 (the year leading up to new standards). DOE estimates that complete platform redesigns would cost the industry $170.8 million in product conversion costs. These conversion costs largely relate to the extensive research programs required to develop new products that meet the efficiency standards at TSL 4. These costs are equivalent to 17.8 times the industry annual budget for research and development. As such, the conversion costs associated with the changes in products and manufacturing facilities required at TSL 4 would require significant use of manufacturers' financial reserves (manufacturer capital pools), impacting other areas of business that compete for these resources and significantly reducing INPV. In addition, manufacturers could face a substantial impact on profitability at TSL 4. Because manufacturers are more likely to reduce their margins to maintain a price-competitive product at higher TSLs, especially in the lower-capacity portable segment, DOE expects that TSL 4 would yield impacts closer to the high end of the range of INPV impacts. If the high end of the range of impacts is reached, as DOE expects, TSL 4 could result in a net loss to manufacturers of 58.4 percent of INPV.

Beyond the direct financial impact on manufacturers, TSL 4 may also contribute to the unavailability of portable ACs at certain cooling capacities. The efficiency at TSL 4 is a theoretical level that DOE developed by modeling the most efficient components available. However, DOE is aware that the highest-efficiency compressors that are necessary to meet TSL 4 may not be available to all manufacturers for the full range of capacities of portable ACs. Because specific high-efficiency components available are driven largely by the markets for other products with higher shipments (e.g., room ACs), portable AC manufacturers may be constrained in their design choices. This may have the potential to eliminate portable ACs of certain cooling capacities from the market, should TSL 4 be selected.

The Secretary tentatively concludes that at TSL 4 for portable ACs, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the economic burden on some consumers, and the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV.

Consequently, the Secretary has tentatively concluded that TSL 4 is not economically justified.

DOE then considered TSL 3, which would save an estimated 0.78 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be $3.23 billion using a discount rate of 7 percent, and $7.64 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 55.7 Mt of CO_2, 29.9 thousand tons of SO_2, 102.6 thousand tons of NO_X, 0.11 tons of Hg, 243.0 thousand tons of CH_4, and 0.6 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 3 ranges from $382 million to $5,367 million.

At TSL 3, the average LCC impact is a savings of $194 for residential, $392 for commercial, and $218 for both sectors. The simple payback period is 2.1 years for residential, 1.1 years for commercial, and 2.0 years for both sectors. The fraction of all consumers experiencing a net LCC cost is 17 percent.

At TSL 3, the projected change in INPV ranges from a decrease of $346.8 million to a decrease of $306.2 million, which correspond to decreases of 47.8 percent and 42.2 percent, respectively. Again, DOE estimates that no portion of the market will meet the efficiency standard specified by this TSL in 2020, the year before the compliance year. As such, manufacturers would have to make upgrades to all products by the 2021 projected compliance date to meet demand. Redesigning all units to meet TSL 3 would require considerable capital and product conversion expenditures. The estimated capital conversion costs total as much as $282.0 million, which is 12.1 times the industry annual capital expenditure in 2020 (the year leading up to the new standards). DOE estimates that the redesigns necessary to meet these standards would cost the industry $161.8 million in product conversion costs. These conversion costs largely relate to the research programs and re-testing required to develop products that meet the efficiency standards set forth by TSL 3, and are 16.8 times the industry annual budget for research and development in 2020, the year leading up to new standards. As such, the conversion costs associated with the changes in products and manufacturing facilities required at TSL 3 would still require significant use of manufacturers' financial reserves, impacting other areas of business that compete for these resources and significantly reducing INPV. Because manufacturers are more likely to reduce their margins to maintain a price-competitive product at higher TSLs, DOE expects that TSL 3 would yield impacts closer to the high end of the range of INPV impacts as indicated by the preservation of per-unit operating profit markup scenario. If this is the case, TSL 3 could result in a net loss of 47.8 percent in INPV to manufacturers of portable ACs.

Similar to TSL 4, beyond the direct financial impact on manufacturers, TSL 3 may also contribute to the unavailability of portable ACs at certain cooling capacities. TSL 3 is based on the single highest efficiency unit in DOE's test sample. However, DOE believes few, if any, other units on the market are able to achieve these efficiencies and that the highest efficiency single-speed compressors likely necessary to meet TSL 3 may not be available to all manufacturers for the full range of capacities of portable ACs. Because high-efficiency components available at any given time are driven largely by the markets for other products with higher shipments (e.g., room ACs), portable AC manufacturers may be constrained in their design choices. This may have the potential to eliminate portable ACs of certain cooling capacities from the market.

