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[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 430

[Docket Number EERE–2012–BT–STD–0027]

RIN: 1904-AC81

Energy Conservation Program: Energy Conservation Standards for Residential Dehumidifiers

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

ACTION: Notice of Proposed Rulemaking and Announcement of Public Meeting.

SUMMARY: The Energy Policy and Conservation Act of 1975 (EPCA), as amended, prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including residential dehumidifiers. EPCA also requires the U.S. Department of Energy (DOE) to periodically determine whether more-stringent, amended standards would be technologically feasible and economically justified, and would save a significant amount of energy. In this document, DOE proposes amended energy conservation standards for different categories of residential

dehumidifiers. This document also announces a public meeting to receive comment on these proposed standards and associated analyses and results.

DATES: Comments: DOE will accept comments, data, and information regarding this notice of proposed rulemaking (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 VII, "Public Participation," for details.

Meeting: DOE will hold a public meeting on Tuesday, July 7, 2015, from 9 a.m. to 4 p.m., in Washington, DC. The meeting will also be broadcast as a webinar. See section VII, "Public Participation" for webinar registration information, participant instructions, and information about the capabilities available to webinar participants.

ADDRESSES: The meeting will also be broadcast as a webinar. See section VII, "Public Participation" for webinar registration information, participant instructions, and information about the capabilities available to webinar participants. 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.

Any comments submitted must identify the NOPR for Energy Conservation Standards for Residential Dehumidifiers, and provide docket number EERE-2012–BT–STD–0027 and/or regulatory information number (RIN) number 1904-AC81. 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: ResDehumidifier2012STD0027@ee.doe.gov. Include the docket number and/or RIN in the subject line of the message.
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., Suite 600, 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.

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.

For detailed instructions on submitting comments and additional information on the rulemaking process, see section VII, "Public Participation."

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, such as those containing information that is exempt from public disclosure, may not be publicly available.

A link to the docket webpage can be found at: http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/55. This webpage will contain a link to the docket for this notice 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 VII, "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 Office, EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-0371. E-mail: bryan.berringer@ee.doe.gov.

Mr. Peter Cochran, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-9496. E-mail: Peter.Cochran@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 email: Brenda.Edwards@ee.doe.gov.

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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 Conservation Program for Consumer Products Other Than Automobiles.[2] These products include residential dehumidifiers, the subject of this notice.

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)) EPCA also provides that not later than 6 years after issuance of any final rule establishing or amending a standard, DOE must publish either a

[1] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.
[2] All references to EPCA in this document refer to the statute as amended through the American Energy Manufacturing Technical Corrections Act (AEMTCA), Pub. L. 112-210 (Dec. 18, 2012).

notice of determination that standards for the product do not need to be amended, or a notice of proposed rulemaking including new proposed energy conservation standards. (42 U.S.C. 6295(m)(1)) Once complete, this rulemaking will satisfy this statutory provision.

In accordance with these and other statutory provisions discussed in this notice, DOE proposes amended energy conservation standards for residential dehumidifiers. The proposed standards, which correspond to trial standard level 3 (described in section V.A), divide residential dehumidifiers into two categories: portable and whole-home. The proposed minimum allowable integrated energy factor (IEF) standards, which are expressed in liters (L) of moisture removed per kilowatt-hour (kWh), are shown in Table I.1. These proposed standards, if adopted, would apply to all products listed in Table I.1 and manufactured in, or imported into, the United States on or after the date three years after the publication of the final rule for this rulemaking.[3]

[3] The current energy conservation standards for residential dehumidifiers went into effect on October 1, 2012. EPCA, as amended, provides that a "manufacturer shall not be required to apply new standards to a product with respect to which other new standards have been required during the prior 6-year period." (42 U.S.C. 6295(m)(4)(B)) Thus, the proposed standards could not go into effect until October 1, 2018 at the earliest. DOE anticipates issuing a final rule on amended energy conservation standards for residential dehumidifiers in 2016. To ensure that the amended standards will not go into effect until after October 1, 2018, DOE is not requiring compliance with the new standards until three years after the publication of the final rule.

Table I.1 Proposed Energy Conservation Standards for Residential Dehumidifiers

Portable Dehumidifier Product Capacity (pints/day)	**Minimum IEF** (L/kWh)
30.00 or less	1.30
30.01–45.00	1.60
45.01 or more	2.80
Whole-Home Dehumidifier Product Case Volume (cubic feet)	
8.0 or less	2.09
More than 8.0	3.52

A. Benefits and Costs to Consumers

Table I.2 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of residential dehumidifiers, as measured by the average life-cycle cost (LCC) savings and the payback period (PBP). The average LCC savings are positive for all product classes and the PBP is significantly less than the average lifetimes for portable and whole-home residential dehumidifiers, which are approximately 11 and 19 years, respectively.[4]

[4] Lifetimes are based on: 28th Annual Portrait of the U.S. Appliance Industry, Appliance Magazine, Sept. 2005, at 65; Toru Kubo, Harvey Sachs, and Steve Nadel, Opportunities for New Appliance and Equipment Efficiency Standards: Energy and Economic Savings Beyond Current Standards Programs, American Council for an Energy Efficient Economy (Sept. 2001); Northeast Energy Star Lighting and Appliance, Dehumidifiers, (Available at http://www.myenergystar.com/Dehumidifiers.aspx) (last visited Nov. 14, 2014).

Table I.2 Impacts of Proposed Energy Conservation Standards on Consumers of Residential Dehumidifiers

Product Class	**Average LCC Savings** (2013$)	**Payback Period** (years)
Portable Dehumidifier: ≤ 30.00 pints/day	64	0.2
Portable Dehumidifier: 30.01-45.00 pints/day	99	0.2
Portable Dehumidifier: >45.00 pints/day	147	2.8
Whole-home Dehumidifier: ≤8ft^3	207	1.3
Whole-home Dehumidifier: >8ft^3	416	1.4

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 (2015 to 2048). Using a real discount rate of 8.43 percent,[5] DOE estimates that the INPV for manufacturers of residential dehumidifiers is $186.5 million.[6] Under the proposed standards, DOE expects that manufacturers may lose up to 18.7 percent of their INPV, which is approximately $34.9 million. Additionally, based on DOE's interviews with the manufacturers of residential dehumidifiers, DOE does not expect significant impacts on manufacturing capacity or loss of employment for the industry as a whole.

[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 2013 dollars; discounted values are discounted to 2014 unless explicitly stated otherwise.

C. National Benefits and Costs

DOE's analyses indicate that the proposed standards would save a significant amount of energy. The lifetime full-fuel-cycle (FFC) energy savings for residential dehumidifiers purchased in the 30-year period that begins in the first full year of compliance with the amended standards (2019–2048) amount to 0.32 quads.[7]

The cumulative net present value (NPV) of total consumer costs and savings for the proposed residential dehumidifier standards ranges from $1.04 billion (at a 7-percent discount rate) to $2.27 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 residential dehumidifiers purchased in 2019–2048.

In addition, the proposed standards would have significant environmental benefits. The energy savings described above (for dehumidifiers purchased in the 2019-2048 period) are estimated to result in cumulative emission reductions of 19.3 million metric tons (Mt)[8] of carbon dioxide (CO_2), 85.9 thousand tons of methane (CH_4), 16.0 thousand tons of sulfur dioxide (SO_2), 28.8 thousand tons of nitrogen oxides (NO_X), 0.3 thousand tons of nitrous oxide (N_2O), and 0.05 ton of mercury (Hg).[9] The cumulative

[7] A quad is equal to 10^{15} British thermal units (Btu). 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.1

[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 Annual Energy Outlook 2014 (AEO 2014) Reference case, which generally represents current legislation and environmental regulations for which implementing regulations were available as of October 31, 2013.

reduction in CO_2 emissions through 2030 amounts to 5.9 Mt, which is equivalent to the emissions resulting from the annual electricity use of 0.8 million 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 recent Federal interagency process.[10] The derivation of the SCC values is discussed in section IV.L of this notice. Using discount rates appropriate for each set of SCC values, DOE estimates the present monetary value of the CO_2 emissions reduction is between $0.14 billion and $1.93 billion, DOE also estimates the present monetary value of the NO_X emissions reduction, is $0.04 billion at a 7-percent discount rate and $0.10 billion at a 3-percent discount rate.[11]

Table I.3 summarizes the national economic costs and benefits expected to result from the proposed standards for residential dehumidifiers.

[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 (November 2013) (Available at: http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf).

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

Table I.3 Summary of National Economic Benefits and Costs of Proposed Energy Conservation Standards for Residential Dehumidifiers*

Category	Present Value Billion 2013$	Discount Rate
Benefits		
Consumer Operating Cost Savings	1.15	7%
	2.49	3%
CO_2 Reduction Monetized Value ($12.0/t case)**	0.14	5%
CO_2 Reduction Monetized Value ($40.5/t case)**	0.63	3%
CO_2 Reduction Monetized Value ($62.4/t case)**	0.99	2.5%
CO_2 Reduction Monetized Value ($119/t case)**	1.93	3%
NO_X Reduction Monetized Value (at $2,684/ton) †	0.04	7%
	0.10	3%
Total Benefits††	1.82	7%
	3.21	3%
Costs		
Consumer Incremental Installed Costs	0.12	7%
	0.22	3%
Total Net Benefits		
Including Emissions Reduction Monetized Value††	1.70	7%
	3.00	3%

* This table presents the costs and benefits associated with residential dehumidifiers shipped in 2019−2048. These results include benefits to consumers which accrue after 2048 from the products purchased in 2019−2048. The incremental 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 2013$, 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 used by DOE incorporate an escalation factor.

† The $/ton values used for NO_X are described in section IV.L.2.

†† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to average SCC with 3-percent discount rate ($40.5/t in 2015).

The benefits and costs of today's proposed standards, for products sold in 2019–2048, 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 and installation costs, plus (3) the value of the benefits of CO_2 and NO_X emission reductions, all annualized.[12]

Although DOE believes that the benefits of operating cost savings and CO_2 emission reductions are both important, two issues should be considered. First, the national operating savings are domestic U.S. consumer monetary savings that occur as a result of market transactions, 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 residential dehumidifiers shipped in 2019–2048. 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 well beyond 2100.

Estimates of annualized benefits and costs of the proposed standards are shown in Table I.4. The results under the primary estimate are as follows. Using a 7-percent discount rate for benefits and costs other than CO_2 reduction (for which DOE used a 3-

[12] 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 (e.g., 2020 or 2030), and then discounted the present value from each year to 2014. 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. DOE then calculated the fixed annual payment over a 30-year period, starting in the compliance year, that yields the same present value.

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

percent discount rate along with the average SCC series that has a value of $40.5/t in 2015),[14] the estimated cost of the standards proposed in today's rule is $12.6 million per year in increased equipment costs, while the estimated benefits are $122.0 million per year in reduced equipment operating costs, $35.9 million per year in CO_2 reductions, and $4.6 million per year in reduced NO_X emissions. In this case, the net benefit amounts to $150 million per year. Using a 3-percent discount rate for all benefits and costs and the average SCC series that has a value of $40.5/t in 2015, the estimated cost of the standards proposed in today's rule is $12.5 million per year in increased equipment costs, while the estimated benefits are $142.7 million per year in reduced operating costs, $35.9 million per year in CO_2 reductions, and $6.0 million per year in reduced NO_X emissions. In this case, the net benefit amounts to $172 million per year.

[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).

Table I.4 Annualized Benefits and Costs of Proposed Energy Conservation Standards for Residential Dehumidifiers

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*	High Net Benefits Estimate*
		million 2013$/year		
Benefits				
Operating Cost Savings	7%	122.0	116.8	126.3
	3%	142.7	136.3	149.2
CO_2 Reduction Monetized Value ($12.0/t case)**	5%	10.9	10.7	11.1
CO_2 Reduction Monetized Value ($40.5/t case)**	3%	35.9	35.3	36.7
CO_2 Reduction Monetized Value ($62.4/t case)**	2.5%	52.2	51.4	53.4
CO_2 Reduction Monetized Value ($119/t case)**	3%	110.9	109.2	113.4
NO_X Reduction Monetized Value†	7%	4.65	4.59	4.73
	3%	5.96	5.86	6.09
Total Benefits††	7% plus CO_2 range	138 to 238	132 to 231	142 to 244
	7%	163	157	168
	3% plus CO_2 range	160 to 260	153 to 251	166 to 269
	3%	185	177	192
Costs				
Consumer Incremental Product Costs	7%	12.6	12.3	13.7
	3%	12.5	12.0	13.9
Net Benefits				
Total††	7% plus CO_2 range	125 to 225	120 to 218	128 to 231
	7%	150	144	154
	3% plus CO_2 range	147 to 247	141 to 239	152 to 255
	3%	172	165	178

* This table presents the annualized costs and benefits associated with residential dehumidifiers shipped in 2019−2048. These results include benefits to consumers which accrue after 2048 from the products purchased in 2019−2048. 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 Estimate, and High Estimate, 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.F.1 of this notice.

** The CO_2 values represent global monetized values of the SCC, in 2013$, 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 used by DOE incorporate an escalation factor.

† The $/ton values used for NO_X are described in section IV.L.2.

†† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to the average SCC with 3-percent discount rate ($40.5/t in 2015). 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.

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 levels are already commercially available for all product classes covered by today's 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 notice and related information collected and analyzed during the course of this rulemaking effort, DOE may adopt energy efficiency levels presented in this notice that are either higher or lower than the proposed standards, or some combination of level(s) that incorporate the proposed standards in part.

II. Introduction

The following section briefly discusses the statutory authority underlying today's proposal, as well as some of the relevant historical background related to the establishment of standards for residential dehumidifiers.

A. Authority

Title III, Part B of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles, a program covering most major household appliances (collectively referred to as "covered products"), which includes the types of residential dehumidifiers that are the subject of this rulemaking. (42 U.S.C. 2(a)(6295(cc))) EPCA, as amended, prescribes energy conservation standards for residential dehumidifiers[15] manufactured on or after October 1, 2007, and more stringent energy conservation standards for residential dehumidifiers manufactured on or after October 1, 2012. (42 U.S.C. 6295(cc)) Under 42 U.S.C. 6295(m), the agency must periodically review established energy conservation standards for a covered product.

[15] Dehumidifiers are defined as self-contained, electrically operated, and mechanically encased assemblies consisting of: (1) a refrigerated surface (evaporator) that condenses moisture from the atmosphere; (2) a refrigerating system, including an electric motor; (3) an air-circulating fan; and (4) a means for collecting or disposing of the condensate. (42 U.S.C. 6291(34))

Under this requirement, such review must be conducted no later than 6 years from the issuance of a final rule establishing or amending a standard for a covered product.

Pursuant to EPCA, DOE's energy conservation program for covered products consists essentially of four parts: (1) testing; (2) labeling; (3) the establishment of Federal energy conservation standards; and (4) certification and enforcement procedures. The Federal Trade Commission (FTC) is primarily responsible for labeling, and DOE implements the remainder of the program. Subject to certain criteria and conditions, DOE is required to develop test procedures to measure the energy efficiency, energy use, or estimated annual operating cost of each covered product. (42 U.S.C. 6293(b)) 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 procedures for residential dehumidifiers currently appear at title 10 of the Code of Federal Regulations (CFR) part 430, subpart B, appendix X.

DOE must follow specific statutory criteria for prescribing new or amended standards for covered products. 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 residential dehumidifiers, 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, and after receiving comments on the proposed standard, 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 by, to the greatest extent practicable, considering the following seven factors:

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

(2) The savings in operating costs throughout the estimated average life of the covered products in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses for the covered products that are likely to result from the imposition of the standard;

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

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

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

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

(7) Other factors the Secretary of Energy (Secretary) considers relevant. (42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

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, as codified, also contains what is known as an "anti-backsliding" provision, which prevents the Secretary from prescribing any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. (42 U.S.C. 6295(o)(1)) Also, the "Secretary may not prescribe an amended or new standard under this section if the Secretary finds (and publishes such finding) that 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 at the time of the Secretary's finding." (42 U.S.C. 6295(o)(4))

Additionally, 42 U.S.C. 6295(q)(1) specifies requirements when promulgating a standard for a covered product that has two or more subcategories. DOE must specify a different standard level for a type or class of covered 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 current test procedures for residential dehumidifiers address standby mode and off mode energy use. In this rulemaking, DOE intends to adopt a single energy conservation standard that addresses active, off, and standby modes.

B. Background

1. Current Standards

EPCA prescribes energy conservation standards for residential dehumidifiers manufactured on or after October 1, 2012. In a final rule published on March 23, 2009, DOE codified these standards at 10 CFR 430.32(v)(2). 74 FR 12058. The current standards are set forth in Table II.1below.

Table II.1: Federal Energy Efficiency Standards for Residential Dehumidifiers*

Product Class* (pints/day)	**Energy Factor (EF)**** (L/kWh)
Up to 35.00	1.35
35.01–45.00	1.50
45.01–54.00	1.60
54.01–75.00	1.70
75.00 or more	2.5

*Capacity in pints/day is measured according to the current DOE test procedure.
**EF is a measure of the water removed from the air per unit of energy consumed by a dehumidifier and is calculated according to the current DOE test procedure.

2. History of Standards Rulemaking for Residential Dehumidifiers

As amended by the Energy Policy Act of 2005 (EPACT 2005), EPCA established the first energy conservation standards for residential dehumidifiers manufactured as of October 1, 2007, based on the EF metric. EISA 2007 subsequently amended EPCA to prescribe new energy conservation standards for dehumidifiers manufactured on or after October 1, 2012. In a final rule published on March 23, 2009, DOE codified the standards at 10 CFR 430.32(v)(2). 74 FR 12058.

DOE initiated today's rulemaking pursuant to 42 U.S.C. 6295(m)(1), which requires DOE, no later than 6 years after issuance of any final rule establishing or amending a standard, to publish either a notice of determination that standards for the product do not need to be amended, or a NOPR that includes new proposed energy conservation standards. As noted above, DOE issued the last final rule for residential dehumidifiers on March 23, 2009.

DOE initiated this rulemaking by issuing an analytical Framework Document, "Energy Conservation Standards Rulemaking Framework Document for Residential Dehumidifiers." 77 FR 49739 (Aug. 17, 2012). The Framework Document explained the issues, analyses, and process that DOE anticipated using to develop energy conservation standards for residential dehumidifiers.

DOE held a public meeting on September 24, 2012, to solicit comments from interested parties regarding the Framework Document and DOE's proposed analytical

approach. DOE sought feedback from interested parties on these subjects and provided information regarding the rulemaking process that DOE would follow. Interested parties discussed the following major issues at the public meeting: rulemaking schedule; test procedure revisions; product classes; technology options; efficiency levels (ELs); and approaches for each of the analyses performed by DOE as part of the rulemaking process.

Comments received following the publication of the framework document helped DOE identify and resolve issues related to the subsequent 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 technical support document (TSD) that presented the methodology and results of each of these analyses is available at http://www.regulations.gov/#!documentDetail;D=EERE-2012-BT-STD-0027-0015.

DOE also conducted, and included in the preliminary TSD, several other analyses that supported the major analyses or were expanded upon for today's 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 identified the methods to be used for the consumer subgroup analysis, the emissions

[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.

analysis, the employment impact analysis, the regulatory impact analysis, and the utility impact analysis.

DOE published a notice of public meeting and availability of the preliminary TSD on May 22, 2014. 79 FR 29380. DOE subsequently held a public meeting on June 13, 2014, to discuss and receive comments on the preliminary TSD. DOE received comments on topics including: whole-home dehumidifier coverage and test procedures, product classes, design options, ELs, use of experience curves, shipments projections, social cost of carbon estimates and the associated monetization of carbon dioxide, and small business impacts. After reviewing these comments, DOE gathered additional information, held further discussions with manufacturers, performed product testing, 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))

Existing energy conservation standards divide residential dehumidifiers into five product classes based on the number of pints per day of moisture that the product removes from ambient air at test conditions, as measured by the current DOE test procedure. In this rulemaking, DOE is proposing new product classes that differentiate between portable and whole-home residential dehumidifiers. For portable residential dehumidifiers, DOE is proposing the following three product classes based on the product capacity in number of pints per day of moisture removed from ambient air at test conditions[17]: (1) 30.00 pints/day or less; (2) 30.01 to 45.00 pints/day; and (3) 45.01 pints/day or more. For whole-home residential dehumidifiers, DOE is proposing the following two product classes based on product case volume:[18] (1) less than or equal to 8.0 ft^3; and (2) greater than 8.0 ft^3.

The product classes for portable residential dehumidifiers analyzed for today's NOPR are different from those examined in DOE's initial analysis, while the product classes for whole-home residential dehumidifiers are the same. DOE initially analyzed five product classes for portable residential dehumidifiers based on product capacity. Due, in part, to comments received on the preliminary TSD, DOE is proposing only the

[17] Note that the test conditions for the proposed product classes are different from those for the existing product classes.
[18] Product case volume is the rectangular volume that the product case occupies, exclusive of any duct attachment collars or other external components.

three product classes discussed above. Comments received relating to the scope of coverage and product classes are discussed in section IV.A of this proposed rule.

B. Test Procedure

EPCA specifies that the dehumidifier test criteria used under the ENERGY STAR[19] program in effect as of January 1, 2001,[20] must serve as the basis for the DOE test procedure for dehumidifiers, unless revised by DOE. (42 U.S.C. 6293(b)(13)) The ENERGY STAR test criteria required that American National Standards Institute (ANSI)/Association of Home Appliance Manufacturers (AHAM) Standard DH-1, "Dehumidifiers," be used to measure capacity while the Canadian Standards Association (CAN/CSA) standard CAN/CSA-C749-1994 (R2005), "Performance of Dehumidifiers," be used to calculate the Energy Factor (EF). The version of AHAM Standard DH-1 in use at the time the ENERGY STAR test criteria were adopted was AHAM Standard DH-1-1992. In 2006, DOE adopted these test criteria, along with related definitions and tolerances, as its test procedure for dehumidifiers at 10 CFR part 430, subpart B, appendix X. 71 FR 71340, 71347, 71366–68 (Dec. 8, 2006).

On October 31, 2012, DOE published a final rule to establish a new test procedure for dehumidifiers that references ANSI/AHAM Standard DH-1-2008, "Dehumidifiers," (ANSI/AHAM DH-1-2008) for both energy use and capacity measurements. 77 FR 65995 (Oct. 31, 2012). The final rule also adopted standby and off mode provisions that

[19] For more information on the ENERGY STAR program, please visit www.energystar.gov.
[20] "Energy Star Program Requirements for Dehumidifiers", Version 1.0, U.S. Environmental Protection Agency (EPA), available online at: www.energystar.gov/products/specs/system/files/DehumProgReqV1.0.pdf.

satisfy the requirement in EPCA for DOE to include measures of standby mode and off mode energy consumption in its test procedures for residential products, if technically feasible. (42 U.S.C. 6295(gg)(2)(A)) This new DOE test procedure, codified at that time at 10 CFR part 430, subpart B, appendix X1, established a new metric, IEF, which incorporates measures of active, standby, and off mode energy use.

DOE subsequently removed the existing test procedures at appendix X and redesignated the test procedures at appendix X1 as appendix X. 79 FR 7366 (Feb. 7, 2014). Any representations of energy use, including standby mode or off mode energy consumption, or efficiency of portable dehumidifiers must be made in accordance with the results of testing pursuant to the redesignated appendix X.

On May 21, 2014, DOE published a NOPR proposing further amendments to residential dehumidifier test procedures. 79 FR 29272. In addition to making clarifications and corrections, the proposed amendments would create a new appendix, appendix X1, which would: (1) require certain active mode testing at a lower ambient temperature; (2) add a measure of fan-only mode energy consumption in the IEF metric; and (3) include testing methodology and measures of performance for whole-home dehumidifiers.

On February 4, 2015, DOE published a supplemental notice of proposed rulemaking (SNOPR). 80 FR 5994. In the SNOPR, DOE maintained its proposals from the NOPR, except that DOE proposed: (1) various adjustments and clarifications to the whole-home dehumidifier test setup and conduct; (2) a method to determine whole-home

dehumidifier case volume; (3) a revision to the method for measuring energy use in fan-only operation; (4) a clarification to the relative humidity and capacity equations; and (5) additional technical corrections and clarifications.

In response to the May 2014 Notice, June 2014 public meeting, and February 2015 SNOPR, DOE received comments from interested parties related to the test procedure. DOE addressed these issues in the test procedure final rule to establish appendix X1, and based its analysis in this notice on capacities and efficiencies determined according to the appendix X1 test procedure.

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)) Section IV.B of this proposed rule discusses the results of the screening analysis for residential dehumidifiers, particularly the designs DOE considered, those it screened out, and those that are the basis for the standards considered in this rulemaking. For further details on the screening analysis for this rulemaking, see chapter 4 of the NOPR TSD.

2. Maximum Technologically Feasible Levels

When DOE proposes to adopt an amended standard for a type or class of covered product, it must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for such product. (42 U.S.C. 6295(p)(1)) Accordingly, in the engineering analysis, DOE determined the maximum technologically feasible (max-tech) improvements in energy efficiency for residential dehumidifiers, 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, section 5.3.2 of the NOPR TSD.

D. Energy Savings

1. Determination of Savings

For each trial standard level (TSL), DOE projected energy savings from application of the TSL to residential dehumidifiers purchased in the 30-year period that begins in the first full year of compliance with the proposed standards (2019–2048).[21] The savings are measured over the entire lifetime of residential dehumidifiers purchased in the 30-year analysis period.[22] DOE quantified the energy savings attributable to each TSL as the difference in energy consumption between each standards case and the base case. The base case represents a projection of energy consumption that reflects how the market for a product would likely evolve in the absence of amended mandatory efficiency standards.

DOE uses its NIA spreadsheet models to estimate energy savings from potential amended standards. The NIA spreadsheet model (described in section IV.H of this notice) 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,

[21] 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 also conducted a sensitivity analysis that considers impacts for products shipped in a 9-year period.

[22] In the past DOE presented energy savings results for only the 30-year period that begins in the year of compliance. In the calculation of economic impacts, however, DOE considered operating cost savings measured over the entire lifetime of products purchased in the 30-year period. DOE has chosen to modify its presentation of national energy savings to be consistent with the approach used for its national economic analysis.

natural gas, petroleum fuels), and thus presents a more complete picture of the impacts of energy efficiency standards.[23] 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.1 of this proposed rule.

2. Significance of Savings

To adopt any new or amended standard 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 "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, 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.

[23] 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).

6295(o)(2)(B)(i)) The following sections discuss how DOE has addressed each of those seven factors in this rulemaking.

a. Economic Impact on Manufacturers and Consumers

In determining the impacts of a potential amended standard on manufacturers, DOE conducts a manufacturer impact analysis (MIA), as discussed in section IV.J of this proposed rule. 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) industry net present value (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 NPV of the economic impacts applicable to a particular rulemaking. DOE also evaluates the LCC impacts of potential standards on identifiable subgroups of consumers that may be affected disproportionately by a national 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 the 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. For its analysis, DOE assumes that consumers will purchase the covered products in the first full year of compliance with amended standards.

The LCC savings for the considered ELs are calculated relative to a base case that reflects projected market trends in the absence of amended standards. DOE identifies the

percentage of consumers estimated to receive LCC savings or experience an LCC increase, in addition to the average LCC savings associated with a particular standard level. DOE's LCC and PBP analyses are 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 IV.H.1, DOE uses the NIA spreadsheet to project national energy savings.

d. Lessening of Utility or Performance of Products

In establishing classes of products, and in evaluating design options and the impact of potential standard levels, DOE 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.

e. Impact of Any Lessening of Competition

EPCA directs DOE to consider the impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from a proposed

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

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 associated with energy production. DOE reports the emissions impacts from the proposed standards, and from each TSL it considered, in section IV.K of this proposed rule. DOE also reports

estimates of 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 PBP 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.10 of this proposed rule.

IV. Methodology and Discussion

DOE used three spreadsheet tools to estimate the impact of today's proposed standards. The first spreadsheet calculates LCCs and PBPs of potential standards. The second provides shipments forecasts, and then calculates national energy savings and net present value of total consumer costs and savings expected to result from potential standards. Finally, DOE assessed manufacturer impacts, largely through use of the Government Regulatory Impact Model (GRIM).

Additionally, DOE estimated the impacts on utilities and the environment that would be likely to result from potential amended standards for residential dehumidifiers. DOE used a version of EIA's National Energy Modeling System (NEMS) for the utility and environmental analyses. The NEMS simulates the energy sector of the U.S. economy. EIA uses NEMS to prepare its AEO, a widely-known energy forecast for the United States. NEMS offers a sophisticated picture of the effect of standards, because it accounts for the interactions between the various energy supply and demand sectors and the economy as a whole.

A. Market and Technology Assessment

DOE develops information 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. DOE's market and technology analysis activity includes both quantitative and qualitative assessments, based primarily on publicly available information. The subjects addressed in the market and technology assessment for this residential dehumidifier rulemaking include: (1) a determination of the scope of the rulemaking and product classes; (2) manufacturers and industry structure; (3) existing efficiency programs; (4) product shipments; (5) market and industry trends; and (6) technologies that could improve the energy efficiency of residential dehumidifiers. 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

EPCA defines a dehumidifier as product that is self-contained, electrically operated, mechanically encased, and a product that incorporates a refrigerated surface to condense moisture from the atmosphere. It further defines it as a refrigerating system with an electric motor; a fan for air circulation; and a means for collecting or disposing of the condensate. (42 U.S.C. 6291(34)) In the concurrent test procedure rulemaking, DOE is clarifying that this definition of a dehumidifier, codified at 10 CFR 430.2, does not apply to portable air conditioners, room air conditioners, or packaged terminal air conditioners.

Aprilaire Inc. (Aprilaire) commented to suggest that the EPCA definition for a dehumidifier is too broad, and believes that it would include all products that provide

means of dehumidification, including portable, window, and central air conditioners. Aprilaire further suggested that products such as a refrigerator could meet the EPCA definition even though refrigerators are not intended to dehumidify the living space. Therefore, Aprilaire requested that DOE provide a more specific definition for dehumidifiers. (Aprilaire, No. 20 at p. 3) DOE notes that the definition for dehumidifier established in the concurrent test procedure rulemaking specifically excludes portable air conditioners, room air conditioners, and packaged terminal air conditioners because these products also deliver conditioned air to a space such as a room similar to a dehumidifier, in contrast to a refrigerator which provides cooling to a cabinet. DOE has already established energy conservation standards for room air conditioners and refrigerators separately under EPCA (42 U.S.C. 6295(b) and (cc)), and is currently considering new standards for portable air conditioners in a separate rulemaking. The energy conservation standards for these products address energy use in active, standby, and off modes.

In the concurrent test procedure rulemaking, DOE is also adding definitions to 10 CFR 430.2 for portable dehumidifiers and whole-home dehumidifiers. Portable dehumidifiers are designed to operate within the dehumidified space without ducting attached, although ducting may be attached optionally. Whole-home dehumidifiers are designed to be installed with inlet ducting for return process air and outlet ducting that supplies dehumidified process air to one or more locations in the dehumidified space.

Therma-Stor LLC (Therma-Stor) expressed concern that DOE is proposing to subdivide dehumidifiers into “portable” and “whole-home” dehumidifiers, as defined by

their intended application or installation. According to Therma-Stor, this approach may not provide clear differentiation among products, and therefore DOE should revise the proposed definitions of each product type to accurately define specific attributes to avoid confusion in the marketplace. (Therma-Stor, No. 21 at p. 1) Due to the many similarities between certain portable and whole-home dehumidifiers and the inability to determine their intended use through examination of the product, DOE determined that design features associated with installation, namely the attachment of ducts, are the most reliable method for differentiation. The definitions established in the concurrent test procedure rulemaking separate the product types based on this differentiation. For those dehumidifiers that may be optionally configured in either manner, DOE would require that each configuration of these products be certified under corresponding portable and whole-home dehumidifier energy conservation standards.

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))

Under 42 U.S.C. 6295(cc)(2), residential dehumidifiers, manufactured on or after October 1, 2012, are divided into five product classes based on the capacity of the unit in pints of water extracted per day:

Table IV.1: Current Dehumidifier Product Classes

Capacity (pints/day)
Up to 35.00
35.01–45.00
45.01–54.00
54.01–75.00
75.00 or more

a. Preliminary Analysis Proposals

In the preliminary analysis conducted for this rulemaking, DOE considered the following portable dehumidifier product classes that were based on the existing product classes, but with capacities adjusted for the lower ambient temperature proposed in the May 2014 test procedure NOPR:

Table IV.2: Preliminary Analysis Portable Dehumidifier Product Classes

Capacity (pints/day)
20.00 or less
20.01 to 30.00
30.01 to 35.00
35.01 to 45.00
45.01 or more

In the preliminary analysis, DOE also considered two product classes for whole-home dehumidifiers, differentiated by product case volume.

Table IV.3: Preliminary Analysis Whole-Home Dehumidifier Product Classes

Product Class (case volume, cubic feet)
less than or equal to 8.0
greater than 8.0

b. Comments and Responses

Aprilaire commented that portable and whole-home dehumidifiers are two different classes of product, in their construction as well as their intended application and function. Aprilaire commented that the National Renewable Energy Laboratory (NREL) technical report, NREL/TP-5500-61076, highlights the difference between portables and whole-home dehumidifiers, not only in application, size, and capacity, but also in performance. Aprilaire expressed concern that due to these many differences in the two types of dehumidifier products, the inclusion of both into one rule and test procedure may not be appropriate. Therefore, Aprilaire suggested that DOE not consider whole-home dehumidifiers in the rulemaking and test procedures at this time. (Aprilaire No. 20 at pp. 1–3)

Pacific Gas and Electric Company, Southern California Gas Company, San Diego Gas and Electric, and Southern California Edison (California Investor-Owned Utilities (IOUs)) supported extending coverage to whole-home dehumidifiers and regulating them as a separate product class from portable dehumidifiers, as they are designed and installed differently in order to properly take advantage of ducted configurations. According to the California IOUs, whole-home dehumidifiers require more energy than portable units, and the difference in energy use between high and low efficiency products is significant. The California IOUs further stated that whole-home dehumidifiers have a longer lifetime than portable dehumidifiers, and that due to the longer lifetime and large difference in energy use between whole-home dehumidifiers of varying efficiency, it is important to ensure

that these products are efficient to realize savings for the duration of the expected lifetime. (California IOUs, No. 24 at pp. 1–2)

DOE notes that although portable and whole-home dehumidifiers have different applications and overall performance, they both: (1) fall under the statutory definition of a dehumidifier; (2) provide the same dehumidification function: and (3) can be characterized with the same energy efficiency performance metric. Therefore, DOE believes it is appropriate to address both portable and whole-home dehumidifiers in the same rulemaking. DOE, however, is considering separate proposed efficiency standards levels for each product type. The considered product classes are split between portable and whole-home dehumidifiers, as defined according to the definitions provided in section IV.A.1 of this notice, with further divisions based on product capacity or volume. In addition, DOE established, in a separate test procedure rulemaking, unique testing setups and methodology for the two product types.

The California IOUs commented that there are a group of products in the 65 to 75 pint/day capacity range with significantly higher efficiencies than other dehumidifiers with capacities under 75 pints/day. The California IOUs suggested that DOE analyze these products to understand their technology options and whether or not lower-capacity units can achieve similar efficiencies, or whether a separate product class is necessary to develop more appropriate energy conservation standards for those products. (California IOUs No. 24 at pp. 3–4) DOE investigated the models with higher efficiencies near 75 pints/day rated capacity (as measured according to the current test procedure in 10 CFR

part 430, subpart B, appendix X). DOE notes that these products typically have construction similar to whole-home dehumidifiers, but in a portable configuration. They include larger heat exchangers (and for some units, an inlet air-to-air heat exchanger), higher-volumetric flow rate blowers, and higher-capacity compressors. These units are currently rated at capacities between 65 and 75 pints/day, and although these capacities would decrease under the appendix X1 test procedure, DOE expects, based on its investigative testing, that the units would likely be classified in the proposed 45.01 pints/day or more product class. Accordingly, DOE considered higher efficiencies for this product class in this NOPR analysis than for the lower-capacity portable product classes (see section IV.C.1 of this proposed rule).

Appliance Standards Awareness Project (ASAP) asked why DOE proposed multiple product classes for portable dehumidifiers with capacities less than 45 pints/day. (ASAP, Public Meeting Transcript, No. 25 at p. 16)[24] ASAP also asked if there is consumer utility associated with either smaller capacities or smaller chassis. (ASAP, Public Meeting Transcript, No. 25 at p. 18) In a joint comment, ASAP, Alliance to Save Energy, American Council for an Energy-Efficient Economy, Consumers Union, National Consumer Law Center, Natural Resources Defense Council, and Northwest Energy Efficiency Alliance (hereinafter the "Joint Commenters"), as well as the

[24] A notation in the form "ASAP, Public Meeting Transcript, No. 25 at p. 16" identifies an oral comment that DOE received during the June 13, 2014, residential dehumidifier energy conservation standards preliminary analysis public meeting. Oral comments were recorded in the public meeting transcript and are available the residential dehumidifier energy conservation standards rulemaking docket (Docket No. EERE–2012– BT–STD–0027). This particular notation refers to a comment: (1) made by Appliance Standards Awareness Project during the public meeting; (2) recorded in document number 25, which is the public meeting transcript that is filed in the docket of this energy conservation standards rulemaking; and (3) which appears on page 16 of document number 25.

California IOUs , supported a single product class for all portable dehumidifiers with capacities less than 45 pints/day because they claimed that DOE had not demonstrated that dehumidification capacity is a feature that justifies a lower standard level. They also noted the availability of dehumidifiers over a range of capacities that meet or exceed the current ENERGY STAR specification (EF of 1.85 for all dehumidifiers up to 75 pints/day), which, according to the Joint Commenters, suggests that lower-capacity dehumidifiers may achieve the same efficiencies as higher-capacity models. (California IOUs, No. 24 at p. 2; Joint Commenters, No 23 at pp. 1–2) The California IOUs noted that many commercially available lower-capacity products are able to meet the ENERGY STAR performance levels, but that non-qualified products are typically clustered right at the Federal standard level, resulting in a significant gap in performance. According to the California IOUs, this large gap is not apparent for higher capacity units, and highlights the increased energy savings potential of requiring lower-capacity units to meet the same energy conservation standards as higher-capacity units. (California IOUs, No. 24 at p. 3)

The Joint Commenters also stated that DOE determined there is no inherent relationship between capacity and efficiency, and that efficiency is instead primarily a function of chassis size. The Joint Commenters further stated that the possibility that some manufacturers' current chassis components may make it difficult for them to meet higher ELs at certain capacities does not justify the use of separate product classes to shield those manufacturers from more stringent standards. The Joint Commenters further stated that, at most, the cost (not the ability) to meet a standard level is different from manufacturer to manufacturer. (Joint Commenters, No 23 at p. 2) The California IOUs

commented that by "right-sizing" the chassis, manufacturers can produce high-efficiency dehumidifiers of any capacity. Thus, all product classes below 75 pints/day (based on the current test procedure in appendix X) should be consolidated into a single class. (California IOUs, No. 24 at p. 3)

AHAM supported maintaining several product classes for portable dehumidifiers, and agreed that DOE should not collapse portable dehumidifier product classes into two product classes (less than 75 pints/day and greater than 75 pints/day according to the current test conditions). AHAM also agreed that maintaining several product classes would allow DOE to individually consider appropriate ELs in each class that would take into account unique performance factors and costs. (AHAM, No. 22 at pp. 1–2) AHAM commented that it was concerned that the 65 degrees Fahrenheit (°F) ambient temperature test condition in the proposed test procedure for residential dehumidifiers, as opposed to the current 80 °F ambient temperature, would increase test-to-test variation and make it more difficult to establish product classes based on capacity thresholds. Therefore, AHAM stated that it may be necessary to combine two of the lower-capacity product classes, for a total of four portable dehumidifier product classes. (AHAM, No. 22 at p. 2) Therma-Stor commented that the number of product classes may need to be reduced or increased to reflect the (relative) range of ratings. (Therma-Stor, No. 21 at p. 1)

While all current product classes are able to reach similar maximum efficiencies under current test procedures, DOE observed that the two lowest capacity portable product classes considered for the preliminary analysis (20.00 pints/day or less and 20.01

to 30.00 pints/day) could not reach the same maximum IEF as the other product classes when tested under the appendix X1 test procedure. This suggested that there may be an inherent trend between capacity and efficiency at lower ambient test temperatures.

DOE also notes that product sizes and weights vary between products currently available on the market. Lower-capacity units typically use a smaller chassis that limits the sizes of internal components such as heat exchangers. In the sample of units DOE selected for the engineering analysis, DOE observed that portable dehumidifiers with rated capacities below 45 pints/day typically had smaller chassis and had an average weight of 33 pounds. Portable dehumidifiers currently rated with capacities between 45 pints/day and 75 pints/day typically had larger chassis and had an average weight of 45 pounds. DOE believes the 12-pound average increase in product weight in moving to a larger case would reduce portability (i.e., increase difficulty moving the unit within the home), which would negatively impact consumer utility.

DOE also observed that there was no key difference in product characteristics for the two product classes analyzed for the preliminary analysis that DOE proposes to combine into a single product class in this NOPR. The 20.00 pints/day or less and 20.01 to 30.00 pints/day product classes had similar product characteristics and were able to achieve similar ELs under both the current and appendix X1 test procedures. Similarly, the 30.01 to 35.00 pints/day and 35.01 to 45.00 pints/day product classes had similar construction and measured efficiencies. For this NOPR analysis, DOE proposes combing the four lowest-capacity portable product classes analyzed in the preliminary analysis

into two: 30.00 pints/day or less and 30.01 to 45.00 pints/day. DOE proposes maintaining the 45.01 pints/day or more product class as considered in the preliminary analysis because the larger chassis size and weight typically associated with these products would allow for consideration of certain design options, such as inlet pre-cooling heat exchangers, that would be infeasible in lower-capacity portable dehumidifiers.

AHAM stated that because dehumidifiers are typically rated at even number capacities, DOE should use odd number boundaries for the product classes, especially as standards become more stringent. AHAM commented that DOE's proposal to define product class boundaries at even numbers may cause findings of noncompliance simply due to test procedure variation. (AHAM, Test Procedure NOPR, No. 7 at p, 6) Based on a review of the products certified in DOE's Compliance Certification Database, DOE observed that approximately 75 percent of certified units are rated at a capacity that is a multiple of 10.[25] However, these capacity ratings are based on the current test procedures, and the certified capacities would change under the appendix X1 test procedures. Therefore, DOE concludes that an a priori selection of either an even or odd product class capacity threshold would not be warranted, and instead proposes to define product class boundaries based on the capacities associated with chassis sizes and weights that provide different consumer utility.