The Secretary tentatively concludes that at TSL 3 for portable ACs, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the negative impacts on some consumers and on manufacturers, including the conversion costs that could result in a large reduction in INPV for manufacturers. Consequently, the Secretary has tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2, which would save an estimated 0.53 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefit would be $2.15 billion using a discount rate of 7 percent, and $5.20 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 37.7 Mt of CO_2, 20.2 thousand tons of SO_2, 69.6 thousand tons of NO_X, 0.07 tons of Hg, 165.3 thousand tons of CH_4, and 0.4 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 2 ranges from $255 million to $3,606 million.

At TSL 2, the average LCC impact is a savings of $144 for residential, $292 for commercial, and $162 for both sectors. The simple payback period is 2.2 years for residential, 1.2 years for commercial, and 2.1 years for both sectors. The fraction of all consumers experiencing a net LCC cost is 12 percent.

At TSL 2, the projected change in INPV ranges from a decrease of $221.7 million to a decrease of $203.8 million, which correspond to decreases of 30.6 percent and 28.1 percent, respectively. DOE estimates that approximately 23 percent of available platforms and 21 percent of shipments will meet the efficiency standards specified by this TSL in 2020, the year before the compliance year. As such, manufacturers would have to make upgrades to 77 percent of platforms by the 2021 projected compliance date to meet demand. At TSL 2, manufacturers will incur conversion costs associated with the integration of higher efficiency components. The estimated capital conversion costs total as much as $188.9 million, which is 8.1 times the industry annual capital expenditure in 2020 (the year leading up to the new standards). DOE estimates that the redesigns necessary to meet these standards would cost the industry $113.9 million in product conversion costs. These conversion costs largely relate to the research programs and re-testing required to develop products that meet the efficiency standards set forth by TSL 2, and are 11.8 times the industry annual budget for research and development in 2020, the year leading up to new standards. Because manufacturers are more likely to reduce their margins to maintain a price-competitive product at higher TSLs, DOE expects that TSL 2 would yield impacts closer to the high end of the range of INPV impacts as indicated by the preservation of per-unit operating profit markup scenario. If this is the case, TSL 2 could result in a net loss of 30.6 percent in INPV to manufacturers of portable ACs.

After considering the analysis and weighing the benefits and burdens, the Secretary has tentatively concluded that at TSL 2 for portable ACs, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, the estimated monetary value of the emissions reductions, and positive average LCC savings would outweigh the negative impacts on some consumers and on manufacturers, including the conversion costs that could result in a reduction in INPV for manufacturers. Accordingly, the Secretary has tentatively concluded that TSL 2 would offer the maximum improvement in efficiency that is technologically feasible and economically justified, and would result in the significant conservation of energy.

Therefore, based on the above considerations, DOE proposes to adopt the energy conservation standards for portable ACs at TSL 2. The proposed new energy conservation standards for portable ACs, which are expressed as CEER, are shown in Table V.23.

Table V.23 Proposed Energy Conservation Standards for Portable Air Conditioners

Portable Air Conditioner Product Class	**Minimum CEER** (Btu/Wh)
Single-duct and dual-duct portable air conditioners	$Minimum\ CEER = 1.14 \times \frac{SACC}{(2.7447 \times SACC^{0.6829})}$
CEER is Combined Energy Efficiency Ratio in in Btu/Wh Seasonally Adjusted Cooling Capacity (SACC) in Btu/h determined in accordance with Appendix CC	

2. Summary of 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 the sum of: (1) the annualized national economic value (expressed in 2014$) 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 CO_2 and NO_X emission reductions.[77]

Table V.24 shows the annualized values for portable ACs under TSL 2, expressed in 2014$. The results under the primary estimate are as follows.