Therma-Stor commented that the current product classes, which are based on water removal capacity at 80 °F and 60-percent relative humidity, should be revised to

[25] The Compliance Certification Database is available at: http://www.regulations.doe.gov/certification-data/.

reflect new capacity values if different ambient rating test conditions are chosen. (Therma-Stor, No. 21 at p. 1) As discussed previously, DOE adjusted its portable product classes to account for the updated test conditions at 65 °F ambient temperature.

Aprilaire agreed with using the volume of whole-home dehumidifiers as a product class differentiator, because installed location is one of the restrictions on these units rather than their capacity. However, Aprilaire requested clarification on the selection of 8.0 cubic feet as the threshold between product classes, and whether there was any relationship between this threshold and product capacity. Aprilaire commented that the differentiation of whole-home product classes based on case volume less than or greater than 8.0 cubic feet appears to be arbitrary and only based on products on the market today, and that product sizes exist today due to application and size constraints incurred during or after installation. Aprilaire noted its concern that the market for whole-home dehumidifiers and potential applications were not totally understood, and placing an arbitrary threshold may limit innovation and new product applications. Aprilaire stated that doing so would negatively impact the ability to obtain whole-home energy-efficient humidity control. (Aprilaire, Public Meeting Transcript, No. 25 at pp. 14–15; Aprilaire, No. 20 at p. 3) Therma-Stor also commented that basing whole-home dehumidifier product classes on case volume is arbitrary, and would be confusing in the marketplace. Therma-Stor suggested that whole-home product classes be based upon the same capacity metric as portable dehumidifiers. (Therma-Stor, No. 21 at p.1)

DOE considered whole-home product class differentiation based on those products that are installed in space-constrained locations. Many of the design options associated with improving efficiencies for these products, such as larger heat exchangers or an inlet pre-cooling heat exchanger, require making the unit physically larger. Whole-home units that are not space constrained may incorporate all of these design options and reach higher efficiencies. DOE observed that products available on the market with case volumes greater than 8.0 cubic feet are able to incorporate additional design options and reach higher efficiencies than products with volumes at or less than 8.0 cubic feet. DOE also expects that products with volumes of 8.0 cubic feet or less would be able to meet consumers' needs for space-constrained installations. DOE notes that switching to a capacity-based product class differentiation, as proposed for portable dehumidifier product classes, would not ensure products would maintain the smaller case sizes. Whole-home units at lower capacities could increase case size to incorporate all available design options and maximize heat exchanger sizes to reach high efficiencies, but the increased case size would also limit consumer applications. For these reasons, DOE proposes to maintain the two whole-home dehumidifier product classes based on case volume: less than or equal to 8.0 cubic feet and greater than 8.0 cubic feet.

c. NOPR Proposals

In summary, DOE proposes classifying portable products into three product classes, by merging two of the current five portable product classes into the other three, and classifying whole-home dehumidifiers in two product classes based on case volume, resulting in the following product classes:

Table IV.4: Dehumidifier Product Classes

Portable (pints/day)
30.00 or less
30.01 to 45.00
45.01 or more
Whole-Home (case volume, cubic feet)
less than or equal to 8.0
greater than 8.0

In the remaining sections of this NOPR, presented product capacities and efficiencies are consistent with the appendix X1 test procedures.

3. Technology Options

In the preliminary market analysis and technology assessment, DOE identified 14 technology options that would be expected to improve the efficiency of residential dehumidifiers:

IV.5 Technology Options for Dehumidifiers

1.	Built-in hygrometer/humidistat
2.	Improved compressor efficiency
3.	Improved condenser and evaporator performance
4.	Improved controls
5.	Improved defrost methods
6.	Improved demand-defrost controls
7.	Improved fan and fan-motor efficiency
8.	Improved flow-control devices
9.	Low-standby-loss electronic controls
10.	Washable air filters
11.	Pre-cooling air-to-air heat exchanger
12.	Heat pipes
13.	Improved refrigeration system insulation
14.	Refrigerant-desiccant systems

In response to the preliminary analysis, two commenters suggested additional technology options that DOE should consider, but the agency has determined that neither option merits further consideration. First, the Joint Commenters and California IOUs stated that DOE should include chassis size as a technology option for improving efficiency in the engineering analysis if it maintains separate portable dehumidifier product classes. (California IOUs, No. 24 at p. 2; Joint Commenters, No. 23 at p. 2) DOE notes that increasing chassis size does not itself increase product efficiency, but it allows the product to house larger heat exchangers, which does improve efficiency. DOE included larger heat exchangers as a design option, and considered any necessary chassis changes associated with the larger components in the engineering analysis.

Second, the California IOUs commented that DOE should consider the potential benefits from networked smart controls, which would allow dehumidifiers to benefit from time-of-use metering and other demand management schemes to maximize the time-

value of energy production in participating utilities. They noted that as an added benefit, advanced sensors with more sophisticated reporting capabilities would alert the user when the unit begins to degrade significantly, requiring maintenance or replacement. (California IOUs, No. 24 at p. 5) The current and recently established DOE test procedures for dehumidifiers measure the site energy consumption in typical operation and do not reflect potential overall benefits related to demand management enabled by smart controls. Products incorporating smart controls would have the same (or lower) measured efficiencies according to the DOE test procedure because such controls consume additional energy to provide those features that are not directly related to energy efficiency. Additionally, DOE is not aware of any dehumidifiers currently available on the market or any working prototypes that incorporate a demand response function via smart controls. Accordingly, DOE did not consider smart controls as a design option to reach higher ELs in this analysis. DOE requests comment on any information or data about the availability of dehumidifiers with smart controls, including those currently available on the market or any working prototypes.

After identifying all potential technology options for improving the efficiency of residential dehumidifiers, 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.

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 of a technology in commercial products and reliable installation and servicing of the technology could not be achieved on the scale necessary to serve the relevant market at the time of the effective date of the standard, then that technology will not be considered further.

3. Impacts on product utility to consumers. If a technology is determined to have significant adverse impact on the utility of the product to significant subgroups of consumers, or 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 U.S. at the time, it will not be considered further.

4. Safety of technologies. If it is determined that a technology will 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

Pre-cooling Air-to-Air Heat Exchangers (for Portable Dehumidifiers up to 45 Pints/Day)

Based on teardowns and research, DOE determined that portable dehumidifiers with capacities up to 45 pints/day have little room to incorporate additional components within the product case (see chapter 4, section 4.2.1 of the NOPR TSD). DOE estimated that the addition of an effective pre-cooling air-to-air heat exchanger would require case sizes to, at a minimum, double. Because of the increased size and weight, DOE determined that incorporating a pre-cooling air-to-air heat exchanger in portable dehumidifiers with capacities up to 45 pints/day would have an adverse impact on product utility to consumers. Because this design option would result in the unavailability of products with the same size and volume as products currently available

on the market, DOE screened out pre-cooling air-to-air heat exchangers as a design option for portable dehumidifiers with capacities up to 45 pints/day.

AHAM supported screening out pre-cooling air-to-air heat exchangers for smaller-capacity dehumidifiers. They noted that the pre-cooling heat exchangers would make larger-capacity products even bigger, because the enclosure would need to be bigger, which could impact portability and consumer utility. (AHAM, No. 22 at p. 6) DOE maintains its proposal to eliminate pre-cooling inlet air-to-air heat exchangers from further consideration for portable products with capacity less than 45 pints/day. For portable products with capacities greater than 45 pints/day, DOE notes that certain products available on the market already incorporate this technology option. Thus, DOE has maintained it as a potential design option for this larger-capacity product class.

Heat Pipes (for Portable Dehumidifiers up to 45 Pints/Day)

In the preliminary analysis, DOE also identified heat pipes as a potential technology to increase dehumidifier efficiency. Heat pipes perform a similar function as pre-cooling air-to-air heat exchangers, lowering the inlet air temperature to increase the efficiency of the refrigeration system, except that heat pipes use a phase-change fluid to transfer heat between the two air streams. DOE estimated that the additional heat exchangers and fluid tubing for heat pipes would likely require significant increases in case size and overall weight for portable dehumidifiers with capacities of up to 45 pints/day, resulting in an adverse impact on product utility to consumers. Because this design option would result in the unavailability of products with the same weight and

volume as products currently available on the market, DOE screened out heat pipes as a design option for portable dehumidifiers with capacities up to 45 pints/day. AHAM agreed that heat pipes should be screened out for smaller-capacity portable dehumidifiers due to their consumer utility impacts. (AHAM, No 22 at p. 6)

However, in the preliminary analysis, DOE retained heat pipes as a design option for whole-home dehumidifiers and portable dehumidifiers with capacities greater than 45 pints/day. DOE noted that many of these products already use larger case sizes to accommodate pre-cooling air-to-air heat exchangers. Products incorporating heat pipes would likely require similar case volumes as the products available on the market that include pre-cooling air-to-air heat exchangers, and would not likely impact consumer utility for whole-home dehumidifiers and portable dehumidifiers with capacities greater than 45 pints/day.

Regarding improved condenser and evaporator performance, AHAM commented that adjusting the cross-sectional area of the heat exchanger to increase heat transfer is feasible, but it will likely involve a change in enclosure size. AHAM suggested that DOE consider screening out this option for smaller capacities. (AHAM, No. 22 at p. 4) DOE agrees that increased heat exchanger areas may require an increase in enclosure size. However, larger coils requiring a larger case and chassis do not necessarily require moving to a product case as large as is needed for higher-capacity portable units (due to smaller heat exchangers as well as compressors, blowers, and condensate buckets). 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.

2. Remaining Technologies

After a review of each technology, DOE found that all of the identified technologies, with the restrictions for pre-cooling air-to-air heat exchangers and heat pipes discussed above, met all four screening criteria and are suitable for further examination in DOE's analysis.

Table IV.6 Remaining Design Options for Dehumidifiers

1. Built-in hygrometer/humidistat
2. Improved compressor efficiency
3. Improved condenser and evaporator performance
4. Improved controls
5. Improved defrost methods
6. Improved demand-defrost controls
7. Improved fan and fan-motor efficiency
8. Improved flow-control devices
9. Low-standby-loss electronic controls
10. Washable air filters
11. Pre-cooling air-to-air heat exchanger (high-capacity portable and whole-home dehumidifiers)
12. Heat pipes (high-capacity portable and whole-home dehumidifiers)
13. Improved refrigeration system insulation
14. Refrigerant-desiccant systems

DOE determined that these technology options are technologically feasible because they are being used or have previously been used in commercially available products or working prototypes. DOE also finds that all of the remaining technology options meet the other screening criteria (i.e., practicable to manufacture, install, and

service and do not result in adverse impacts on consumer utility, product availability, health, or safety). For additional details, see chapter 4 of the NOPR TSD.

C. Engineering Analysis

In the engineering analysis DOE establishes the relationship between the manufacturer production cost (MPC) and improved residential dehumidifier 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 combining aspects of all three analytic methods described above. The efficiency-level approach for residential dehumidifiers, combined with the cost-assessment approach, allowed DOE to develop a cost for each product analyzed. DOE estimated that the costs for these products reflected the costs for typical units at their respective efficiency levels. This

approach involved physically disassembling commercially available products, consulting with outside experts, reviewing publicly available cost and performance information, and modeling equipment cost. To ensure that DOE's analysis covered the entire range of capacities and efficiencies available on the market, DOE relied on the design-option approach to determine what changes would be needed for a particular unit to meet each incrementally higher EL.

For this NOPR, DOE followed the same general approach as for the preliminary engineering analysis, but modified the analysis based on comments from interested parties and to reflect the most current available information. This section provides more detail on how DOE selected the ELs used for its analysis and developed the MPC at each EL. Chapter 5 of the NOPR TSD contains further description of the engineering analysis.

1. Efficiency Levels

a. Baseline Efficiency Levels

A baseline unit is a product that just meets current Federal energy conservation standards and provides basic consumer utility. DOE uses the baseline unit for comparison in several phases of the NOPR analyses, including the engineering analysis, LCC analysis, PBP analysis, and NIA. To determine energy savings that will result from an amended energy conservation standard, DOE compares energy use at each of the higher energy ELs to the energy consumption of the baseline unit. Similarly, to determine the changes in price to the consumer that will result from an amended energy

conservation standard, DOE compares the price of a unit at each higher EL to the price of a unit at the baseline.

As discussed in section IV.A.2 of this notice, DOE adjusted the existing dehumidifier product classes for the preliminary analysis to reflect capacities measured according to the test procedures proposed in the May 2014 Test Procedure NOPR. Similarly, DOE established baseline ELs in the preliminary engineering analysis by adjusting the existing baseline EFs to IEFs as would be measured under the proposed testing requirements. For the portable product classes, the most significant adjustments accounted for the lower ambient test temperature, and energy consumption in standby mode, off mode, and fan-only mode. DOE also established separate baseline efficiencies for the two proposed whole-home dehumidifier product classes. Table IV.7 and Table IV.8 present the baseline ELs developed for the preliminary analysis. Additional information on the development of these baseline ELs is included in chapter 5, section 5.3.1 of the preliminary TSD.

Table IV.7 Preliminary Analysis Portable Dehumidifier Baseline Efficiency Levels

Capacity (pints/day)	**IEF** (L/kWh)
20.00 or less	0.77
20.01 – 30.00	0.80
30.01 – 35.00	0.94
35.01 – 45.00	1.00
45.01 or more	2.07

Table IV.8 Preliminary Analysis Whole-Home Dehumidifier Baseline Efficiency Levels

Product Class (case volume, cubic feet)	**IEF** (L/kWh)
less than or equal to 8.0	1.10
greater than 8.0	1.68

In response to the preliminary analysis, AHAM commented that if the test procedure includes a measure of fan-only mode energy use, AHAM would support the proposed baseline IEF based on units with fan-only mode. (AHAM, No. 22 at p. 3) DOE notes that the appendix X1 test procedure incorporates energy consumption in fan-only mode into the calculation of IEF, and DOE considered units with fan-only mode to determine the proposed baseline IEF in this analysis.

Aprilaire commented that it was not aware of any whole-home units that have a fan-only mode. According to Aprilaire, whole-home dehumidifiers use the HVAC air handler instead of the dehumidifier fan to circulate air inside the home. (Aprilaire, Public Meeting Transcript, No. 25 at pp. 23–24) Aprilaire's comment is consistent with what DOE observed during investigative testing. No whole-home units in DOE's test sample operated in fan-only mode. Accordingly, DOE has not adjusted the whole-home dehumidifier baseline levels to account for operation in this mode.

For this NOPR, DOE maintained the baseline efficiencies determined for the preliminary analysis, with updates to reflect the combined product classes as discussed in section IV.A.1 of this notice. DOE set the baseline efficiency level for the combined product classes at the lower of the two baseline IEF levels considered in the preliminary

analysis for the two previously separate product classes, because that IEF would be based on the minimum energy conservation standard currently applicable for any product within the combined product classes. Table IV.9 and Table IV.10 present the baseline efficiency levels used in this NOPR analysis.

Table IV.9 Portable Dehumidifier Baseline Efficiency Levels

Capacity (pints/day)	**IEF** (L/kWh)
30.00 or less	0.77
30.01 – 45.00	0.94
45.01 or more	2.07

Table IV.10 Whole-Home Dehumidifier Baseline Efficiency Levels

Product Class (case volume, cubic feet)	**IEF** (L/kWh)
8.0 or less	1.77
more than 8.0	2.41

Additional details on the selection of baseline units may be found in chapter 5, section 5.3.1 of the NOPR TSD.

b. Higher Energy Efficiency Levels

For the preliminary analysis, DOE considered incremental efficiency levels beyond the baseline that were based on existing efficiency levels (e.g., the ENERGY STAR level) available in the market and observed during investigative testing. Similar to the baseline efficiency levels discussed above, DOE adjusted these efficiency levels to reflect values that would be obtained when using the test procedure proposed in the May 2014 Test Procedure NOPR. In addition, DOE proposed that the first incremental efficiency level beyond the baseline for each product class be achieved by the elimination

of fan-only mode. Table IV.11 and Table IV.12 present the efficiency levels DOE considered in the preliminary analysis. Additional information on the development of incremental efficiency levels is included in chapter 5, section 5.3.2 of the preliminary TSD.

Table IV.11 Preliminary Analysis Portable Dehumidifier Efficiency Levels

Efficiency Level	Efficiency Level Source	Integrated Energy Factor Efficiency Levels (L/kWh)				
		20.00 pints/day or less	20.01–30.00 pints/day	30.01–35.00 pints/day	35.01–45.00 pints/day	45.01 pints/day or more
Baseline	Baseline with Fan-only Mode	0.77	0.80	0.94	1.00	2.07
1	Baseline with no Fan-only Mode	1.10	1.10	1.20	1.30	2.40
2	Gap Fill 1	1.20	1.20	1.40*	1.40*	2.80
3	Gap Fill 2/ Maximum Available	1.30*	1.30*	1.60	1.60	3.52
4	Maximum Available	1.42	1.52	1.75	1.75	

* These IEF levels represent a translation of the ENERGY STAR efficiency level of 1.85 L/kWh based on the current test conditions to the proposed test condition of 65 °F for the given product class.

Table IV.12 Preliminary Analysis Whole-Home Dehumidifier Efficiency Levels

Efficiency Level	Efficiency Level Source	Integrated Energy Factor Efficiency Levels (L/kWh)	
		8.0 ft^3 or less (Case Volume)	8.0 ft^3 or more (Case Volume)
Baseline	Minimum Available	1.10	1.68
1	Gap Fill 1	1.40	1.90
2	Gap Fill 2/Maximum Available	1.59	2.80
3	Maximum Available		3.41

In response to the preliminary analysis, AHAM commented that its members were conducting testing to compare performance at 80 °F and 65 °F ambient conditions, and if possible, AHAM would provide this aggregated data to DOE. (AHAM, No. 22 at p. 4) DOE has not received additional test data from AHAM at the time of this NOPR, and has therefore relied on its internal test data to establish appropriate IEF values for the incremental efficiency levels beyond the baseline.

Aprilaire noted that there was only about an 11-percent difference between the current DOE energy conservation standards and ENERGY STAR qualification criteria. Aprilaire stated that if the purpose of ENERGY STAR is to promote the best technology at the best value, the current DOE and ENERGY STAR requirements may not provide sufficient consumer choices and differentiation to promote using the latest technology. (Aprilaire, Public Meeting Transcript, No. 25 at pp. 48, 50) Although the U.S. Environmental Protection Agency (EPA), rather than DOE, establishes the ENERGY STAR qualification criteria, DOE selected the current ENERGY STAR level as the basis for an efficiency level in each portable product dehumidifier product class because many products available on the market are rated at that level. While the ENERGY STAR level does not represent a large jump in efficiency from the current DOE standards, on a percentage basis, the range of dehumidifier efficiencies on the market is not large, and the increase in efficiency from baseline to ENERGY STAR represents a significant increase in efficiency over this range. DOE also evaluated higher ELs than the ENERGY STAR level.

Aprilaire asked why there was such a large difference between the highest efficiency levels for the two whole-home product classes. (Aprilaire, Public Meeting Transcript, No. 25 at p. 33) DOE notes that the smaller case volume for the less than 8.0 ft^3 product class limits the available technology options that may be incorporated into these units. For example, the smaller case limits the size of the condenser and evaporator heat exchangers and the ability to incorporate a pre-cooling heat exchanger. Units with larger case volumes are able to more easily incorporate these design options and thus can achieve a higher max-tech efficiency.

For the preliminary analysis, DOE used the maximum available efficiencies as the highest efficiency levels for its analysis, and requested feedback on whether these levels were appropriate. ASAP asked whether the max-tech levels should be higher than the current maximum available efficiency levels. ASAP also asked whether the max-tech level is independent of what level might be appropriate for a standard. (ASAP, Public Meeting Transcript, No. 25 at pp. 34–35) The Joint Commenters stated that DOE should evaluate potential efficiency improvements beyond the maximum available level, and should not use the maximum available level as a proxy for the max-tech levels. They stated that, for example, modest increases in chassis size, permanent-magnet fan motors, and additional heat exchanger improvements may provide further efficiency gains, and that the max-tech levels would likely be higher than the efficiency levels of the most-efficient currently available products. (Joint Commenters, No. 23 at pp. 2–3) The California IOUs commented that the max-tech efficiency level should be based on modeled efficiencies, as opposed to products currently available in the market. They

stated that it is important for DOE to either physically test or model a true max-tech level of dehumidifier efficiency, and this level need not be constrained by cost or other factors that are present in normal commercial product development. The California IOUs stated that this max-tech option should incorporate every known measure to maximize efficiency (e.g., inlet air pre-cooling, improved compressor efficiency, and improved condenser and evaporator heat transfer rate). They stated that in addition to capturing the full energy savings potential, existing dehumidifiers could be compared to this benchmark to determine effective timeframes for when the commercial market could meet the max-tech level. (California IOUs, No. 24 at p. 4)

DOE establishes the max-tech level as the maximum efficiency that is technologically feasible for the covered product. In analyzing potential standards, DOE is not constrained to selecting max-tech levels as the proposed standards levels. DOE agrees that dehumidifiers commercially available at this time may not incorporate all design options that are technologically feasible, and therefore revised the max-tech efficiency levels to incorporate additional design options beyond those observed in its test sample. DOE then modeled the increased efficiency associated with these new max-tech levels.