Using a 7-percent discount rate for benefits and costs other than CO_2 reductions (for which DOE used a 3-percent discount rate along with the average SCC series corresponding to a value of $40.0/ton in 2015 (2014$)), the estimated cost of the proposed standards for portable ACs is $30 million per year in increased equipment costs, while the estimated benefits are $273 million per year in reduced equipment operating costs, $70 million per year in CO_2 reductions, and $5.4 million per year in reduced NO_X emissions. In this case, the net benefit amounts to $318 million per year.

[77] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2014, the year used for discounting the NPV of total consumer costs and savings. For the benefits, DOE calculated a present value associated with each year's shipments in the year in which the shipments occur (2020, 2030, etc.), and then discounted the present value from each year to 2015. The calculation uses discount rates of 3 and 7 percent for all costs and benefits except for the value of CO_2 reductions, for which DOE used case-specific discount rates. Using the present value, DOE then calculated the fixed annual payment over a 30-year period, starting in the compliance year that yields the same present value.

Using a 3-percent discount rate for all benefits and costs and the average SCC series corresponding to a value of $40.0/ton in 2015 (2014$), the estimated cost of the proposed standards for portable ACs is $30 million per year in increased equipment costs, while the estimated annual benefits are $338 million in reduced operating costs, $70 million in CO_2 reductions, and $7.2 million in reduced NO_X emissions. In this case, the net benefit amounts to $385 million per year.

Table V.24 Annualized Benefits and Costs of Proposed Standards (TSL 2) for Portable Air Conditioners

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*,‡	High Net Benefits Estimate*
		Million 2014$/year		
Benefits				
Consumer Operating Cost Savings	7%	273	125	296
	3%	338	153	371
CO_2 Reduction at $12.2/t**	5%	21	10	23
CO_2 Reduction at $40.0/t**	3%	70	33	75
CO_2 Reduction at $62.3/t**	2.5%	102	48	109
CO_2 Reduction at $117/t**	3%	213	100	228
NO_X Reduction at $2,684/t†	7%	5.4	3	12.9
	3%	7.2	3	17.4
Total††	7% plus CO_2 range	300 to 492	137 to 227	331 to 537
	7%	348	160	383
	3% plus CO_2 range	366 to 558	167 to 256	411 to 616
	3%	415	189	463
Costs				
Consumer Incremental Product Costs	7%	30	31	27
	3%	30	31	26
Total Net Benefits				
Total††	7% plus CO_2 range	269 to 462	106 to 196	304 to 510
	7%	318	129	357
	3% plus CO_2 range	336 to 528	135 to 225	385 to 590
	3%	385	158	437

* This table presents the annualized costs and benefits associated with portable ACs shipped in 2021−2050. These results include benefits to consumers which accrue after 2050 from the products purchased in 2021−2050. The results account for the incremental variable and fixed costs incurred by manufacturers due to the standard, some of which may be incurred in preparation for the rule. The Primary, Low Benefits, and High Benefits Estimates utilize projections of energy prices from the AEO 2015 Reference case, Low Economic Growth case, and High Economic Growth case, respectively. In addition, incremental product costs reflect a medium decline rate in the Primary Estimate, a low decline rate in the Low Benefits Estimate, and a high decline rate in the High Benefits Estimate. The methods used to derive projected price trends are explained in section IV.H.

** The CO_2 values represent global monetized values of the SCC, in 2014$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. The SCC time series incorporate an escalation factor.

† The $/ton values used for NO_X are described in section IV.L.

†† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to the average SCC with a 3-percent discount rate ($40.0/t case). In the rows labeled "7% plus CO_2 range" and "3% plus CO_2 range," the operating cost and NO_X benefits are calculated using the labeled discount rate, and those values are added to the full range of CO_2 values.

‡ In addition to the AEO 2015 Low Economic Growth case, the Low Net Benefits Estimate reflects a 50-percent reduction in the number of operating hours. Details of the sensitivity analysis can be found in appendix 8F.

VI. Certification Reporting and Enforcement Requirements

In a recent test procedure rulemaking, DOE established sampling plan requirements for portable ACs in 10 CFR 429.62, to enable manufacturers to make representations of energy consumption or efficiency metrics. DOE proposes in this rulemaking that certain product specific information be included when a manufacturer wishes to certify their products with DOE and demonstrate compliance with any energy conservation standards established as a result of this rulemaking. DOE proposes in this NOPR that portable AC certification reports include CEER and SACC, as determined by the DOE test procedure in appendix CC, in addition to the duct configuration (single-duct, dual-duct, or ability to operate in both configurations), presence of heating function, and primary condensate removal feature (auto-evaporation, gravity drain, removable internal collection bucket, or condensate pump).