For the NOPR analysis, another key change to the efficiency levels considered for the preliminary analysis was to combine the previous four lowest capacity portable product classes into two, as discussed in section IV.A.1 of this proposed rule. The two portable product classes from the preliminary analysis with capacities less than 30.00

pints/day each have three identical intermediate efficiency levels. For the combined 30.01 to 45.00 pints/day product class, DOE used an IEF of 1.20 L/kWh for Efficiency Level 1. The previous Efficiency Level 1 for the 35.01 to 45.00 product class in the preliminary analysis was at an IEF of 1.30 L/kWh. DOE chose an IEF of 1.20 L/kWh as the appropriate level for the combined product class because this represents the baseline IEF with no fan-only mode; therefore, DOE concluded it would be appropriate to maintain the lower of the two IEFs at this level for the combined product class.

DOE also updated the efficiency levels for the whole-home dehumidifier classes based on the appendix X1 test procedures, which require a different ambient dry-bulb temperature (73 °F instead of 65 °F) from that proposed in the May 2014 Test Procedure NOPR and a different external static pressure (0.20 inches of water column instead of 0.5 and 0.25 inches of water column) from those proposed in the May 2014 Test Procedure NOPR and the February 2015 Test Procedure SNOPR).

Table IV.13 and Table IV.14 present the revised efficiency levels DOE considered in this NOPR analysis.

Table IV.13 NOPR Analysis Portable Dehumidifier Efficiency Levels

Efficiency Level	Efficiency Level Source	Integrated Energy Factor Efficiency Levels (L/kWh)		
		30.00 pints/day or less	30.01–45.00 pints/day	45.01 pints/day or more
Baseline	Current Baseline with Fan-only Mode	0.77	0.94	2.07
1	Current Baseline with no Fan-only Mode	1.10	1.20	2.40
2	Gap Fill 1	1.20	1.40	2.80
3	Gap Fill 2/ Max Tech	1.30	1.60	3.66
4	Max Tech	1.57	1.80	

Table IV.14 NOPR Analysis Whole-Home Dehumidifier Efficiency Levels

Efficiency Level	Efficiency Level Source	Integrated Energy Factor Efficiency Levels (L/kWh)	
		8.0 ft^3 or less (Case Volume)	More than 8.0 ft^3 (Case Volume)
Baseline	Minimum Available	1.77	2.41
1	Gap Fill 1	2.09	2.70
2	Gap Fill 2/Max Tech	2.53	3.52
3	Max Tech		4.50

Additional details on the selection of incremental efficiency levels may be found in chapter 5, section 5.3.2 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 product class considered in that analysis. DOE selected products covering the range of efficiencies

available on the market for the teardown analysis. During the teardown process, DOE created detailed bills of materials (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 was used to calculate 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 dehumidifier. DOE also developed BOMS and MPCs for theoretical units that could implement the current max-tech for dehumidifier components.

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 determine what changes would be needed for a particular unit to meet each incrementally higher efficiency level. DOE constructed cost-efficiency curves for multiple manufacturers to reflect the incremental MPC corresponding to each manufacturer's product line and available platforms. DOE combined the individual cost-efficiency curves based on estimates of each manufacturer's market share to develop an overall cost-efficiency curve representative of the entire industry. Table IV. 15 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. The incremental MPCs are presented in 2012 dollars (2012$), which reflects the year in which the preliminary analysis teardowns and modeling were performed.

Table IV.15 Preliminary Analysis Dehumidifier Incremental Manufacturer Production Costs (2012$)

	Portable Product Class Capacities (pints/day)					**Whole-Home Product Class Case Volume** (cubic feet)	
Efficiency Level	**≤ 20.00**	**20.01-30.00**	**30.01-35.00**	**35.01-45.00**	**> 45.00**	**≤ 8.0**	**> 8.0**
EL1	$-	$-	$-	$-	$38.40	$15.22	$6.14
EL2	$1.56	$1.85	$2.94	$1.98	$49.16	$76.18	$37.05
EL3	$4.64	$3.78	$8.72	$7.56	$100.13	N/A	$112.01
EL4	$7.77	$10.82	$13.40	$11.24	N/A	N/A	N/A

Section 5.5 of Chapter 5 of the preliminary TSD contains additional details on the analysis conducted in support of developing these MPC estimates.

DOE received multiple comments from interested parties on the engineering analysis and MPC estimates developed for the preliminary analysis. GE Appliances (GE) commented that it is very low cost to get to Efficiency Level 1 by eliminating fan-only mode because it only requires software changes. (GE, Public Meeting Transcript, No. 25 at p. 43) AHAM and GE commented that removing fan-only mode reduces consumer utility with longer defrost times at lower temperatures, less stability of the humidity in the environment, and stagnation of the air. AHAM also stated that for manufacturers that would not want to make these tradeoffs, Efficiency Level 1 would be nearly impossible to meet by combining other technology options. (AHAM, No. 22 at p. 3; GE, Public Meeting Transcript, No. 25 at p. 43) DOE continues to expect manufacturers would remove fan-only mode in products as a first step to improving efficiency because of the low cost and ease of implementation. Many units available on the market already do not incorporate fan-only mode. In manufacturer interviews, manufacturers typically stated

that there would be no impact on consumer utility to remove fan-only mode. DOE also notes that although it asserts that manufacturers would remove fan-only mode to reach Efficiency Level 1, manufacturers may elect to incorporate other design options to improve efficiency to that level.

Aprilaire asked whether DOE considered in its analysis the limited availability of compressor technologies for the larger dehumidifiers. Aprilaire noted that compressors in larger dehumidifiers do not have a lot of new technologies and sizes available to them. Manufacturers would have to increase efficiency by increasing coil sizes or incorporating features such as air-to-air heat exchangers or wrap-around coils, which would be very expensive for the manufacturer. (Aprilaire, Public Meeting Transcript, No. 25 at pp. 23–24) AHAM commented that compressor efficiency has not been increasing significantly. Manufacturers may be seeking to incorporate higher efficiency compressors, but it is possible that compressors are reaching close to max-tech levels such that selecting a higher efficiency compressor may be cost prohibitive. (AHAM, No. 22 at p. 4)

For the preliminary engineering analysis, DOE identified the range of compressor capacities observed in dehumidifiers available on the market. DOE then identified the range of efficiencies for all available compressors within that capacity range. When evaluating higher compressor efficiencies, DOE considered the most efficient rotary R-410A compressor available in the required range of capacities, without requiring a switch to a different compressor technology. Additionally, DOE factored in the compressor efficiencies observed in products in its teardown sample when determining the overall

efficiency gains that may be achieved through compressor improvements. If a dehumidifier already incorporated an efficient compressor, DOE relied on other design options such as increasing heat exchanger sizes to improve efficiencies.

In AHAM's comments on the preliminary engineering analysis cost estimates, it asked for more information on how a 3,000 Btu/h compressor would be estimated to cost less than $7. (AHAM, Public Meeting Transcript, No. 25 at p. 38) GE commented that because there are very few room air conditioner compressors rated as low as 5,000 Btu/h, the curve used to determine compressor prices is probably valid only down to 5,000 Btu/h. (GE, Public Meeting Transcript, No. 25 at p. 39) DOE notes that in the preliminary analysis, it relied on the room air conditioner compressor cost curve only over the range of capacities for which it was developed, 5,000 to 24,000 Btu/h. DOE used the $7 cost for a 3,000 Btu/h compressor as an example of an inappropriately low cost from extrapolating the cost curve below its lower limit (5,000 Btu/h). DOE did not use this cost estimate in the preliminary analysis or in this NOPR. In both the preliminary analysis and this NOPR, DOE estimated that compressor costs would continue to decrease for compressor capacities less than 5,000 Btu/h, but estimated a more conservative linear decrease in costs compared to extrapolating the room air conditioner curve. (For additional information, see chapter 5, section 5.5.5 of the preliminary TSD.)

ASAP asked if DOE had evaluated heat exchanger improvements other than increasing the cross-sectional area, and if so, which improvement had the largest impact. (ASAP, Public Meeting Transcript, No. 25 at p. 46) AHAM commented that

manufacturers might choose to rely on heat exchanger sizes to improve condenser and evaporator performance, but larger coils mean more static pressure, thus adding more costly motors. (AHAM, No. 22 at pp. 3–4)

As part of the preliminary analysis, DOE considered additional heat exchanger design changes, including increasing the number of tube passes and heat exchanger depth in the direction of the air flow. DOE modeled the efficiency improvements of these changes, as well as an increase in cross-sectional area, and found that increasing the heat exchanger cross-sectional area resulted in the greatest efficiency improvement. As noted in section 5.5.1 and throughout chapter 5 of the preliminary TSD, DOE asserted that manufacturers would rely on this heat exchanger design change to reach higher efficiency levels. Manufacturers confirmed during interviews that they would typically rely on increased cross-sectional area rather than other heat exchanger design changes to reach higher efficiencies. In considering larger cross-sectional areas, DOE also did not assume a corresponding increase in motor power. DOE expects that the static pressure over the heat exchanger would not increase with larger cross-sectional area because of the lower relative air velocity through the coil.

ASAP asked whether a fixed standby power level is incorporated into each IEF level. ASAP noted that the preliminary analysis does not include reduced standby power as a design option, which is reasonable as long as the standby power levels at each efficiency level are low. ASAP further commented that the energy study that DOE cited in the preliminary TSD found standby power levels for some products to be as high as 12

watts (W), and requested confirmation that high standby power levels are not incorporated in the IEFs. (ASAP, Public Meeting Transcript, No. 25 at pp. 44–45) AHAM agreed with DOE's determination in the preliminary analysis that manufacturers would rely on changes other than low-standby-loss electronic controls to achieve the relatively large increments in efficiency levels. (AHAM, No. 22 at p. 5)

In section 5.5.3.2 of the preliminary TSD, DOE noted that while the average low-power mode power draw for units in its test sample was lower for a switch-mode power supply compared to a linear power supply (0.4 W compared to 1.2 W), these values, incorporated into the same unit, would have a negligible effect on the final rounded IEF. Accordingly, DOE did not consider improving low-power mode energy consumption at any efficiency level. If a unit did indeed have a 12 W low-power mode power draw, DOE expects that the manufacturer would switch to low-standby-power controls to improve IEF. However, DOE notes that the 12 W level was observed in the field, and does not necessarily reflect the control settings and operation of the unit as tested according to the low-power mode testing provisions in the appendix X1 test procedures. DOE did not observe any standby mode or off mode power levels higher than 4.5 W in its testing of a large sample of dehumidifiers from manufacturers representing over 80 percent of the market.

GE and AHAM commented that Underwriters Laboratories (UL) has a new standard, UL 474, which requires Arc Fault Circuit Interrupter (AFCI) protection to be added to all cord-connected dehumidifiers manufactured on or after February 6, 2017.

Adding AFCI protection to dehumidifiers will increase standby power. According to GE, the increase in standby power would be about 0.5 W. (AHAM, No. 22 at p. 7; GE, Public Meeting Transcript, No. 25 at pp. 47–48) This estimated increase in low-power mode power draw is similar to the range in low-power mode power consumption that DOE observed among the units in its test sample, and which DOE determined had little or no effect on the final rounded IEF value. Accordingly, DOE determined that the new UL 474 standard would not require adjusting the IEF values considered for each efficiency level.

In chapter 5, section 5.5.3.2 of the preliminary TSD, DOE provided discussion on a number of design options that were not directly considered in the engineering analysis. These design options were described in chapter 3, section 3.14.2 of the preliminary TSD. AHAM agreed that:

1. A built-in hygrometer/humidistat would not result in efficiency gains.
2. Because the test procedure requires continuous unit operation at constant ambient conditions, it would not reflect improved control schemes and thus these should not be further considered in the analysis.
3. If DOE adopts the 65 °F ambient condition, manufacturers would likely adjust their units to avoid defrosts when operating at that condition, and thus improved defrost methods should not be considered further in the analysis.

4. Demand-defrost controls should not be considered because units on the market already feature sensor-based defrost control and because the test procedure would not capture efficiency improvements from it.
5. Any benefit associated with the unit's ability to adjust to varying ambient conditions would not be captured by the test procedure, and thus improved flow-control devices should not be further considered in the analysis.
6. Washable air filters are not a design option because all units DOE analyzed include this feature.
7. Improved refrigeration system insulation should not be considered as a design option because DOE did not observe a relationship between efficiency and insulation.

(AHAM, No. 22 at pp. 4–6)

The California IOUs commented that measures that were rejected because their impact would not be directly observable under the current DOE test procedure—variable -speed compressors, permanent-magnet fan motors, improved controls (standby power consumption, relative humidity set-point accuracy, refrigerant flow controls, improved defrost controls), and improved insulation in the refrigeration system—all have the potential for significant energy use reduction and therefore should be considered as design options. The California IOUs stated that a number of areas for improving the accuracy and range of controls could greatly enhance overall dehumidifier efficiency, and although the majority of these measures would not significantly affect the rated active mode efficiency of dehumidifiers under the current test procedure, they should be

considered as design options because future updates to the test procedure may properly account for these efficiency gains. (California IOUs, No. 24 at pp. 4 and 5) The California IOUs also commented that DOE should consider requiring dehumidifiers to contain hygrometers, which would reduce overall energy use by automatically controlling active mode operation based on ambient temperature and humidity conditions. They stated that more advanced controls are capable of using data from hygrometers to optimize compressor and fan usage by utilizing a pre-programmed compressor and fan schedule over a range of dry-bulb and wet-bulb temperature combinations. They also stated that because some hygrometers can be inaccurate, which could cause units to run much longer duty cycles than the user intends, DOE should consider requiring a certain hygrometer accuracy and should modify the test procedure to accommodate this measurement. (California IOUs, No. 24 at p. 5)

DOE identified these design options in the market and technology assessment because of their potential to increase dehumidifier efficiencies in real-world applications. However, because the benefits of these design options would likely not be measured under the appendix X1 test procedure, DOE determined that manufacturers would not likely incorporate the design options to existing products to reach higher efficiency levels. The appendix X1 test procedure determines dehumidifier performance under constant ambient conditions, and therefore would not reflect potential energy impacts of design options that improve controls to adjust unit operation to respond to ambient conditions. Accordingly, DOE requests comment on whether to promote installation of

any of the design options identified by the California IOUs, even though the resulting efficiency gains would not be measurable with the existing test protocol.

ASAP and the Joint Commenters stated that DOE should include the efficiency improvements associated with permanent-magnet fan motors unless the savings are trivial. (ASAP, Public Meeting Transcript, No. 25 at pp. 45–46; Joint Commenters, No. 23 at pp. 2–3) The Joint Commenters also stated that while costs to both consumers and manufacturers are important considerations in determining appropriate standard levels, costs can't be considered in establishing the max-tech levels. They also noted that DOE analyzed permanent-magnet fan motors in several recent rulemakings (furnace fans, walk-in coolers and freezers, commercial refrigeration equipment). (Joint Commenters, No. 23 at pp. 2–3) AHAM commented in agreement with DOE's determination in the preliminary analysis that improved fan and fan-motor efficiency should not be considered because DOE found no significant changes to blowers and fan motors at different efficiencies. (AHAM, No. 22 at p. 5)

In improving the max-tech efficiencies beyond the maximum available, as discussed in section IV.C.1.b of this proposed rule, DOE included a change to permanent-magnet fan motors. While manufacturers do not currently incorporate permanent-magnet fan motors in products available on the market, DOE determined that this is a technologically feasible change that would improve product efficiencies. The revised MPCs for the NOPR analysis reflect this design change, as well as others, at the max-tech efficiency level.

For the NOPR analysis, DOE also updated the incremental MPC estimates from the preliminary analysis to combine the four lower capacity portable product classes into two, as discussed in section IV.A.1 of this proposed rule. To combine the cost estimates from the previous separate portable product classes, DOE used the market shares discussed in the preliminary analysis (see chapter 9, section 9.3.3 of the preliminary TSD) to determine a weighted average of the previous cost estimates. Additionally, DOE updated the MPCs to 2013$, the most recent year for which full-year data was available at the time of this analysis. DOE notes that the whole-home test procedure revisions did not impact the MPC cost estimates for those product classes. DOE assumed products would maintain the same construction as considered for the preliminary analysis, with updated IEFs to reflect the proposed, revised test conditions. Table IV.16 presents the updated MPC estimates DOE developed for this NOPR.

Table IV.16 NOPR Analysis Dehumidifier Incremental Manufacturer Production Costs (2013$)

	Portable Product Class Capacities (pints/day)			**Whole-Home Product Class Case Volume** (ft^3)	
Efficiency Level	**≤ 30.00**	**30.01-45.00**	**> 45.00**	**≤ 8.0**	**> 8.0**
EL1	$-	$-	$42.81	$15.30	$6.20
EL2	$1.69	$2.39	$53.66	$129.22	$37.20
EL3	$4.27	$8.07	$120.33	N/A	$161.39
EL4	$19.38	$22.42	N/A	N/A	N/A

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 in the distribution chain to convert the MPC estimates derived in the engineering analysis to consumer prices. At each step in the distribution channel, companies mark up the price of the product to cover business costs and profit margin. For residential dehumidifiers, the main parties in the distribution chain are manufacturers and retailers.

The manufacturer markup converts MPC to manufacturer selling price (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 residential dehumidifiers.

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.[26]

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

[26] U.S. Census, 2007 Annual Retail Trade Survey (ARTS), Electronics and Appliance Stores sectors.

E. Energy Use Analysis

DOE's energy use analysis estimated the range of energy use of residential dehumidifiers in the field, i.e., as they are actually used by consumers. The energy use analysis provided 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 standards.

A dehumidifier uses energy when the compressor is operating to remove moisture from the air. When the compressor is not operating, the dehumidifier may use energy for a fan-only mode that circulates air through the unit to sample the ambient relative humidity and to defrost the condenser coils. When neither the fan nor the compressor is operating, energy is used in standby mode or off mode to supply power for functions such as keeping a user panel lit.

DOE determined the annual energy consumption of residential dehumidifiers by multiplying the capacity (liters per day) by the hours of operation in dehumidification mode, dividing that quantity by the product efficiency, and adding the energy use for the fan mode and the standby and off mode.

The efficiency and capacity values were measured using a temperature of 80 °F and humidity set point of 60 percent, as stipulated in the current test procedure for dehumidifiers.

To estimate hours of operation in each mode, DOE used two recent field studies that measured daily hours of use in each operating mode for both portable and whole-home dehumidifiers.[27] DOE paired these data with estimates of the number of months that dehumidifiers are used in a representative sample of U.S. households. DOE used data from the EIA's 2009 Residential Energy Consumption Survey (RECS 2009), which was the most recent such survey available at the time of DOE's analysis.[28] RECS is a national sample survey of housing units that collects statistical information on the consumption of and expenditures for energy in housing units along with data on energy-related characteristics of the housing units and occupants. RECS 2009 questioned each household on two aspects of dehumidifier use: (1) ownership and (2) number of months of dehumidifier use. DOE estimated that consumers leave the dehumidifier to cycle on and off for the entire month or months of the dehumidification season.

DOE estimated the energy use for the fan mode and the standby and off mode using the hours of operation described above, along with data on average power in fan and standby modes from the field studies.

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

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[27] Willem, H., *et al*., Using Field-Metered Data to Quantify Annual Energy Use of Residential Portable Unit Dehumidifiers, Lawrence Berkeley National Laboratory (Nov. 2013); Willem, H., *et al*., Field-Monitoring of Whole-Home Dehumidifiers: Initial Results of a Pilot Study, Lawrence Berkeley National Laboratory (Nov. 2013).

[28] U.S. Department of Energy: Energy Information Administration, Residential Energy Consumption Survey: 2009 RECS Survey Data (2013) (Available at: http://www.eia.gov/consumption/residential/data/2009/).

F. Life-Cycle Cost and Payback Period Analysis

In determining whether an energy conservation standard is economically justified, DOE considers the economic impact of potential standards on consumers. 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:

- LCC (life-cycle cost) is the total consumer cost of an appliance or product, generally over the life of the appliance or product. The LCC calculation includes total installed cost (equipment manufacturer selling price, distribution chain markups, sales tax, and installation costs), operating costs (energy, repair, and maintenance costs), equipment lifetime, and discount rate. Future operating costs are discounted to the time of purchase and summed over the lifetime of the appliance or product.
- PBP (payback period) measures the amount of time it takes consumers to recover the estimated higher purchase price of a more energy-efficient product through reduced operating costs. Inputs to the payback period calculation include the installed cost to the consumer and first-year operating costs.

For any given EL, DOE measures the change in LCC relative to the LCC in the base case, which reflects the market in the absence of new or amended energy conservation standards, and includes baseline products as well as products with higher

efficiency. In contrast, the PBP for a given EL is measured relative to the baseline product only.

For each product class efficiency level, DOE calculated the LCC and PBP for a nationally representative set of housing units. As stated previously, DOE developed household samples with RECS 2009 data. For each sample household, DOE determined the energy consumption for the residential dehumidifier 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 residential dehumidifiers.

AHAM continues to oppose DOE's reliance on RECS 2009 for the LCC and PBP analysis. AHAM considers it difficult, if not impossible, to compare the results to the energy use measured in a controlled test procedure situation. (AHAM, No. 22 at p. 6)

The LCC and PBP analyses are designed to support DOE's consideration of the economic impact of potential standards on consumers of the products subject to the standard, as required by EPCA. (42 U.S.C. 6295(o)(2)(B)(i)(I)) The use of RECS 2009 to develop a consumer sample and to provide data for estimation of product energy use allows DOE to characterize the range of conditions in which covered appliances are operated. As a result, DOE is able to estimate how the energy savings would vary among households for each considered EL. Measurement of energy use in a controlled test

procedure situation has a different purpose, which is to provide accurate and comparable measures of energy efficiency for particular covered products.

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

The computer model DOE uses to calculate the LCC and PBP, which incorporates Crystal Ball™ (a commercially available software program), relies on a Monte Carlo simulation to incorporate uncertainty and variability into the analysis. The Monte Carlo simulations randomly sample input values from the probability distributions and residential dehumidifier user samples. The model calculated the LCC and PBP for products at each efficiency level for 10,000 housing units per simulation run.

DOE calculated the LCC and PBP for all customers as if each were to purchase a new product in the expected year of compliance with amended standards. The amended standards would apply to residential dehumidifiers manufactured 3 years after the date on which the amended standards for residential dehumidifiers are published. At this time,

DOE estimates publication of a final rule in 2016. Therefore, for purposes of its analysis, DOE used 2019 as the first year of compliance with any amended standards.

Table IV.17 summarizes the approach and data DOE used to derive inputs to the LCC and PBP calculations. The subsections that follow provide further discussion. Details of the spreadsheet model, and of all the inputs to the LCC and PBP analyses, are contained in chapter 8 of the NOPR TSD and its appendices.

Table IV.17 Summary of Inputs and Methods for the LCC and PBP Analysis*

Inputs	Source/Method
Product Cost	Derived by multiplying MPCs by manufacturer and retailer markups and sales tax, as appropriate. Used historical data to derive a price scaling index to forecast product costs.
Installation Costs	Baseline installation cost determined with data from RS Means. Assumed no change with efficiency level.
Annual Energy Use	The total annual energy use multiplied by the hours per year. Average number of hours based on field data. Variability: Based on the 2009 RECS.
Energy Prices	Electricity: Based on EIA's Form 861 data for 2012. Variability: Regional energy prices determined for 27 regions. Variability: By census region.
Energy Price Trends	Energy: Forecasted using AEO 2015 price forecasts.
Repair and Maintenance Costs	Assumed no change with efficiency level.
Product Lifetime	Portable dehumidifiers: used lifetime from the previous DOE rulemaking for dehumidifiers. Whole-home dehumidifiers: applied the lifetime parameters derived for room air conditioners.
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 SCF** for 1989, 1992, 1995, 1998, 2001, 2004, 2007, and 2010.
Projected Compliance Date	2019

* 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.
** Survey of Consumer Finances.

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.

In the preliminary analysis, DOE projected future dehumidifier prices using a trend based on the appropriate Producer Price Index (PPI) series. AHAM submitted a comment on the preliminary analysis opposing the use of experience curves to project future product prices. (AHAM, No. 22 at pp. 6–7)

There is extensive literature supporting the use of experience curves (also known as learning curves) for a broad range of products. The approach that DOE has used in some rulemakings to derive an experience rate (defined as the fractional reduction in price expected from each doubling of cumulative production) is consistent with the methods used in numerous studies.[29] However, the historical shipment data for dehumidifiers are too limited to construct a robust cumulative production estimation for these products. Instead, DOE retained the approach using an exponential fit of historic PPI data. PPI data specific to residential dehumidifiers were not available, so DOE used the Small Electric Household Appliances PPI (1983 to 2012) from the Bureau of Labor Statistics for portable dehumidifiers, and the Room Air Conditioners and Dehumidifiers PPI (1990 to 2009) for whole-home dehumidifiers.[30] The average annual rate of price decline, adjusted for inflation, in the default case is 2.02 percent for portable dehumidifiers and 2.23 percent for whole-home dehumidifiers.

[29] Margaret Taylor and K. Sydny Fujita, Accounting for Technological Change in Regulatory Impact Analyses: The Learning Curve Technique, Lawrence Berkeley National Laboratory (Apr. 30, 2013); P.B. Kantor and W. I. Zangwill, Theoretical Foundation for a Learning Rate Budget, Management Science, Mar. 1, 1991, at 315; L. Argote and D. Epple, Learning Curves in Manufacturing, Science, Feb. 1990, at 920; J.M. Dutton and A. Thomas, Treating Progress Functions as a Managerial Opportunity, The Academy of Management Review, Apr. 1984, at 235.

[30] PPI Series ID for Small Electric Household Appliance: PCU33521033521014; PPI Series ID for Room Air Conditioner and Dehumidifiers: PCU3334153334156. (Available at: http://www.bls.gov/ppi/).

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous materials and parts needed to install the product. DOE used data from the 2013 RSMeans Residential Cost Data book to estimate the baseline installation cost for whole-home dehumidifiers. DOE found no evidence that installation costs would be impacted with increased efficiency levels.

3. Annual Energy Consumption

For each sampled household, DOE determined the energy consumption for a residential dehumidifier at different efficiency levels using the approach described above in section IV.E of this notice.

4. Energy Prices

DOE derived average annual residential electricity prices for 27 geographic regions using data from EIA's Form EIA-861 database.[31] DOE calculated an average annual regional residential price by: (1) estimating an average residential price for each utility in the region (by dividing the residential revenues by residential sales); and (2) weighting each utility by the number of residential consumers it served in that region. The NOPR analysis used data from 2012.

To estimate energy prices in future years, DOE multiplied the average regional energy prices by the forecast of annual change in national-average residential energy

[31] Available at: www.eia.doe.gov/cneaf/electricity/page/eia861.html.

price in the reference case from AEO 2015, which has an end year of 2040.[32] To estimate price trends after 2040, DOE used the average annual rate of change in prices from 2020 to 2040.

5. Maintenance and Repair Costs

Repair costs are associated with repairing or replacing product components that have failed in an appliance; maintenance costs are associated with maintaining the operation of the product. Typically, small incremental increases in product efficiency produce no, or only minor, changes in repair and maintenance costs.

During the 2013 preliminary analysis phase of the rulemaking, DOE requested information as to whether maintenance and repair costs are a function of efficiency level and product class. Manufacturers responded that these costs would not increase with efficiency. As a result, DOE assumed that repair and maintenance costs do not scale with the efficiency of residential dehumidifiers.

6. Product Lifetime

For portable dehumidifiers, DOE used lifetime estimates from the previous DOE rulemaking for dehumidifiers.[33] DOE assumed whole-home dehumidifiers have the same life span as residential room air conditioners and applied the lifetime parameters derived

[32] DOE-EIA, Annual Energy Outlook 2013 with Projections to 2040 (Available at: http://www.eia.gov/forecasts/aeo/).

[33] DOE-Energy Efficiency and Renewable Energy, Energy Conservation Program for Consumer Products, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment, Residential Dishwashers, Dehumidifiers, and Cooking Products, and Commercial Clothes Washers (2009) (Available at: http://www.regulations.gov/#!documentDetail;D=EERE-2006-STD-0127-0097).

for room air conditioners in the 2011 rulemaking to whole-home dehumidifiers.[34] The analysis yielded an estimate of mean lifetime of approximately 11 years for portable dehumidifiers and approximately 19 years for whole-home dehumidifiers. DOE also used the data to develop a survival function that was incorporated as a probability distribution in the LCC analysis. See chapter 8, section 8.2.2.8 of the NOPR TSD for further details on the method and sources DOE used to develop product lifetimes.

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 discount rates for dehumidifiers 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 in order to approximate a consumer's opportunity cost of funds related to appliance energy cost savings and maintenance costs. DOE then 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 (SCF) for 1995, 1998, 2001, 2004, 2007, and 2010.[35] Using the SCF

[34] DOE-Energy Efficiency and Renewable Energy, Energy Conservation Program for Consumer Products, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment, Residential Clothes Dryers and Room Air Conditioners (2011) (Available at: http://www.regulations.gov/#!documentDetail;D=EERE-2007-BT-STD-0010-0053).

[35] Two older versions of the SCF are also available, 1989 and 1992, but these surveys are not used in this analysis because they do not provide all of the necessary types of data (e.g., credit card interest rates). DOE concludes that the 15-year span covered by the six surveys included is sufficiently representative of recent debt and equity shares and interest rates.

and other sources, DOE then developed a distribution of rates for each type of debt and asset by income group to represent the rates that may apply in the year in which amended standards would take effect. DOE assigned each sample household a specific discount rate drawn from one of the distributions. The average rate across all types of household debt and equity and income groups, weighted by the shares of each class, is 5.0 percent. See chapter 8, section 8.2.3 of the NOPR TSD for further details on the development of consumer discount rates.

8. Base-Case Efficiency Distribution

To accurately estimate the share of consumers that would be affected by a standard at a particular efficiency level, DOE's LCC analysis considered the projected distribution of product efficiencies in the base case (i.e., the case without new energy efficiency standards). DOE refers to this distribution of product efficiencies as a base-case efficiency distribution.

To estimate the efficiency distribution of standard residential dehumidifiers for 2014, DOE analyzed its Compliance Certification Database for residential dehumidifiers. To project the efficiency trend between 2014 and 2019, DOE used a 0.25 percent annual increase in shipment-weighted efficiency, as discussed in section IV.H. The estimated shares for the base-case efficiency distribution for residential dehumidifiers are shown in Table IV.18. See chapter 8, section 8.2.5 of the NOPR TSD for further information on the derivation of the base-case efficiency distributions.

Table IV.18 Residential Dehumidifier Base-Case Efficiency Distribution by Product Class in 2019

PC1		PC2		PC3		PC4		PC5	
≤ 30.00 pints/day		30.01 – 45.00 pints/day		> 45.00 pints/day		≤ 8.0 ft^3		>8.0 ft^3	
EL	Share	EL	Share	EL	Share	EL	Share	EL	Share
0	11%	0	0%	0	57%	0	75%	0	31%
1	23%	1	0%	1	20%	1	25%	1	46%
2	0%	2	94%	2	23%	2	0%	2	23%
3	66%	3	2%	3	0%			3	0%
4	0%	4	4%						

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

10. Rebuttable Presumption Payback Period

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 EL, DOE determined the value of the first year's energy savings by multiplying the energy savings by the average energy price forecast for the year in which compliance with the amended standard would be required. The results of the rebuttable presumption PBP analysis are summarized in section V.B.1.c of this proposed rule.

G. Shipments

DOE uses forecasts of annual product shipments to calculate the national impacts of potential amended energy conservation standards on energy use, NPV, and future manufacturer cash flows. [36] The shipments model takes an accounting approach, tracking market shares of each product class and the vintage of units in the stock. Stock accounting uses product shipments as inputs to estimate the age distribution of in-service product stocks for all years. The age distribution of in-service product stocks is a key input to calculations of both the NES and NPV, because operating costs for any year depend on the age distribution of the stock.

To determine shipments to the replacement market, DOE estimated a stock of dehumidifiers by vintage by integrating historical shipments starting from 1972. Over time, some units are retired and removed from the stock, triggering the shipment of a replacement unit. Depending on the vintage, a certain percentage of each type of unit will fail and need to be replaced. DOE based the retirement function on a probability distribution for the product lifetime that was developed in the LCC analysis. The

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

shipments model assumes that no units are retired below a minimum product lifetime and that all units are retired before exceeding a maximum product lifetime.

To calibrate the estimated shipments with the historical data, DOE introduced into the model a market segment identified as existing households without dehumidifiers, also referred to as first-time owners. Based on the calibration, DOE estimated that 0.35 percent of existing households without a dehumidifier would annually purchase this product over the analysis period, 2019─2048.

Because the incremental cost of products meeting the considered standard levels is very low relative to the operating cost savings (see section V.B.1.a), DOE assumed that shipments would not be affected by the proposed standards. For details on the shipments analysis, see chapter 9 of the NOPR TSD.

AHAM stated that the historical shipments and the projected shipments do not seem to be logically connected—the historical shipments are jagged, going up and down, sometimes dramatically, while the future shipments show a relatively smooth, upward curve. (AHAM, No. 22 at p. 7) DOE used the average trend of historical shipments to forecast shipments for all dehumidifier product classes. The smoothed-line forecast is a product of this approach.

H. National Impact Analysis

The NIA assesses the NES and the national NPV of total consumer costs and savings that would be expected to result from new or amended standards at specific efficiency levels. DOE calculates the NES and NPV based on projections of annual appliance shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses.[37] For the present analysis, DOE forecasted the energy savings, operating cost savings, product costs, and NPV of consumer benefits over the lifetime of dehumidifiers sold from 2019 through 2048.

DOE evaluates the impacts of new and amended standards by comparing base-case projections with standards-case projections. The base-case projection characterizes energy use and consumer costs for each product class in the absence of new or amended energy conservation standards. DOE compares these projections with projections characterizing the market for each product class if DOE adopted new or amended standards at specific energy ELs (i.e., the TSLs or standards cases) for that class. For the base-case forecast, DOE considers historical trends in efficiency and various forces that are likely to affect the mix of efficiencies over time. For the standards cases, DOE also considers how a given standard would likely affect the market shares for 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

[37] For the NIA, DOE adjusts the installed cost data from the LCC analysis to exclude sales tax, which is a transfer.

analyses by changing various input quantities within the spreadsheet. The NIA spreadsheet model uses typical values (as opposed to probability distributions) as inputs.

Table IV.19 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.19 Summary of Inputs and Methods for the National Impact Analysis

Inputs	**Method**
Shipments	Annual shipments from shipments model.
Projected Compliance Date of Standard	2019
Base-Case Forecasted Efficiencies	Shipment-Weighted Integrated Energy Factor (SWIEF) determined in 2014 for each of the considered products classes. Annual growth rate of 0.25 percent assumed for determining SWIEF between 2014 and 2048.
Standards-Case Forecasted Efficiencies	Roll-up scenario for 2019; efficiency improvement after 2019 based on 0.25 percent.
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 forecast 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	AEO 2015 forecasts (to 2040) and extrapolation through 2048.
Energy site-to-power plant conversion	A time-series conversion factor derived from AEO 2014.
Discount Rate	Three and seven percent real.
Present Year	Future costs and savings are discounted to 2014.

1. 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 base case with no new or amended energy conservation standards. DOE calculated the national energy consumption by multiplying the number of units (stock) of each product (by vintage or age) by the unit energy consumption (also by vintage). Vintage represents the age of the product. DOE calculated annual NES based on the difference in national energy consumption for the base case (without amended efficiency standards) and for each higher efficiency standard. 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 the AEO 2015 version of NEMS. Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

In response to the recommendations of a committee on "Point-of-Use and Full-Fuel-Cycle Measurement Approaches to Energy Efficiency Standards," appointed by the National Academy of Sciences, DOE announced its intention to use FFC measures of energy use and greenhouse gas and other emissions in the NIA and emissions analyses included in future energy conservation standards rulemakings. 76 FR 51281 (Aug. 18, 2011). After evaluating the approaches discussed in the August 18, 2011 notice, DOE published a statement of amended policy in the Federal Register in which DOE explained its determination that NEMS is the most appropriate tool for its FFC analysis and its

intention to use NEMS for that purpose. 77 FR 49701 (Aug. 17, 2012). NEMS is a public domain, multi-sector, partial equilibrium model of the U.S. energy sector[38] that EIA uses to prepare its Annual Energy Outlook. The approach used for deriving FFC measures of energy use and emissions is described in appendix 10C of the NOPR TSD.

a. Forecasted Efficiency in the Base Case and Standards Cases

A key component of the NIA is the trend in energy efficiency forecasted for the base case (without new or amended standards) and each of the standards cases. Section IV.F.8 of this notice describes how DOE developed a base-case energy efficiency distribution (which yields a shipment-weighted average efficiency) for each of the considered product classes for the first year of the forecast period. To project the trend in efficiency for residential dehumidifiers over the entire forecast period, DOE used a 0.25 percent annual increase based on the rate that was used for room air conditioners in DOE's 2011 rule making.[39] This trend is described in chapter 10, section 10.2 of the NOPR TSD.

DOE used a "roll-up" scenario to establish the shipment-weighted efficiency for the year that standards are assumed to become effective (2019). In this scenario, product efficiencies in the base case that do not meet the standard under consideration would "roll

[38] 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/).

[39] DOE-Energy Efficiency and Renewable Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment, Residential Clothes Dryers and Room Air Conditioners (2011) (Available at: http://www.regulations.gov/#!documentDetail;D=EERE-2007-BT-STD-0010-0053).

up" to meet the new standard level, and the market share of products above the standard would remain unchanged.

To develop standards-case efficiency trends, DOE used an approach that assumes that the rate of adoption of more efficient products under the standards case occurs at a rate that ensures that the average total installed cost difference between the standards case and base case is constant over the entire forecast period. Because the total installed cost versus efficiency relationship for each product class demonstrates an increasing cost rate for more efficient products, the efficiency growth rate for each standards case is lower than the growth rate for the base case. For more information, see chapter 10, section 10.2 of the NOPR TSD.

2. 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 calculates net savings each year as the difference between the base case and each standards case in total savings in operating costs and total increases in installed costs. DOE calculates operating cost savings over the life of each product shipped during the forecast period.

As discussed in section IV.F.1 of this proposed rule, DOE developed residential dehumidifier price trends based on historical PPI data. Within the portable and whole-

house product groups, DOE applied the same trends to forecast prices for each product class at each considered EL. By 2048, which is the end date of the forecast period, the average dehumidifier price is forecasted to drop 37 percent relative to 2013. DOE's projection of product prices for residential dehumidifiers is described in further detail 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 residential dehumidifiers. In addition to the default price trend, DOE considered two product price sensitivity cases: (1) a high price decline case based on an exponential fit using PPI data for 1988 to 2013; and (2) a low price decline case based on an experience rate derived using PPI and shipments data for 1991 to 2000. 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 energy prices by the forecast of annual national-average residential energy 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 today's NOPR, DOE estimated the NPV of consumer benefits using both a 3-percent and a 7-percent real discount rate. DOE uses these discount rates in accordance with guidance provided by the Office of Management and Budget (OMB) to Federal agencies on the development of regulatory analysis.[40] The discount rates for the determination of NPV are in contrast to the discount rates used in the LCC analysis, which are designed to reflect a consumer's perspective. The 7-percent real value is an estimate of the average before-tax rate of return to private capital in the U.S. economy. The 3-percent real value represents the "social rate of time preference," which is the rate at which society discounts future consumption flows to their present value.

I. Consumer Subgroup Analysis

In analyzing the potential impact of new or amended standards on consumers, DOE evaluates the impact on identifiable subgroups of consumers that may be disproportionately affected by a 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

[40] United States Office of Management and Budget, "Circular A-4: Regulatory Analysis," Section E (Sept. 17, 2003) (Available at: www.whitehouse.gov/omb/memoranda/m03-21.html.http://www.whitehouse.gov/omb/circulars_a004_a-4/).

of the considered standard levels on low-income households and senior-only households. Chapter 11 in the NOPR TSD describes the consumer subgroup analysis.

J. Manufacturer Impact Analysis

1. Overview

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

The quantitative part of the MIA primarily relies on the Government Regulatory Impact Model (GRIM), an industry cash flow model with inputs specific to this rulemaking. The key GRIM inputs include data on the industry cost structure, unit production costs, product shipments, manufacturer markups, and investments in R&D and manufacturing capital required to produce compliant products. The key GRIM outputs are the INPV and the impact to domestic manufacturing employment. The model estimates the impacts of more stringent energy conservation standards on a given industry

by comparing changes in INPV and domestic manufacturing employment between the base case and the various TSLs in the standards case. To capture the uncertainty relating to manufacturer pricing strategy following amended 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, sections 12.1 and 12.2 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 residential dehumidifier manufacturing industry. This included a top-down analysis of residential dehumidifier 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, including SEC 10-K filings, corporate annual reports, the U.S. Census Bureau's Economic Census, and reports from Dunn & Bradstreet, to conduct the analysis.

In Phase 2 of the MIA, DOE prepared a framework industry cash flow analysis to quantify the impacts of new and amended energy conservation standards. The GRIM uses several factors to determine a series of annual cash flows starting with the

announcement of the standard and extending over a 30-year period following the 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.

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

In Phase 3 of the MIA, DOE conducted structured, detailed interviews with representative manufacturers. During these interviews, DOE discussed engineering, manufacturing, procurement, and financial topics to validate assumptions used in the GRIM and to identify key issues or concerns. See section IV.J.4 for a description of the key issues raised by manufacturers during the interviews. As part of Phase 3, DOE also evaluated subgroups of manufacturers that may be disproportionately impacted by amended standards or that may not be accurately represented by the average cost assumptions used to develop the industry cash flow analysis. Such manufacturer subgroups may include small business manufacturers, low-volume manufacturers (LVMs), niche players, or manufacturers exhibiting a cost structure that largely differs

from the industry average. DOE identified one dehumidifier manufacturer subgroup (small businesses) for which average cost assumptions may not hold.

Based on the size standards published by the Small Business Administration (SBA),[41] to be categorized as a small business manufacturer of residential dehumidifiers under North American Industry Classification System (NAICS) codes 333415 ("Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing") or 335210 ("Small Electrical Appliance Manufacturing"), a dehumidifier manufacturer and its affiliates may not employ more than 750 employees. The 750-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 identified five manufacturers of residential dehumidifiers that qualify as small businesses, the majority of which are manufacturers of whole-home and high-capacity portable dehumidifiers.