In this NOPR, DOE is also establishing a new section within 10 CFR 429.134 to include enforcement requirements for portable ACs. The enforcement provisions clarify how the SACC would be used for determining the minimum allowable CEER for a tested basic model.

DOE requests comment on the proposed certification reporting requirements and enforcement requirements for portable ACs.

VII. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

Section 1(b)(1) of Executive Order 12866, "Regulatory Planning and Review," 58 FR 51735 (Oct. 4, 1993), requires each agency to identify the problem that it intends to address, including, where applicable, the failures of private markets or public institutions that warrant new agency action, as well as to assess the significance of that problem. The problems that the proposed standards 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 GHGs that impact human health and global warming. DOE attempts to quantify some of the external benefits through use of social cost of carbon values.

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.

Furthermore, the Administrator of OIRA has determined that the proposed regulatory action is an "economically" significant regulatory action under section (3)(f)(1) of Executive Order 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 TSD for this rulemaking.

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

DOE emphasizes as well that Executive Order 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, 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, DOE believes that 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 Executive Order 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 (http://energy.gov/gc/office-general-counsel). DOE has prepared the following IRFA for the products that are the subject of this rulemaking.

For manufacturers of portable ACs, the SBA has set a size threshold, which defines those entities classified as "small businesses" for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. See 13 CFR part 121. The size standards are listed by NAICS code and industry description and are available at http://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf. Manufacturing of portable ACs is classified under NAICS 333415, "Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing Other Major Household Appliance Manufacturing." The SBA sets a threshold of 1,250 employees or less for an entity to be considered as a small business for this category.

To estimate the number of companies that could be small business manufacturers of products covered by this rulemaking, DOE first surveyed the AHAM member directory. DOE then consulted publicly available data, purchased company reports from vendors such as Dun and Bradstreet, and contacted manufacturers, where needed, to determine the number of manufacturers with manufacturing facilities located within the United States that meet the SBA's definition of a "small business manufacturing facility." DOE screened out companies that do not manufacture products covered by this rulemaking or are foreign owned and operated. In the February 2015 TP NOPR, DOE estimated that there was one small business that manufactured portable ACs. DOE subsequently determined that this small business no longer manufactures portable ACs and, therefore, DOE estimates that there are no domestic manufacturers of single-duct or dual-duct portable ACs that meet the SBA's definition of a "small business."

Based on the discussion above, DOE certifies that the standards for portable ACs set forth in this proposed rule would not have a significant economic impact on a substantial number of small entities. Accordingly, DOE has not prepared a regulatory flexibility analysis for this rulemaking. DOE will transmit this certification to the SBA as required by 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act

DOE has determined that portable ACs are a covered product under EPCA. 81 FR 22514 (April 18, 2016). Because portable ACs are a covered product, manufacturers would need to 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, 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 portable 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 30 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

D. Review Under the National Environmental Policy Act of 1969

Pursuant to the National Environmental Policy Act (NEPA) of 1969, DOE has determined that the proposed rule fits within the category of actions included in Categorical Exclusion (CX) B5.1 and otherwise meets the requirements for application of a CX. See 10 CFR Part 1021, App. B, B5.1(b); 1021.410(b) and App. B, B(1)–(5). The proposed rule fits within this category of actions because it is a rulemaking that establishes energy conservation standards for consumer products or industrial equipment, and for which none of the exceptions identified in CX B5.1(b) apply. Therefore, DOE has made a CX determination for this rulemaking, and DOE does not need to prepare an Environmental Assessment or Environmental Impact Statement for this proposed rule. DOE's CX determination for this proposed rule is available at http://energy.gov/nepa/categorical-exclusion-cx-determinations-cx/.

E. Review Under Executive Order 13132

Executive Order 13132, "Federalism," 64 FR 43255 (Aug. 10, 1999), imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have Federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE has examined this proposed rule and has tentatively determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this proposed rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, "Civil Justice Reform," imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; and (3) provide a clear legal standard for affected conduct rather than a general standard and promote simplification and burden reduction. 61 FR 4729 (Feb. 7, 1996). Regarding the review required by section 3(a), section 3(b) of Executive Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this proposed rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. 104-4, sec. 201 (codified at 2 U.S.C. 1531) For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed "significant intergovernmental mandate," and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect them. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820. DOE's policy statement is also available at http://energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf.

This proposed rule does not contain a Federal intergovernmental mandate because it does not require expenditures of $100 million or more in any one year by the private sector. The proposed rule will likely result in a final rule that could result in expenditures of $100 million or more, but there is no proposed requirement that mandates that result. Potential expenditures may include: (1) investment in R&D and in capital expenditures by portable AC manufacturers in the years between the final rule and the projected compliance date for the new standards, and (2) incremental additional expenditures by consumers to purchase higher-efficiency portable ACs, starting at the projected 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(o), this proposed rule would establish energy conservation standards for portable ACs that are designed to achieve the maximum improvement in energy efficiency that DOE has determined to be both technologically feasible and economically justified. A full discussion of the alternatives considered by DOE is presented in the "Regulatory Impact Analysis" section of the TSD for this proposed rule.

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

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

Pursuant to Executive Order 12630, "Governmental Actions and Interference with Constitutionally Protected Property Rights" 53 FR 8859 (Mar. 18, 1988), DOE has determined that this proposed rule would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

J. Review Under the Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516, note) provides for Federal agencies to review most disseminations of information to the public under information quality guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed this NOPR under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OIRA at OMB, a Statement of Energy Effects for any proposed significant energy action. A "significant energy action" is defined as any action by an agency that promulgates or is expected to lead to promulgation of a final rule, and that: (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy, or (3) is designated by the Administrator of OIRA as a significant energy action. For any proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

DOE has tentatively concluded that this regulatory action, which proposes new energy conservation standards for portable 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 the proposed rule.

L. Review Under the Information Quality Bulletin for Peer Review

On December 16, 2004, OMB, in consultation with the Office of Science and Technology 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." Id. at 2667.

In response to OMB's Bulletin, DOE conducted formal in-progress peer reviews of the energy conservation standards development process and analyses and has prepared a Peer Review Report pertaining to the energy conservation standards rulemaking analyses. Generation of this report involved a rigorous, formal, and documented evaluation using objective criteria and qualified and independent reviewers to make a judgment as to the technical/scientific/business merit, the actual or anticipated results, and the productivity and management effectiveness of programs and/or projects. The "Energy Conservation Standards Rulemaking Peer Review Report" dated February 2007 has been disseminated and is available at the following website: http://energy.gov/eere/buildings/downloads/energy-conservation-standards-rulemaking-peer-review-report-0.

VIII. Public Participation

A. Attendance at the Public Meeting

The time, date, and location of the public meeting are listed in the **DATES** and **ADDRESSES** sections at the beginning of this proposed rule. If you plan to attend the public meeting, please notify Ms. Brenda Edwards at (202) 586-2945 or Brenda.Edwards@ee.doe.gov.

Please note that foreign nationals participating in the public meeting are subject to advance security screening procedures which require advance notice prior to attendance at the public meeting. If a foreign national wishes to participate in the public meeting, please inform DOE of this fact as soon as possible by contacting Ms. Regina Washington at (202) 586-1214 or by e-mail (Regina.Washington@ee.doe.gov) so that the necessary procedures can be completed.

DOE requires visitors to have laptops and other devices, such as tablets, checked upon entry into the Forrestal Building. Any person wishing to bring these devices into the building will be required to obtain a property pass. Visitors should avoid bringing these devices, or allow an extra 45 minutes to check in. Please report to the visitor's desk to have devices checked before proceeding through security.

Due to the REAL ID Act implemented by the Department of Homeland Security (DHS), there have been recent changes regarding identification (ID) requirements for individuals wishing to enter Federal buildings from specific States and U.S. territories. As a result, driver's licenses from several States or territory will not be accepted for building entry, and instead, one of the alternate forms of ID listed below will be required. DHS has determined that regular driver's licenses (and ID cards) from the following jurisdictions are not acceptable for entry into DOE facilities: Alaska, American Samoa, Arizona, Louisiana, Maine, Massachusetts, Minnesota, New York, Oklahoma, and Washington. Acceptable alternate forms of Photo-ID include: U.S. Passport or Passport Card; an Enhanced Driver's License or Enhanced ID-Card issued by the States of

Minnesota, New York or Washington (Enhanced licenses issued by these States are clearly marked Enhanced or Enhanced Driver's License); a military ID or other Federal government issued Photo-ID card.