The manufacturer subgroup analysis is discussed in greater detail in chapter 12, section 12.6 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 amended energy conservation standards. The GRIM uses manufacturer costs, markups, shipments, and industry financial information to arrive at a series of base-case annual

[41] 65 FR 30836 (May 15, 2000), as amended at 65 FR 53533, 53544 (Sept. 5, 2000).

cash flows absent new or amended standards, beginning with the present year, 2014, and continuing through 2048. The GRIM then models changes in 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 residential dehumidifiers, DOE used a real discount rate of 8.43 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 base case and the various TSLs. The difference in INPV between the base case and a standards case represents the financial impact of the amended 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 notice. Additional details about the GRIM can be found in chapter 12, sections 12.4 and 12.5 of the NOPR TSD.

a. Government Regulatory Impact Model Key Inputs

Manufacturer Production Costs

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 EL for each product class, 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.

Base-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 2015 (the base year) to 2048 (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 amended 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 efficiency 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

Amended 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. 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 amended 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, sections 12.4.7 and 12.4.8 of the NOPR TSD.

b. Government Regulatory Impact Model Scenarios

Base-Case Markup

As discussed in section IV.D of this notice, 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 residential dehumidifiers and comments from manufacturer interviews, DOE assumed the industry average base-case markup on production costs to be 1.45. This markup takes into account the two-tiered sourcing structure of the small portable dehumidifier segment, detailed below, in addition to the traditional one-tiered structure of the high-capacity portable and whole-home dehumidifier segment. The majority of the market for the lower-capacity portable product classes (product classes 1 and 2) are manufactured under contract by an overseas original equipment manufacturer (OEM). The engineering analysis, as detailed in chapter 5 of the NOPR TSD, estimates the cost of manufacturing at the OEM. This production cost is marked up once by the OEM to the company contracting its manufacturer and again by the contracting company who imports the product and sells it to retailers. For the small portable dehumidifier segment, the industry average baseline markup breaks down as follows:

Table IV.20 Industry-Average Baseline Markups

OEM to Contracting Company Markup	1.20
Contracting Company to First Customer Markup	1.21
Overall OEM to First Customer Markup	1.45

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 amended

energy conservation standards: (1) a preservation of gross margin[42] (percentage) scenario; and (2) a preservation of per-unit operating profits scenario. These scenarios lead to different markups 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 1.45 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 amended standards. Under this scenario, gross margin as a percentage decreases in the standards case.

[42] "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. Discussion of Comments

During the public comment period following the preliminary analysis public meeting, trade associations and small business manufacturers of residential dehumidifiers provided several comments on the potential impact of amended energy conservation standards on manufacturers.

In response to the May 2014 Notice, AHAM suggested that Canada's Energy Efficiency Regulations mandate standards for dehumidifiers that are harmonized with the existing standards in the United States. For other products, AHAM stated that the Canadian standards currently or soon will lag behind the U.S. standards, even though Canada has expressed its desire for harmonization. AHAM believes that this disharmony will result in added burden for manufacturers and confusion to consumers. AHAM encouraged DOE to work closely with Natural Resources Canada (NRCan) as it promulgates revised dehumidifier standards so that NRCan can publish harmonized Canadian standards with the same projected compliance date as in the United States. AHAM stated that it will work with NRCan and DOE to accomplish this goal. (AHAM, No. 22 at pp. 2–3)

Therma-Stor commented that changes to the testing and rating procedures may lead to confusion in the marketplace as the public has become accustomed to the current dehumidifier rating scheme. Therma-Stor also commented that it will be necessary to educate dealers and consumers about a revised rating scheme which substantially changes the capacity and efficiency ratings of each dehumidifier model. As a small manufacturer,

Therma-Stor stated that it has limited engineering design, manufacturing, and marketing resources at its disposal. Therma-Stor typically maintains and manufactures a given dehumidifier model design for several years. According to Therma-Stor, a substantial change in the test procedure may require it to re-engineer its current product designs and revise related literature. Due to their small size and limited resources, this re-engineering may require more time for small manufacturers than larger entities with larger resource pools (Therma-Stor, No. 21 at p. 2) and may place a larger burden on small manufacturers.

Therma-Stor also expressed concern about the divergence of rating test procedures between DOE and EPA ENERGY STAR programs. Therma-Stor believes that DOE and EPA should work together to harmonize the rating test procedures to minimize the cost, time, and complexity of compliance for manufacturers. Therma-Stor further requested that if the rating test procedures are significantly revised, a reasonable "grace period" between the publication of the final rule and enforcement of the rule should be provided to allow small manufacturers to make necessary revisions to their products and literature to achieve compliance. Id.

DOE acknowledges that the new test procedure will result in a new rating system that will need to be properly conveyed to consumers via updated sizing recommendations in manufacturer product literature and websites. DOE notes that all manufacturers will be subject to the same shift in rating system.

While DOE also acknowledges that the presence of multiple standards and test procedures may place a disproportionate burden on small business manufacturers, DOE notes that EPA typically adopts the most recent DOE test procedure for the ENERGY STAR program. See sections V.B.2.d and VI.B of this proposed rule for a discussion of the impacts on small business manufacturers. Feedback from manufacturers also suggests that a 3-year period for compliance after the final rule is published is reasonable.

Aprilaire noted that energy conservation standards for whole-home dehumidifier products could negatively impact the development of this segment of the dehumidifier industry. Aprilaire explained that, as the whole-home dehumidifier segment is a relatively new industry, innovative products are being developed to help control whole-home latent conditions with minimal energy use. According to Aprilaire, this is achieved through combinations of application, latent removal techniques, and control methods and algorithms. Aprilaire believes that prematurely placing rules and tests that cannot anticipate some of these product designs and applications could limit the number of products on the market and hinder innovation. (Aprilaire, No. 20 at p. 2)

DOE understands that amended conservation standards will require manufacturers to divert at least a portion of R&D and/or capital expenditure resources to standards compliance in the years leading up to the projected compliance date, effectively taking these resources away from other projects. The effect of these investments on manufacturer cash flows is discussed further in section V.B.2.a of this proposed rule.

Aprilaire also commented that it believes DOE is singling out whole-home dehumidifiers for this rule, and ignoring other products which have functions built into them to obtain whole-home dehumidification, such as air conditioners. According to Aprilaire, separating one product from a larger category places an undue and unfair burden on whole-home dehumidifier manufacturers. Aprilaire referenced EPA document 402-F-13053, saying that EPA recognizes that there are multiple methods of controlling humidity, but the proposed standard only restricts the stand-alone whole-home dehumidification method. (Aprilaire, No. 20 at p. 2)

DOE regulations already cover central air conditioners and room air conditioners, and manufacturers of these products must demonstrate compliance with current energy conservation standards codified in 10 CFR 430.32(c) and (b), respectively.

4. Manufacturer Interviews

To inform the MIA, DOE interviewed manufacturers with an estimated combined market share of approximately 70 percent. The information gathered during these interviews enabled DOE to tailor the GRIM to reflect the unique financial characteristics of the residential dehumidifier industry. These confidential interviews provided information that DOE used to evaluate the impacts of amended energy conservation standards on manufacturer cash flows, manufacturing capacities, and employment levels.

During the interviews, DOE asked manufacturers to describe the major issues they anticipate to result from the energy conservation standards proposed in this

rulemaking. The following sections describe the most significant issues identified by manufacturers. DOE also includes additional concerns in chapter 12, section 12.3 of the NOPR TSD.

Consumer Confusion

The majority of manufacturers interviewed emphasized concerns over the impact of new test conditions in the DOE dehumidifier test procedure on the rated capacity of their products. One manufacturer noted a 60-percent to 70-percent decrease in capacity and efficiency due to lower ambient temperatures for testing. Some manufacturers fear that a shift in rated capacity resulting from a change in test procedure will lead to confusion in the market, as consumers find it important to have the same apparent capacity in a replacement residential dehumidifier, even if it is simply a larger unit at a lower rating condition. Also, dehumidifiers with smaller capacities cannot reach the same efficiency as higher-capacity units due to limitations of the vapor-compression cycle, because the parasitic losses (i.e., the power draw not associated with running the compressor during dehumidification mode) make it harder to maintain efficiency with smaller compressors. One manufacturer estimated that a multi-million dollar investment would be necessary to redesign products that would maintain customer perception of rated capacities. That manufacturer went on to note that if it is unable to produce comparable products at the same effective capacity, it would consider exiting the market.

Other manufacturers indicated that as product ratings are modified to reflect the test results at the lower ambient temperature, the whole product classification system will need to be revisited, which will require a substantial investment in consumer education.

Consumer Utility

Multiple manufacturers interviewed expressed concerns that an amended energy conservation standard for residential dehumidifiers would have an adverse impact on price, noise level, and size, and would thus compromise consumer utility. Manufacturers are concerned that residential dehumidifiers would need to become physically larger to deliver the same moisture removal capacity to comply with new amended testing and energy conservation standards. For customers with space constraints, finding a product that best fits their needs may be more difficult under an amended standard. For example, some whole-home dehumidifiers must fit into a small attic or crawl space. If amended energy conservation standards for whole-home products cannot be met within the size constraints associated with this type of installation, part of the whole-home market segment may move to portable products, reducing consumer utility by forcing the unit into the living space. Additionally, larger portable dehumidifiers are already cumbersome to move around, making them close to the limit of what is considered portable. As such, consumers may be forced to purchase a lower-capacity dehumidifier or alternative product.

Impacts on Profitability

During interviews, many manufacturers stated that an industry-wide price increase of 25 percent would have major negative impacts on the portable dehumidifier market. Manufacturers went on to note that a price increase of 50 percent or more would cause the market to collapse entirely. A whole-home dehumidifier manufacturer stated that a 10-percent cost increase would have a significant impact on the whole-home market because any increases in manufacturer production costs are magnified due to the two-tiered distribution channel that is characteristic of the whole-home market (i.e., OEM to distributor to dealer). Among manufacturers, it was agreed that consumers find a product's price to be the most important aspect when considering dehumidifier purchases. Relatedly, one manufacturer suggested that as prices increase, consumers may opt to rent units as-needed, instead of buying one. Accordingly, manufacturers expect a negative impact on profitability as revenues decline following any amended energy conservation standard which would raise prices for residential dehumidifiers. Similar impacts on profitability are expected if manufacturers maintain current prices while absorbing the higher costs associated with the design and manufacture of higher efficiency products.

Impacts on Small Businesses

One small manufacturer noted that it and its competitors in the whole-home segment would be disproportionately impacted by an amended energy conservation standard. Small business manufacturers have fewer human and capital resources than larger, more diversified portable unit manufacturers. Additionally, due to the low-volume nature of the residential whole-home dehumidifier market, small business manufacturers of whole-home products are disadvantaged in achieving the scale needed to exert purchasing power in sourcing components from vendors. One small business

manufacturer noted that its lack of influence on suppliers ultimately impacts its ability to compete with larger manufacturers.

K. Emissions Analysis

The emissions analysis consists of two components. The first component estimates the effect of potential energy conservation standards on power sector and site (where applicable) combustion emissions of CO_2, NO_x, SO_2, and Hg. The second component estimates the impacts of potential standards on emissions of two additional greenhouse gases, CH_4 and N_2O, as well as the reductions to emissions of 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 calculated using a methodology based on results published for the AEO 2014 reference case and a set of side cases that implement a variety of efficiency-related policies.[43] The methodology is described in 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.[44] The FFC upstream emissions are estimated based on the methodology described in chapter 15. The upstream emissions

[43] DOE did not use AEO 2015 for the emissions analysis because it does not provide the side cases that DOE uses to derive marginal emissions factors.
[44] Available at: http://www.epa.gov/climateleadership/inventory/ghg-emissions.html.

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 national impact analysis.

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' global warming potential (GWP) over a 100 year time horizon. Based on the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,[45] DOE used GWP values of 28 for CH_4 and 265 for N_2O.

The AEO 2014 projections incorporate the projected impacts of existing air quality regulations on emissions. AEO 2014 generally represents current legislation and environmental regulations, including recent government actions, for which implementing regulations were available as of October 31, 2013. DOE's estimation of impacts accounts for the presence of the emissions control programs discussed in the following paragraphs.

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

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)), which created an allowance-based trading program that operates along with the Title IV program. CAIR was remanded to the EPA by the U.S. Court of Appeals for the District of Columbia Circuit but it remained in effect.[46] 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[47] and ordered EPA to continue administering CAIR.[48] On April 29, 2014, the U.S. Supreme Court reversed the judgment of the D.C. Circuit and remanded the case for further proceedings consistent with the Supreme Court's opinion.[49] On October 23, 2014, the D.C. Circuit lifted the stay of CSAPR.[50] Pursuant to this action, CSAPR went into effect (and CAIR ceased to be in effect) as of January 1, 2015.

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[46] 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).

[47] See EME Homer City Generation, LP v. EPA, 696 F.3d 7, 38 (D.C. Cir. 2012).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).

[48] See EME Homer City Generation, LP v. EPA, 696 F.3d 7, 38 (D.C. Cir. 2012).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).

[49] 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.

[50] See Georgia v. EPA, Order (D. C. Cir. filed October 23, 2014) (No. 11-1302).

Because AEO 2014 was prepared prior to the Supreme Court's opinion, it assumed that CAIR remains a binding regulation through 2040. Thus, DOE's analysis used emissions factors that assume that CAIR, not CSAPR, is the regulation in force. However, 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.

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 final 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 2014 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. Therefore, DOE believes that energy efficiency standards will 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.[51] Energy conservation standards are expected to have little effect on NO_x 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 today's 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 2014, which incorporates the MATS.

[51] CSAPR also applies to NOx and it would supersede the regulation of NOx 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.

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 equipment 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)(6) of Executive Order 12866, "Regulatory Planning and Review," 58 FR 51735 (Oct. 5, 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[52] 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

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

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.

It is important to emphasize that the interagency process is committed to updating these estimates as the science and economic understanding of climate change and its impacts on society improves over time. 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 carbon dioxide 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 represent the first sustained interagency effort within the U.S. government to develop an SCC for use in regulatory analysis. The results of this preliminary effort were presented in several proposed and final rules.

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.

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 temperature 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,[53] although preference is given to consideration of the global benefits of reducing CO_2 emissions. Table IV.21 presents the values in the 2010 interagency group report,[54] which is reproduced in appendix 14A of the NOPR TSD.

[53] 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.
[54] 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).

Table IV.21 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 today's notice were generated using the most recent versions of the three integrated assessment models that have been published in the peer-reviewed literature.[55]

Table IV.22 shows the updated sets of SCC estimates in 5-year increments from 2010 to 2050. The full set of annual SCC estimates 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.

[55] 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 November 2013) (Available at: http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf).

Table IV.22 Annual SCC Values from 2013 Interagency Report, 2010–2050 (2007$ per metric ton CO_2)

Year	Discount Rate			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
2010	11	32	51	89
2015	11	37	57	109
2020	12	43	64	128
2025	14	47	69	143
2030	16	52	75	159
2035	19	56	80	175
2040	21	61	86	191
2045	24	66	92	206
2050	26	71	97	220

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 Council report mentioned above points out that there is tension between the goal of producing quantified estimates of the economic damages from an incremental ton of carbon and the limits of existing efforts to model these effects. There are a number of 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.

In summary, in considering the potential global benefits resulting from reduced CO_2 emissions, DOE used the values from the 2013 interagency report adjusted to 2013$ using the implicit price deflator for gross domestic product (GDP) from the Bureau of Economic Analysis. For each of the four sets of SCC values, the values for emissions in 2015 were $12.0, $40.5, $62.4, and $119 per metric ton avoided (values expressed in 2013$). 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 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 above, DOE has taken into account how amended energy conservation standards would reduce site NO_X emissions nationwide and 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 today's NOPR based on estimates developed by EPA for 2016, 2020, 2025, and 2030.[56] 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

[56] http://www2.epa.gov/benmap/sector-based-pm25-benefit-ton-estimates

$5,483/ton using a 3-percent discount rate and $4,850/ton using a 7-percent discount rate (2013$). 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.

AHAM continues to believe that monetization of avoided CO_2 emissions should include a more comprehensive analysis to understand the total environmental impact. It stated that any CO_2 analysis should include CO_2 emissions that are caused indirectly, as well as directly, from a standards change, such as increased carbon emissions required to manufacture a given standard level, the increased transportation and related emissions required for a given standard level, and reduced carbon emissions from peak load reductions. (AHAM, No. 22 at p. 7)

In response, DOE notes that EPCA directs DOE to consider the total projected amount of energy, or as applicable, water, savings likely to result directly from the imposition of the standard when determining whether a standard is economically justified. (42 U.S.C. 6295(o)(2)(B)(i)(III)) DOE interprets this to include energy used in the generation, transmission, and distribution of fuels used by appliances or equipment.

In addition, DOE is using the FFC measure, which includes the energy consumed in extracting, processing, and transporting primary fuels. DOE's current accounting of primary energy savings and the FFC measure are directly linked to the energy used by appliances or equipment. DOE believes that energy used in manufacturing or transporting appliances or equipment falls outside the boundaries of "directly" as intended by EPCA. Thus, DOE did not consider such energy use and air emissions in the NIA or in the emissions analysis. DOE's analysis does account for impacts on CO_2 emissions from electricity load reduction.

AHAM stated that DOE should wait for comments on the 2013 interagency report to be resolved before it relies on the 2013 estimates, and, until that time DOE should rely on the 2010 estimates as it has done in rulemakings prior to May 2013. (AHAM, No. 22 at p. 7)

The 2013 report provides an update of the SCC estimates based solely on the latest peer-reviewed version of the models, replacing model versions that were developed up to ten years ago in a rapidly evolving field. It does not revisit other assumptions with regard to the discount rate, reference case socioeconomic and emission scenarios, or equilibrium climate sensitivity. Improvements in the way damages are modeled are confined to those that have been incorporated into the latest versions of the models by the developers themselves in the peer-reviewed literature. Given the above, using the 2010 estimates would be inconsistent with DOE's objective of using the best available information in its analyses.

M. Utility Impact Analysis

The utility impact analysis estimates several effects on the power generation industry that would result from the adoption of new or amended energy conservation standards. In the utility impact analysis, DOE analyzes 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 2014. NEMS produce the AEO reference case as well as a number of other cases that estimate the economy-wide impacts of changes to energy supply and demand. DOE uses those other cases that incorporate efficiency-related policies to estimate the marginal impacts of reduced energy demand on the utility sector.[57] 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. Chapter 15 of the NOPR TSD describes the utility impact analysis in further detail.

N. Employment Impact Analysis

DOE considers employment impacts in the domestic economy as one factor in selecting a proposed standard. Employment impacts include both direct and indirect impacts. Direct employment impacts are any changes in the number of employees of

[57] DOE did not use AEO 2015 for the analysis because it does not provide the side cases that DOE uses to derive marginal impact factors.

manufacturers of the products subject to standards, their suppliers, and related service firms. The MIA addresses those impacts. 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 Labor Department's Bureau of Labor Statistics (BLS).[58] 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.[59] There are many reasons for these differences, including wage differences and the fact that the utility sector is more capital-intensive and less labor-intensive than other sectors. Energy conservation standards have the effect of reducing consumer utility bills. Because reduced consumer expenditures for energy likely lead to increased expenditures in other sectors of the economy, the general effect of efficiency standards is to shift economic activity from a less labor-intensive sector (i.e., the utility sector) to more labor-intensive sectors (e.g., the retail and service sectors). Thus, based on the BLS data alone, DOE believes net national employment

[58] 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.
[59] 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).

may increase due to shifts in economic activity resulting from amended standards for residential dehumidifiers.

For the standard levels considered in today's NOPR, DOE estimated indirect national employment impacts using an input/output model of the U.S. economy called Impact of Sector Energy Technologies, Version 3.1.1 (ImSET).[60] 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 the 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. Because ImSET predicts small job impacts resulting from this rule, regardless of these uncertainties, the actual job impacts are likely to be negligible in the overall economy. For more details on the employment impact analysis, see chapter 16 of the NOPR TSD.

[60] J. M. Roop, M. J. Scott, O.V. Livingston, P.J. Balducci, J.M. Roop, and R. W. Schultz, ImSET 3.1: Impact of Sector Energy Technologies, 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 residential dehumidifiers. It addresses the TSLs examined by DOE and the projected impacts of each of these levels if adopted as energy conservation standards for residential dehumidifiers. Additional details regarding DOE's analyses are contained in the NOPR TSD supporting this notice.

A. Trial Standard Levels

DOE analyzed the benefits and burdens of four TSLs for residential dehumidifiers. These TSLs were developed by combining specific ELs for each of the five product classes analyzed by DOE. DOE presents the results for the TSLs in this document, while the results for all ELs that DOE analyzed are in the NOPR TSD. Table V.1 presents the TSLs and the corresponding efficiency levels for residential dehumidifiers. TSL 4 represents the max-tech energy efficiency for all product classes. TSL 3 consists of the ELs below the max-tech level. TSL 2 consists of the gap-fill ELs below TSL 3 and above the baseline and EL 1 for product classes 1 and 2, while product class 3 through product class 5 repeat the same efficiency level as TSL 3. TSL 1 consists of the first EL above the baseline.

Table V.1 Trial Standard Levels for Residential Dehumidifiers

TSL	PC1		PC2		PC3		PC4		PC5	
	≤ 30.00 pints/day		30.01 – 45.00 pints/day		> 45.00 pints/day		≤ 8.0 ft^3		>8.0 ft^3	
	EL	AEU kWh/yr	EL	AEU kWh/yr	EL	AEU kWh/yr	EL	AEU kWh/yr	EL	AEU kWh/yr
--	0	720	0	1,030	0	905	0	951	0	1,137
1	1	505	1	808	1	781	1	809	1	1,016
2	2	463	2	693	2	670	1	809	2	784
3	3	428	3	607	2	670	1	809	2	784
4	4	355	4	540	3	513	2	671	3	617

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

DOE analyzed the economic impacts on residential dehumidifier consumers by looking at the effects potential amended standards 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 would affect consumers in two ways: (1) purchase prices would increase, and (2) annual operating costs would decrease. Inputs used for calculating the LCC and PBP include total installed costs (i.e., product price plus installation costs), operating costs (i.e., annual energy savings, energy prices, energy price trends, repair costs, and maintenance costs), product lifetime, and discount rates. Chapter 8 of the NOPR TSD provides detailed information on the LCC and PBP analyses.