In addition, you can attend the public meeting via webinar. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website at: https://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/79. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has plans to present a prepared general statement may request that copies of his or her statement be made available at the public meeting. Such persons may submit requests, along with an advance electronic copy of their statement in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format, to the appropriate address shown in the **ADDRESSES** section at the beginning of this proposed rulemaking. The request and advance copy of statements must be received at least one week before the public meeting and may be emailed, hand-delivered, or sent by mail. DOE prefers to receive requests and advance copies via email. Please include a telephone number to enable DOE staff to make follow-up contact, if needed.

C. Conduct of the Public Meeting

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

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

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly and comment on statements made by others. Participants should be prepared to answer questions by DOE and by other participants concerning these issues. DOE representatives may also ask questions of participants concerning other matters relevant to this rulemaking. The official conducting the public meeting will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the above procedures that may be needed for the proper conduct of the public meeting.

A transcript of the public meeting will be included in the docket, which can be viewed as described in the Docket section at the beginning of this proposed rule. 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 proposed rule.

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 below.

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, hand delivery/courier, or mail. Comments and documents submitted via email, hand delivery/courier, or mail 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. If you submit via mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies. No facsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, that are written in English, and that are free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. According to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) A description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person that would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and (7) why disclosure of the information would be contrary to the public interest.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

E. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

1. The proposal to maintain one product class for single-duct and dual-duct portable ACs (see section IV.A.2 of this proposed rule or chapter 3 of the NOPR TSD).

2. The determination that alternative refrigerants should be screened out as a design option for portable ACs because products incorporating these refrigerants are not practicable to manufacture at this time while meeting all applicable safety standards (see section IV.B.1 of this proposed rule or chapter 4 of the NOPR TSD).

3. Data from interested parties that characterize portable AC performance based on the DOE test procedure in appendix CC (see section IV.C.1 of this proposed rule or chapter 5 of the NOPR TSD).

4. The general approach and technological feasibility of the efficiency levels considered for this analysis. Specifically, the determination that the baseline

performance be represented by the minimum performance ratio observed for units in DOE's test sample. DOE also seeks comment on potential utility impacts at any of the analyzed efficiency levels (see section IV.C.1 of this proposed rule or chapter 5 of the NOPR TSD).

5. The specific efficiency improvements associated with microchannel designs in portable AC heat exchangers (see section IV.C.1 of this proposed rule or chapter 5 of the NOPR TSD).

6. Whether to promote installation of any of the design options, including thermostatic or electronic expansion valves, even though the resulting efficiency gains would not be measurable with the existing test procedure (see section IV.C.1 of this proposed rule or chapter 5 of the NOPR TSD).

7. The incremental manufacturer production costs DOE estimated at each efficiency level (see section IV.C.2 of this proposed rule or chapter 5 of the NOPR TSD).

8. The use of room AC consumer usage data from RECS 2009 to establish operating hours for portable ACs. DOE's literature review performed to establish a distribution of energy use values for portable ACs revealed limited available data pertaining to how portable ACs are operated in the field. DOE assumed that the distribution of use calculated for rooms ACs represented the hours of use in cooling

mode for a baseline portable AC unit. DOE conducted a sensitivity analysis that assumed hours of operation to be 50 percent of the hours used in the LCC analysis. DOE seeks data on operating hours and seasonal usage specific to portable AC (see section IV.E of this proposed rule, chapter 7 of the NOPR TSD, or appendix 8F of the NOPR TSD).

9. The determination that there are no domestic small business manufacturers of single-duct and dual-duct portable ACs that would be impacted by the proposed standards (see sections IV.J and V.B.2.d of this proposed rule or chapter 12 of the NOPR TSD).

10. The market share distribution of portable ACs in residential (88 percent) and commercial (12 percent) settings (see section V.B.1.a of this proposed rule or chapter 9 of the NOPR TSD).

11. The use of room AC lifetime as input data to determine portable AC lifetime (see section IV.F of this proposed rule or chapter 8 of the NOPR TSD).