Table V.2 through Table V.11 show the LCC and PBP results for the ELs considered for each residential dehumidifier product class. In the first of each pair of tables, the simple payback period is measured relative to the baseline product. In the second table, the LCC savings are measured relative to the average LCC in the base case, which represents what consumers would purchase in the absence of amended standards (see section IV.F.8 of this proposed rule). Because some consumers purchase products with higher ELs in the base case, the average savings are less than the difference between the average LCC of EL 0 and the average LCC at each TSL.

Table V.2 Average LCC and PBP Results by Efficiency Level for Dehumidifier PC1 (≤ 30.00 pints/day)

TSL	EL	Average Costs 2013$				Simple PBP years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	0	212	101	952	1163	--	11
1	1	212	71	668	879	0.0	11
2	2	214	65	612	826	0.1	11
3	3	218	60	566	784	0.2	11
4	4	241	50	469	710	0.6	11

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 Base-Case Efficiency Distribution for Dehumidifier PC1 (≤ 30.00 pints/day)

TSL	EL	Life-Cycle Cost Savings	
		% of Consumers that Experience	Average Savings*
		Net Cost	2013$
1	1	0%	31
2	2	0%	49
3	3	0%	64
4	4	10.3%	137

* The calculation includes households with zero LCC savings (no impact).

Table V.4 Average LCC and PBP Results by Efficiency Level for Dehumidifier PC2 (30.01 – 45.00 pints/day)

TSL	EL	Average Costs 2013$				Simple PBP years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	0	256	145	1,361	1,617	--	11
1	1	256	114	1,067	1,323	0.0	11
2	2	259	97	915	1,175	0.1	11
3	3	268	85	802	1,069	0.2	11
4	4	290	76	713	1,003	0.5	11

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

Table V.5 Average LCC Savings Relative to the Base-Case Efficiency Distribution for Dehumidifier PC2 (30.01 – 45.00 pints/day)

TSL	EL	Life-Cycle Cost Savings	
		% of Consumers that Experience	Average Savings*
		Net Cost	2013$
1	1	0%	0
2	2	0%	0
3	3	0.5%	99
4	4	5.4%	164

* The calculation includes households with zero LCC savings (no impact).

Table V.6 Average LCC and PBP Results by Efficiency Level for Dehumidifier PC3 (>45.00 pints/day)

TSL	EL	Average Costs 2013$				Simple PBP years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	0	915	127	1,195	2,110	--	11
1	1	989	110	1,032	2,021	4.3	11
2, 3	2	1,008	94	885	1,893	2.8	11
4	3	1,124	72	678	1,802	3.8	11

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

Table V.7 Average LCC Savings Relative to the Base-Case Efficiency Distribution for Dehumidifier PC3 (>45.00 pints/day)

TSL	EL	Life-Cycle Cost Savings	
		% of Consumers that Experience	Average Savings*
		Net Cost	2013$
1	1	18.9%	50
2,3	2	11.7%	147
4	3	31.4%	239

* The calculation includes households with zero LCC savings (no impact).

Table V.8 Average LCC and PBP Results by Efficiency Level for Dehumidifier PC4 (≤ 8.0 ft^3)

TSL	EL	Average Costs 2013$				Simple PBP years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	0	1,662	139	2,048	3,710	--	19
1, 2, 3	1	1,689	118	1,740	3,429	1.3	19
4	2	1,890	98	1,444	3,334	5.5	19

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

Table V.9 Average LCC Savings Relative to the Base-Case Efficiency Distribution for Dehumidifier PC4 (≤ 8.0 ft^3)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		% of Consumers that Experience	Average Savings*
		Net Cost	2013$
1,2,3	1	8.4%	207
4	2	44.4%	302

* The calculation includes households with zero LCC savings (no impact).

Table V.10 Average LCC and PBP Results by Efficiency Level for Dehumidifier PC5 (> 8.0 ft^3)

TSL	EL	Average Costs 2013$				Simple PBP years	Average Lifetime years
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	0	2,142	166	2,446	4,589	--	19
1	1	2,154	149	2,188	4,342	0.7	19
2, 3	2	2,212	115	1,687	3,899	1.4	19
4	3	2,445	90	1,328	3,773	4.0	19

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

Table V.11 Average LCC Savings Relative to the Base-Case Efficiency Distribution for Dehumidifier PC5 (> 8.0 ft^3)

TSL	EL	Life-Cycle Cost Savings	
		% of Consumers that Experience	Average Savings*
		Net Cost	2013$
1	1	1.4%	75
2,3	2	10.7%	416
4	3	39.9%	542

* The calculation includes households with zero LCC savings (no impact).

b. Consumer Subgroup Analysis

As described in section IV.I of this proposed rule, DOE estimated the impact of the considered TSLs on low-income households and senior-only households.[61] Table V.12 through Table V.16 compare the average LCC savings at each efficiency level for the two 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 senior-only households at the considered ELs 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 two subgroups.

[61] DOE did not analyze subgroup impacts for compact dehumidifiers because the saturation of these products is extremely small.

Table V.12 Dehumidifier PC1 (≤ 30.00 pints/day): Comparison of Average LCC Savings for Consumer Subgroups and All Households

	Average Life-Cycle Cost Savings (2013$)			Simple Payback Period (years)		
TSL	**Low-income households**	**Senior-only households**	**All Households**	**Low-income households**	**Senior-only households**	**All Households**
1	28	24	31	0.0	0.0	0.0
2	45	39	49	0.1	0.1	0.1
3	58	51	64	0.2	0.2	0.2
4	125	107	137	0.6	0.7	0.6

Table V.13 Dehumidifier PC2 (30.01 – 45.00 pints/day): Comparison of Average LCC Savings for Consumer Subgroups and All Households

	Average Life-Cycle Cost Savings (2013$)			Simple Payback Period (years)		
TSL	**Low-income households**	**Senior-only households**	**All Households**	**Low-income households**	**Senior-only households**	**All Households**
1	0	0	0	0.0	0.0	0.0
2	0	0	0	0.1	0.1	0.1
3	92	81	99	0.2	0.2	0.2
4	150	130	164	0.5	0.6	0.5

Table V.14 Dehumidifier PC3 (>45.00 pints/day): Comparison of Average LCC Savings for Consumer Subgroups and All Households

	Average Life-Cycle Cost Savings (2013$)			Simple Payback Period (years)		
TSL	**Low-income households**	**Senior-only households**	**All Households**	**Low-income households**	**Senior-only households**	**All Households**
1	43	36	50	4.5	5.2	4.3
2,3	133	114	147	3.0	3.4	2.8
4	209	169	239	4.0	4.6	3.8

Table V.15 Dehumidifier PC4 (≤ 8.0 ft^3): Comparison of Average LCC Savings for Consumer Subgroups and All Households

	Average Life-Cycle Cost Savings (2013$)			Simple Payback Period (years)		
TSL	**Low-income households**	**Senior-only households**	**All Households**	**Low-income households**	**Senior-only households**	**All Households**
1,2,3	113	182	207	1.9	1.4	1.3
4	89	248	302	8.3	6.0	5.5

Table V.16 Dehumidifier PC5 (> 8.0 ft^3): Comparison of Average LCC Savings for Consumer Subgroups and All Households

	Average Life-Cycle Cost Savings (2013$)			Simple Payback Period (years)		
TSL	**Low-income households**	**Senior-only households**	**All Households**	**Low-income households**	**Senior-only households**	**All Households**
1	43	67	75	1.0	0.7	0.7
2,3	224	367	416	2.0	1.5	1.4
4	204	457	542	6.0	4.4	4.0

c. Rebuttable Presumption Payback

As discussed above, EPCA provides 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 PBP for the considered standard levels, DOE used discrete values and, as required by EPCA, based the energy use calculation on the current DOE test procedure for residential dehumidifiers. In contrast, the PBPs presented in section V.B.1.a were calculated using distributions for input values, with energy use based on field studies and RECS data.

Table V.17 presents the rebuttable-presumption PBPs for the considered TSLs.[62] While DOE examined the rebuttable-presumption criterion, it further 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). The results of that analysis serve as the basis for DOE to evaluate the

[62] The PBPs in Table V.17 differ from those shown in Tables V.2, V.4, V.6, V.8 and V.10 because the rebuttable PBPs are calculated with energy use based on the DOE test procedure, whereas the PBPs in the earlier tables are calculated with energy use based on field studies and RECS data.

economic justification for a potential standard level (thereby supporting or rebutting the results of any preliminary determination of economic justification).

Table V.17 Residential Dehumidifiers: Rebuttable Payback Period (years)

Product Class	Trial Standard Level			
	1	**2**	**3**	**4**
PC1 (≤ 30.00 pints/day)	0.0	0.1	0.2	0.8
PC2 (30.00 – 45.00 pints/day)	0.0	0.1	0.3	0.7
PC3 (> 45.00 pints/day)	5.6	3.7	3.7	5.0
PC4 (≤ 8.0 ft^3)	2.0	2.0	2.0	8.6
PC5 (> 8.0 ft^3)	1.0	2.1	2.1	6.2

2. Economic Impacts on Manufacturers

DOE performed an MIA to estimate the impact of amended energy conservation standards on manufacturers of residential dehumidifiers. 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 financial impacts (represented by changes in INPV) of amended energy conservation standards on manufacturers of residential dehumidifiers as well as the conversion costs that DOE estimates manufacturers would incur for all product classes at each TSL. To evaluate the range of cash-flow impacts on the residential dehumidifier manufacturing industry, DOE used two different markup

scenarios to model the range of anticipated market responses to amended 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 1.45 (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 amended energy conservation standards case. 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 or amended 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 base case. The two tables below show the range of potential INPV impacts for manufacturers of residential dehumidifiers. Table V.18 reflects the lower bound of impacts (higher profitability) and Table V.19 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 2048, the difference in INPV between the base case and each standards case, and the total industry conversion costs required for each standards case.

Table V.18 Manufacturer Impact Analysis under the Preservation of Gross Margin Percentage Markup Scenario for Analysis Period (2015 – 2048)

	Units	Base Case	Trial Standard Level			
			1	2	3	4
INPV	2013$ Millions	186.5	184.0	183.4	155.2	146.3
Change in INPV	2013$ Millions		(2.5)	(3.1)	(31.3)	(40.2)
	(%)	-	(1.4%)	(1.6%)	(16.8%)	(21.6%)
Free Cash Flow (2018)	2013$ Millions	15.8	14.1	13.6	(2.5)	(13.7)
Change in Free Cash Flow (2018)	**(%)**		(11.2%)	(14.4%)	(116.1%)	(186.4%)
Product Conversion Costs	2013$ Millions	-	3.9	5.1	30.2	48.1
Capital Conversion Costs	2013$ Millions	-	1.3	1.7	20.5	33.1
Total Conversion Costs	2013$ Millions	-	5.2	6.7	50.7	81.3

Parentheses indicate negative (-) values.

Table V.19 Manufacturer Impact Analysis under the Preservation of Per-Unit Operating Profit Markup Scenario for Analysis Period (2015 – 2048)

	Units	Base Case	Trial Standard Level			
			1	2	3	4
INPV	2013$ Millions	186.5	183.5	182.1	151.6	126.8
Change in INPV	2013$ Millions	-	(3.0)	(4.4)	(34.9)	(59.7)
	(%)	-	(1.6%)	(2.4%)	(18.7%)	(32.0%)
Free Cash Flow (2018)	2013$ Millions	15.8	14.1	13.6	(2.5)	(13.7)
Decrease in Free Cash Flow (2018)	**(%)**		(11.2%)	(14.4%)	(116.1%)	(186.4%)
Product Conversion Costs	2013$ Millions	-	3.9	5.1	30.2	48.1
Capital Conversion Costs	2013$ Millions	-	1.3	1.7	20.5	33.1
Total Conversion Costs	2013$ Millions	-	5.2	6.7	50.7	81.3

Parentheses indicate negative (-) values.

Beyond impacts on INPV, DOE includes a comparison of free cash flow between the base case and the standards case at each TSL in the year before amended 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 residential dehumidifiers to range from -$2.5 million to -$3.0 million, or a decrease in INPV of 1.4 percent to 1.6 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 11.2 percent to $14.1 million, compared to the base-case value of $15.8 million in 2018, the year before the projected compliance date.

At TSL 1, the industry as a whole is expected to incur $3.9 million in product conversion costs attributed to upfront research, development, testing, and certification; as well as $1.3 million in one-time investments in property, plant and equipment (PP&E) necessary to manufacture redesigned platforms. The majority of industry conversion cost burden at TSL 1 would be felt by manufacturers of high-capacity portable and whole-home dehumidifiers, as more of these products are currently at the baseline than is the case for lower-capacity portable products. These baseline products may necessitate complete platform redesigns, which involve moving to a new case size to accommodate larger heat exchangers. These changes require upfront capital investments for new tooling to manufacturing production lines, among other changes. Additionally, it is assumed that manufacturers of high-capacity portable and whole-home dehumidifiers, the majority of which are small business manufacturers, will have to outsource testing of their products to third-party testing facilities, contributing to greater product conversion costs. In contrast, the large manufacturers of small portable dehumidifiers are assumed to have in-house testing capabilities which significantly reduce the cost of testing. DOE confirmed these assumptions regarding testing burdens during manufacturer interviews.

At TSL 2, DOE estimates the impact on INPV for manufacturers of residential dehumidifiers to range from -$3.1 million to -$4.4 million, or a decrease in INPV of 1.6 percent to 2.4 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 14.4 percent to

$13.6 million, compared to the base-case value of $15.8 million in 2018, the year before the projected compliance date.

At TSL 2, the industry as a whole is expected to incur $5.1 million in product conversion costs associated with the upfront research, development, testing, and certification; as well as $1.7 million in one-time investments in PP&E to manufacturer products requiring platform redesigns. Similar to TSL 1, the majority of industry conversion cost burden at TSL 2 will be felt by manufacturers of high-capacity portable and whole-home dehumidifiers, as more products of these types are at the baseline than is the case for lower-capacity portable products, and will require complete platform redesigns. Platform redesigns at TSL 2 will require moving to a new case size to accommodate larger heat exchangers, and will necessitate upfront capital investments for new tooling. Similar to TSL 1, because manufacturers of high-capacity portable and whole-home dehumidifiers are largely small businesses, it is assumed that these manufacturers will be required to outsource testing of their products to third-party testing facilities. In contrast, the large manufacturers of small portable dehumidifiers are assumed to have in-house testing capabilities, which significantly reduce the cost of testing. DOE confirmed these assumptions regarding testing burdens during manufacturer interviews.

At TSL 3, DOE estimates the impact on INPV for manufacturers of residential dehumidifiers to range from -$31.3 million to -$34.9 million, or a decrease in INPV of 16.8 percent to 18.7 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 116.1 percent to -$2.5 million, compared to the base-case value of $15.8 million in 2018, the year before the projected compliance date.

At TSL 3, the industry as a whole is expected to spend $30.2 million in product conversion costs associated with the research and development and testing and certification, as well as $20.5 million in one-time investments in PP&E to manufacture redesigned platforms. While conversion costs remain relatively constant for manufacturers of high-capacity portable and whole-home dehumidifiers between TSLs 1, 2 and 3, the conversion costs for manufacturers of lower-capacity portable products increase substantially at TSL 3, as a greater portion of these products will require total platform redesigns. As with the high-capacity portable and whole-home dehumidifier market segment, platform redesigns for lower-capacity portable units will consist of moving products to a new case size to accommodate larger heat exchangers, and in turn will require capital investments in new tooling for larger cases. This upfront investment is in addition to higher R&D and testing expenditures. Because lower-capacity portable units represent approximately 97 percent of the market, conversion costs associated with this segment have a significant impact on total industry conversion costs for TSL 3.

At TSL 4, DOE estimates the impact on INPV for manufacturers of residential dehumidifiers to range from -$40.2 million to -$59.7 million, or a decrease in INPV of 21.6 percent to 32.0 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 186.4 percent to -$13.7 million, compared to the base-case value of $15.8 million in 2018, the year before the projected compliance date.

At TSL 4, the industry as a whole is expected to spend $48.1 million in product conversion costs associated with the research and development and testing and certification, as well as $33.1 million in one-time investments in PP&E for platform redesigns. Again, conversion costs remain relatively constant for manufacturers of high-capacity portable and whole-home dehumidifiers across TSLs 1, 2, 3, and 4. In contrast, the conversion cost burden for manufacturers of lower-capacity portable products increases substantially at TSL 4, as an increasingly larger portion of smaller portable products will require platform redesigns. Again, since lower-capacity portable units represent approximately 97 percent of the market, conversion costs associated with this segment have a significant impact on total industry conversion costs for TSL 4.

b. Impacts on Employment

DOE used the GRIM to estimate the domestic labor expenditures and number of domestic production workers in the base case and at each TSL from 2015 to 2048. DOE used statistical data from the U.S Census Bureau's 2011 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.[63] 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 for any product class, this analysis also does not factor in the dependence by some manufacturers

[63] The U.S. Census Bureau's 2011 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."

on production volume to make their operations viable. Alternative employment impact scenarios specific to the small business manufacturer subgroup are considered at the end of this section.

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 residential dehumidifier 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.

The employment impacts shown in Table V.20 represent the potential production employment that could result following amended energy conservation standards. These are independent of the employment impacts from the broader U.S. economy, which are documented in chapter 16 of the NOPR TSD.

DOE estimates that in the absence of amended energy conservation standards, there would be 214 domestic production workers for all manufacturers involved in manufacturing residential dehumidifiers in 2019. Using the 2011 Annual Survey of Manufactures and interviews with manufacturers, DOE estimates that approximately 3 percent of residential dehumidifiers sold in the United States are manufactured domestically. Table V.20 shows the range of the impacts of potential amended energy conservation standards on U.S. production workers in the residential dehumidifier manufacturing industry.

Table V.20 Change in Total Number of Domestic Production Employees in 2019 in the Residential Dehumidifier Industry

	Base Case	TSL 1	TSL 2	TSL 3	TSL 4
Total Number of Domestic Production Workers in 2019	214	219	222	222	261
Change in Total Number of Domestic Production Workers in 2019 (%)	-	2.3%	3.7%	3.7%	21.9%

Because production employment expenditures are assumed to be a fixed percentage of cost of goods sold and the MPCs typically increase with more efficient products, labor tracks the increased prices in the GRIM. As efficiency of dehumidifiers increases, so does the complexity of the products, generally requiring more labor to produce the product. However, because only 3 percent of residential dehumidifier manufacturing takes place domestically, employment impacts are expected to be minimal. DOE expects that there would be minimal employment impacts among domestic residential dehumidifier manufacturers for TSLs 1, 2, and 3. For TSL 4, the GRIM predicts a 21.9 percent increase in total domestic production employment following amended standards based on the increase in complexity and relative price of the high-capacity portable and whole-home dehumidifier segment.

During manufacturer interviews, some small businesses stated that, contrary to the above findings, domestic production and non-production employment in the industry may decrease as a result of amended standards for residential dehumidifiers, due to reduced shipments volumes and/or reduced margins.

Similarly, the above analysis does not account for the possible relocation of domestic jobs to lower-labor-cost countries because the potential relocation of U.S. jobs is uncertain and highly speculative. As mentioned above, the vast majority of residential dehumidifiers sold in the United States are manufactured abroad. However, almost all of the high-capacity portable and whole-home dehumidifiers are manufactured domestically. Feedback from manufacturers during NOPR interviews reveals that some domestic small businesses in the residential dehumidifier industry may be forced to make employment cuts or to shift production to new locations, including locations outside of the United States, as a result of amended energy conservation standards.

c. Impacts on Manufacturing Capacity

As noted previously, the majority of residential dehumidifiers sold in the United States are not produced domestically. However, feedback from domestic manufacturers of high-capacity portable products and whole-home dehumidifiers suggested that production of these products could shift abroad as a result of amended energy conservation standards. This could lead to a permanently lower production capacity within the residential dehumidifier industry.

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 identified five domestic small business manufacturers that may be disproportionately affected by the proposed energy conservation standards for residential dehumidifiers. These manufacturers are focused on one specific market segment (high-capacity portable and whole-home dehumidifiers) and, in terms of annual revenue, are at least one order of magnitude smaller than their diversified competitors (tens of millions compared to hundreds of millions). Due to this combination of market concentration and size, these small businesses are at risk of high, disproportionate impacts, depending on the TSL chosen.

DOE received feedback from small business manufacturers and OEM contractors through public comments and confidential interviews (see sections IV.J.3 and IV.J.4 of this proposed rule for a discussion of public comments and feedback received from dehumidifier manufacturers during the NOPR phase). These manufacturers expressed a high degree of concern relating to the magnitude of burdens and the disproportionate impacts that they believe will result from amended energy conservation standards for residential dehumidifiers.