12. Data on historic trends in portable AC efficiency (see section IV.F of this proposed rule or chapter 8 of the NOPR TSD).

13. The proposed certification reporting requirements for portable ACs (see section VI of this proposed rule).

14. Information demonstrating that product switching is occurring between portable ACs and room or central ACs. If data demonstrates switching is occurring, additional data on whether switching to room or central ACs would be significantly increased due to DOE establishing portable AC standards.

15. DOE seeks public comment on the cumulative burden to manaufactures associated with the new Portable ACs standards as well as the approach DOE uses to undertake es used in this evalaution, including the timeframes and regulatory dates evaluated, to effectively assess cumulative regaltory effect on manufactueres subject to DOE standards.

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

Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Reporting and recordkeeping requirements.

10 CFR Part 430

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Intergovernmental relations, Reporting and recordkeeping requirements, and Small businesses.

Issued in Washington, DC, on April 27, 2016.

David Friedman
Principal Deputy Assistant Secretary
Energy Efficiency and Renewable Energy

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Issued in Washington, DC, on April 27, 2016.

____
David Friedman
Principal Assistant Secretary
Energy Efficiency and Renewable Energy

For the reasons set forth in the preamble, DOE proposes to amend parts 429 and 430 of chapter II, subpart C, of title 10 of the Code of Federal Regulations, as set forth below:

PART 429 – CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT

1. The authority citation for part 429 continues to read as follows:

Authority: 42 U.S.C. 6291–6317.

2. Section §429.12 is amended by:

a. Removing in paragraph (b)(13) "§§429.14 through 429.58" and adding in its place, "§§429.14 through 429.62"; and

b. Adding a new row below the last row of the table in paragraph (d) to read as follows:

§429.12 General requirements applicable to certification reports.

* * * * *

(d) * * *

Portable air conditioners	February 1

* * * * *

3. Section §429.62 is amended by revising paragraph (b) to read as follows:

§429.62 Portable Air Conditioners.

* * * * *

(b) Certification reports. (1) The requirements of §429.12 are applicable to single-duct and dual-duct portable air conditioners; and

(2) Pursuant to §429.12(b)(13), a certification report shall include the following public product-specific information: The combined energy efficiency ratio (CEER in British thermal units per Watt-hour (Btu/Wh)), the seasonally adjusted cooling capacity in British thermal units per hour (Btu/h), the duct configuration (single-duct, dual-duct, or ability to operate in both configurations), presence of heating function, and primary condensate removal feature (auto-evaporation, gravity drain, removable internal collection bucket, or condensate pump).

4. Section §429.134 is amended by adding paragraph (j) to read as follows:

§429.134 Product-specific enforcement provisions.

* * * * *

(j) Portable air conditioners. Verification of seasonally adjusted cooling capacity. The seasonally adjusted cooling capacity will be measured pursuant to the test requirements of 10 CFR part 430 for each unit tested. The results of the measurement(s) will be averaged and compared to the value of seasonally adjusted cooling capacity certified by the manufacturer. The certified seasonally adjusted cooling capacity will be considered valid only if the average measured seasonally adjusted cooling capacity is within five percent of the certified seasonally adjusted cooling capacity.

(i) If the certified seasonally adjusted cooling capacity is found to be valid, the certified value will be used as the basis for determining the minimum allowed combined energy efficiency ratio for the basic model.

(ii) If the certified seasonally adjusted cooling capacity is found to be invalid, the average measured seasonally adjusted cooling capacity will be used to determine the minimum allowed combined energy efficiency ratio for the basic model.

PART 430 -- ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

5. The authority citation for part 430 continues to read as follows:

Authority: 42 U.S.C. 6291–6309; 28 U.S.C. 2461 note.

6. In §430.32, add paragraph (z) to read as follows:

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

*   *   *   *   *

(z) Portable air conditioners. Single-duct portable air conditioners and dual-duct portable air conditioners manufactured on or after [**DATE 5 YEARS AFTER THE PUBLICATION OF THE FINAL RULE**] must have a combined energy efficiency ratio (CEER) in Btu/Wh no less than:

$$CEER = 1.14 \times \frac{SACC}{(2.7447 \times SACC^{0.6829})}$$

SACC: seasonally adjusted cooling capacity in Btu/h