Today's standards for residential dehumidifiers could cause small manufacturers to be at a disadvantage relative to large manufacturers. One way in which small

manufacturers could be at a disadvantage is that they may be disproportionately affected by product and capital conversion costs. Product redesign, testing, and certification costs tend to be fixed per basic model and do not scale with sales volume. For each model, small businesses must make investments in research and development to redesign their products, but because they have lower sales volumes, they must spread these costs across fewer units. In addition, because small manufacturers have fewer engineers than large manufacturers, they need to allocate a greater portion of their available resources to meet a standard. Because engineers may need to spend more time redesigning and testing existing models as a result of the new standard, they may have less time to develop new products. Similarly, upfront capital investments in new manufacturing capital for platform redesigns, as well as depreciated manufacturing capital, can only be spread across a lower volume of shipments.

Furthermore, smaller manufacturers may lack the purchasing power of larger manufacturers. For example, since fan motor suppliers give discounts to manufacturers based on the number of motors they purchase, larger manufacturers may have a pricing advantage because they have higher volume purchases. This purchasing power differential between small and large manufacturers applies to other residential dehumidifier components as well, including compressors and heat exchangers. Some larger manufacturers of lower-capacity portable dehumidifiers may even manufacture heat exchangers in-house. Additionally, because small business manufacturers produce larger units, they require larger/custom components (e.g. larger compressors) compared to large manufacturers who produce lower-capacity portable products and who account

for the majority of the dehumidifier market. Because of the low-volume nature of the high-capacity portable and whole-home dehumidifier market, certain technological improvements to components may only be developed for small portable products, or with significant lag time for large dehumidifier products.

To access the capital required to cover the conversion costs associated with reaching the proposed standards, small business manufacturers would likely be forced to take on additional debt, whereas larger manufacturers of small portable products would be better equipped to fund purchases with existing cash flow from operations.

In terms of impacts to small business manufacturers associated with the specific TSLs outlined in this notice, as discussed in section V.B.2.d, disproportionate impacts will be greatest at TSLs 1 and 2, where relatively more high-capacity portable and home-whole dehumidifiers are at or below the baseline than is the case for the lower-capacity portable products. Additionally, it is assumed that small business manufacturers will be required to outsource the testing of their products to third-party testing facilities. In contrast, the large manufacturers of small portable dehumidifiers are assumed to have in-house testing capabilities, which significantly reduce the cost of testing. While the magnitude of the conversion cost burden increases slightly for small business manufacturers at TSLs 3 and 4, disproportionate impacts decrease substantially, as relatively more lower-capacity portable product platforms will require substantial redesign. Between TSLs 3 and 4, TSL 3 minimizes standards compliance burdens for

small business manufacturers relative to the burdens of high-volume portable dehumidifier manufacturers.

Further detail and separate analysis of impacts on small business high-capacity portable and whole-home dehumidifier manufacturers are found in chapter 12, section 12.6 of the NOPR TSD, as well as in sections IV.J.3, IV.J.4, and V.B.2.d of this notice.

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 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.

In addition to DOE's energy conservation regulations for residential dehumidifiers, several other existing and pending regulations apply to these products and other equipment produced by the same manufacturers. The most significant of these additional regulations include several additional Federal energy conservation standards, and third-party certification programs (e.g., UL safety standards certification for dehumidifiers). 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 residential dehumidifiers, DOE compared the energy consumption of those products under the base case to their anticipated energy consumption under each TSL. Table V.21 presents DOE's projections of the national energy savings for each TSL considered for residential dehumidifiers shipped in the 2019-2048 period. The savings were calculated using the approach described in section IV.H.1 of this notice.

Table V.21 Residential Dehumidifiers: Cumulative National Energy Savings (Shipments in 2019–2048)

Savings	Trial Standard Level			
	1	2	3	4
Primary Energy Savings (quads)	0.07	0.11	0.31	0.75
FFC Energy Savings (quads)	0.07	0.11	0.32	0.79

OMB Circular A-4[64] requires agencies to present analytical results, including separate schedules of the monetized benefits and costs that show the type and timing of

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

benefits and costs. Circular A-4 also directs agencies to consider the variability of key elements underlying the estimates of benefits and costs. For this rulemaking, DOE undertook a sensitivity analysis using 9, rather than 30, years of product shipments. The choice of a 9-year period is a proxy for the timeline in EPCA for the review of certain energy conservation standards and potential revision of, and compliance with, such revised standards.[65] The review timeframe established in EPCA is generally not synchronized with the product lifetime, product manufacturing cycles, or other factors specific to residential dehumidifiers. Thus, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology. The NES sensitivity analysis results based on a 9-year analytical period are presented in Table V.22. The impacts are counted over the lifetime of residential dehumidifiers purchased in 2019–2027.

Table V.22 Residential Dehumidifiers: Cumulative National Energy Savings for Products Shipped in 2019–2027

Savings	Trial Standard Level			
	1	2	3	4
Primary Energy Savings (quads)	0.03	0.04	0.11	0.23
FFC Energy Savings (quads)	0.03	0.04	0.11	0.24

[65] Under 42 U.S.C. 6295(m)(1), and no later than 6 years after DOE issues a final rule establishing or amending an energy conservation standard, DOE must publish a notice of determination that standards for the product do not need to be amended or a NOPR that includes new proposed standards. The 9-year analytical period includes this 6-year period and an additional 3 years to issue the final rule and allow time for industry compliance.

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 standard levels considered for residential dehumidifiers. In accordance with the OMB's guidelines on regulatory analysis,[66] DOE calculated NPV using both a 7-percent and a 3-percent real discount rate.

Table V.23 shows the consumer NPV results for each TSL DOE considered for residential dehumidifiers. The impacts are counted over the lifetime of products purchased in 2019–2048.

Table V.23 Residential Dehumidifiers: Cumulative Net Present Value of Consumer Benefits for Products Shipped in 2019–2048

Discount rate	Trial Standard Level			
	1	2	3	4
	Billion 2013$			
3 percent	0.50	0.78	2.27	4.96
7 percent	0.24	0.37	1.04	2.13

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.24. The impacts are counted over the lifetime of products purchased in 2019–2027. 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.

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

Table V.24 Residential Dehumidifiers: Cumulative Net Present Value of Consumer Benefits for Products Shipped in 2019–2027

Discount rate	Trial Standard Level			
	1	2	3	4
	Billion 2013$			
3 percent	0.24	0.36	0.93	1.78
7 percent	0.14	0.22	0.56	1.03

The above results reflect the use of a default trend to estimate the change in price for residential dehumidifiers over the analysis period (see section IV.F.1 of this notice). 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. Impacts on Employment

As discussed above, DOE expects energy conservation standards for residential dehumidifiers to reduce energy bills for consumers of those products, and the resulting net savings to be redirected to other forms of economic activity. These expected shifts in spending and economic activity could affect the demand for labor. As described in section IV.N of this notice, 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 timeframe, where these uncertainties are reduced.

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

4. Impact on Utility or Performance of Products

Based on testing conducted in support of this proposed rule, discussed in section IV.C.1.b of this notice, DOE has concluded that the TSL proposed in this NOPR would not reduce the utility or performance of the residential dehumidifiers under consideration in this rulemaking. Manufacturers of these products currently offer units that meet or exceed today's standards.

5. Impact of Any Lessening of Competition

As discussed in section III.E.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 to DOE, together with an analysis of the nature and extent of such impact. (42 U.S.C. 6295(o)(2)(B)(i)(V) and (B)(ii))

DOE will transmit a copy of this NOPR and the accompanying NOPR TSD to the Attorney General, requesting that the DOJ provide its determination on this issue. DOE will consider DOJ's comments on the proposed rule in determining whether to proceed

with the proposed energy conservation standards. DOE will also publish and respond to DOJ's comments in the Federal Register in a separate notice.

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 or 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, section 15.3 in the NOPR TSD presents the estimated reduction in generating capacity for the TSLs that DOE considered in this rulemaking.

Energy savings from amended standards for residential dehumidifiers could also produce environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with electricity production. Table V.25 provides DOE's estimate of cumulative emissions reductions to result from the TSLs considered in this rulemaking. DOE reports annual CO_2, NO_X, and Hg emissions reductions for each TSL in chapter 13, section 13.5 of the NOPR TSD.

Table V.25 Cumulative Emissions Reduction Estimated for Residential Dehumidifier Trial Standard Levels for Products Shipped in 2019–2048

	Trial Standard Level			
	1	2	3	4
Power Sector Emissions				
CO_2 (million metric tons)	4.05	6.40	18.29	44.55
SO_2 (thousand tons)	3.52	5.55	15.77	38.16
NO_X (thousand tons)	3.18	5.03	14.34	34.83
Hg (tons)	0.01	0.02	0.05	0.12
N_2O (thousand tons)	0.05	0.09	0.25	0.61
CH_4 (thousand tons)	0.38	0.61	1.75	4.28
Upstream Emissions				
CO_2 (million metric tons)	0.22	0.35	1.01	2.50
SO_2 (thousand tons)	0.04	0.06	0.18	0.44
NO_X (thousand tons)	3.14	5.00	14.44	35.57
Hg (tons)	0.00	0.00	0.00	0.00
N_2O (thousand tons)	0.00	0.00	0.01	0.02
CH_4 (thousand tons)	18.32	29.15	84.13	207.16
Total FFC Emissions				
CO_2 (million metric tons)	4.27	6.75	19.31	47.05
SO_2 (thousand tons)	3.56	5.61	15.95	38.60
NO_X (thousand tons)	6.33	10.03	28.79	70.40
Hg (tons)	0.01	0.02	0.05	0.12
N_2O (thousand tons)	0.06	0.09	0.26	0.63
N_2O (thousand tons CO_2eq)*	15.02	23.84	68.57	168.12
CH_4 (thousand tons)	18.70	29.75	85.88	211.44
CH_4 (thousand tons CO_2eq)*	523.57	833.12	2,404.57	5,920.22

* 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 TSLs considered for residential dehumidifiers. As discussed in section IV.L of this notice, 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 2013$) are represented by $12.0/metric ton (the average value from a distribution that uses a 5-percent discount rate), $40.5/metric ton (the average value from a distribution that uses a 3-percent discount rate), $62.4/metric ton (the average value from a distribution that uses a 2.5-percent discount rate), and $119/metric ton (the 95th-percentile value from a distribution that uses a 3-percent discount rate). The values for later years are higher due to increasing damages (emissions-related costs) as the projected magnitude of climate change increases.

Table V.26 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, and these results are presented in chapter 14 of the NOPR TSD.

Table V.26. Estimates of Global Present Value of CO_2 Emissions Reduction for Residential Dehumidifier Trial Standard Levels

TSL	SCC Case*			
	5% discount rate, average	3% discount rate, average	2.5% discount rate, average	3% discount rate, 95th percentile
	Million 2013$			
Power Sector Emissions				
1	29.5	132.8	210.0	409.9
2	46.2	208.7	330.3	644.4
3	130.3	592.6	938.9	1,831.0
4	310.8	1,426.6	2,264.4	4,411.2
Upstream Emissions				
1	1.6	7.2	11.3	22.1
2	2.5	11.3	18.0	35.0
3	7.1	32.4	51.5	100.4
4	17.0	78.9	125.6	244.4
Total FFC Emissions				
1	31.1	140.0	221.4	432.0
2	48.6	220.1	348.3	679.4
3	137.3	625.0	990.5	1,931.3
4	327.8	1,505.6	2,390.0	4,655.6

* For each of the four cases, the corresponding SCC value for emissions in 2015 is $12.0, $40.5, $62.4, and $119 per metric ton (2013$).

DOE is well aware that scientific and economic knowledge about the contribution of CO_2 and other GHG emissions to changes in the future global climate and the potential resulting damages to the world economy continues to evolve rapidly. Thus, any value used to represent the reduction of 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 process.

DOE also estimated the cumulative monetary value of the economic benefits associated with NO_X emissions reductions anticipated to result from amended standards for residential dehumidifiers. The dollar-per-ton values that DOE used are discussed in section IV.L of this notice. Table V.27 presents the cumulative present values for each TSL calculated using 7-percent and 3-percent discount rates.

Table V.27. Estimates of Present Value of NO_X Emissions Reduction under Residential Dehumidifiers Trial Standard Levels

TSL	3% discount rate	7% discount rate
	Million 2013$	
Power Sector Emissions		
1	11.9	5.4
2	18.6	8.3
3	52.4	22.8
4	125.0	52.9
Upstream Emissions		
1	11.4	4.9
2	18.0	7.6
3	51.4	21.2
4	124.5	49.9
Total FFC Emissions		
1	23.3	10.2
2	36.5	15.9
3	103.7	44.0
4	249.5	102.7

7. 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 customer savings calculated for each TSL considered in this rulemaking. Table V.28 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 customer 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.28. Net Present Value of Customer Savings Combined with Present Value of Monetized Benefits from CO_2 and NO_X Emissions Reductions

TSL	Customer NPV at 3% Discount Rate added with:			
	SCC Case $12.0/metric ton CO_2* and Medium Value for NO_X	SCC Case $40.5/metric ton CO_2* and Medium Value for NO_X	SCC Case $62.4/metric ton CO_2* and Medium Value for NO_X	SCC Case $119/metric ton CO_2* and Medium Value for NO_X
	Billion 2013$			
1	0.6	0.7	0.7	1.0
2	0.9	1.0	1.2	1.5
3	2.5	3.0	3.4	4.3
4	5.5	6.7	7.6	9.9
TSL	Customer NPV at 7% Discount Rate added with:			
	SCC Case $12.0/metric ton CO_2* and Medium Value for NO_X	SCC Case $40.5/metric ton CO_2* and Medium Value for NO_X	SCC Case $62.4/metric ton CO_2* and Medium Value for NO_X	SCC Case $119/metric ton CO_2* and Medium Value for NO_X
	Billion 2013$			
1	0.3	0.4	0.5	0.7
2	0.4	0.6	0.7	1.1
3	1.2	1.7	2.1	3.0
4	2.6	3.7	4.6	6.9

* For each of the four cases, the corresponding SCC value for emissions in 2015 is $12.0, $40.5, $62.4, and $119 per metric ton (2013$).

Although adding the value of customer savings to the values of projected emission reductions provides a valuable perspective, two issues should be considered. First, the national operating cost savings are domestic U.S. customer 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 equipment shipped in 2019

to 2048. The SCC values, on the other hand, reflect the present value of future climate-related impacts resulting from the emission of one metric ton of CO_2 in each year. These impacts continue well beyond 2100.

8. 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)) DOE did not consider any other factors for this NOPR.

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 efficiency level that is both technologically feasible and economically justified and saves a significant amount of energy.

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.1.b).

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.[67]

While DOE is not prepared at present to provide a fuller quantifiable framework for estimating the benefits and costs of changes in consumer purchase decisions due to an energy conservation standard, DOE is committed to developing a framework that can support empirical quantitative tools for improved assessment of the consumer welfare impacts of appliance standards. DOE has posted a paper that discusses the issue of

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

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.[68] 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 Residential Dehumidifiers

Table V.29 and Table V.30 summarize the quantitative impacts estimated for each TSL for residential dehumidifiers. The efficiency levels contained in each TSL are described in section IV.A of this this.

[68] 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.29 Residential Dehumidifier Trial Standard Levels: National Impacts

Category	TSL 1	TSL 2	TSL 3	TSL 4
Cumulative FFC Energy Savings quads				
	0.07	0.11	0.32	0.79
NPV of Customer Benefits 2013$ billion				
3% discount rate	0.50	0.78	2.27	4.96
7% discount rate	0.24	0.37	1.04	2.13
Cumulative FFC Emissions Reduction				
CO_2 (million metric tons)	4.27	6.75	19.31	47.05
NO_X (thousand tons)	6.33	10.03	28.79	70.40
Hg (tons)	0.01	0.02	0.05	0.12
N_2O (thousand tons)	0.06	0.09	0.26	0.63
N_2O (thousand tons CO_2eq*)	15.02	23.84	68.57	168.12
CH_4 (thousand tons)	18.70	29.75	85.88	211.44
CH_4 (thousand tons CO_2eq*)	523.57	833.12	2,404.57	5,920.22
SO_2 (thousand tons)	3.56	5.61	15.95	38.60
Value of Emissions Reduction				
CO_2 (2013$ million)**	31 to 432	49 to 679	137 to 1,931	328 to 4,656
NO_X – 3% discount rate (2013$ million)	23.3	36.5	103.7	249.5
NO_X – 7% discount rate (2013$ million)	10.2	15.9	44.0	102.7

Parentheses indicate negative (-) values.

* 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.30 Residential Dehumidifier Trial Standard Levels: Manufacturer and Consumer Impacts

Category	TSL 1	TSL 2	TSL 3	TSL 4
Manufacturer Impacts				
Industry NPV (2013$ millions) (Base Case INPV = 186.5)	184.0 to 183.5	183.4 to 182.1	155.2 to 151.6	146.3 to 126.8
Industry NPV (% change)	(1.4%) to (1.6%)	(1.6%) to (2.4%)	(16.8%) to (18.7%)	(21.6%) to (32.0%)
Consumer Average LCC Savings (2013$)				
PC1 (≤30.00 pints/day)	31	49	64	137
PC2 (30.01 – 45.00 pints/day)	0	0	99	164
PC3 (>45.00 pints/day)	50	147	147	239
PC4 (≤ 8.0 ft^3)	207	207	207	302
PC5 (>8.0 ft^3)	75	416	416	542
Consumer Simple PBP (years)				
PC1 (≤30.00 pints/day)	0.0	0.1	0.2	0.6
PC2 (30.01 – 45.00 pints/day)	0.0	0.1	0.2	0.5
PC3 (>45.00 pints/day)	4.3	2.8	2.8	3.8
PC4 (≤ 8.0 ft^3)	1.3	1.3	1.3	5.5
PC5 (>8.0 ft^3)	0.7	1.4	1.4	4.0
% of Consumers that Experience Net Cost				
PC1 (≤30.00 pints/day)	0%	0%	0%	10.3%
PC2 (30.01 – 45.00 pints/day)	0%	0%	0.5%	5.4%
PC3 (>45.00 pints/day)	18.9%	11.7%	11.7%	31.4%
PC4 (≤ 8.0 ft^3)	8.4%	8.4%	8.4%	44.4%
PC5 (>8.0 ft^3)	1.4%	10.7%	10.7%	39.9%

Parentheses indicate negative (-) values.

DOE first considered TSL 4, which represents the max-tech efficiency levels. TSL 4 would save 0.79 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be $2.13 billion using a discount rate of 7 percent, and $4.96 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 47.1 Mt of CO_2, 70.4 thousand tons of NO_X, 38.6 thousand tons of SO_2, 0.12 ton of Hg, 0.6 thousand tons of N_2O, and

211.4 thousand tons of CH_4. The estimated monetary value of the CO_2 emissions reductions at TSL 4 ranges from $328 million to $4,656 million.

At TSL 4, the average LCC impact is a savings of $137 for PC1, $134 for PC2, $239 for PC3, $302 for PC4, and $542 for PC5. The simple PBP is 0.6 years for PC1, 0.5 years for PC2, 3.8 years for PC3, 5.5 years for PC4, and 4.0 years for PC5. The fraction of consumers experiencing a net LCC cost is 10.3 percent for PC1, 5.4 percent for PC2, 31.4 percent for PC3, 44.4 percent for PC4, and 39.9 percent for PC5.

At TSL 4, the projected change in INPV ranges from a decrease of $40.2 million to a decrease of $59.7 million, which correspond to decreases of 21.6 percent and 32.0 percent, respectively. Products that meet the efficiency standards specified by this TSL are forecast to represent less than 2 percent of shipments. As such, manufacturers would have to redesign nearly all products by the expected 2019 projected compliance date to meet demand. Redesigning all units to meet the current max-tech efficiency levels would require considerable capital and product conversion expenditures. At TSL 4, the capital conversion costs total as much as $33.1 million, 3.0 times the industry annual ordinary capital expenditure in 2018 (the year leading up to amended standards). DOE estimates that complete platform redesigns would cost the industry $48.1 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 8.9 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 32.0 percent of INPV.

Beyond the direct financial impact on manufacturers, TSL 4 may also contribute to the potential unavailability of products at certain capacities across the five product classes. The efficiencies at TSL 4 are theoretical levels that DOE determined dehumidifiers could achieve by incorporating the most efficient type of each component. DOE is not aware of any dehumidifiers currently available on the market that achieve the TSL 4 efficiencies. To meet TSL 4, all products would be required to incorporate the highest efficiency compressors; however, manufacturers indicated that few such compressors are available in the range of compressor capacities suitable for residential dehumidifiers, and it is unlikely that substantially more would become available if standards at TSL 4 were adopted. In addition, the specific compressor capacities available at any given time are driven largely by the markets for other products with higher shipments (e.g., room air conditioners), and thus dehumidifier manufacturers may be constrained in their design choices. Because DOE assumed manufacturers would

optimize all components at TSL 4, including the use of larger heat exchangers and permanent-magnet blower motors, manufacturers would not have alternative design pathways to achieve the max-tech efficiency level in the absence of high efficiency compressors. Therefore, DOE expects that those dehumidifier platforms for which a suitable high efficiency compressor is not available would be unable to meet the max-tech efficiency level associated with TSL 4. While this would likely not eliminate entire product classes from the market, it has the potential to eliminate dehumidifiers of certain capacities within a given product class. The potential for this impact on manufacturers of high-capacity portable and whole-home dehumidifiers is exacerbated by this segment's low production volumes, which limits manufacturers' ability to influence the availability of higher efficiency components from their vendors.

The Secretary tentatively concludes that at TSL 4 for residential dehumidifiers, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the CO_2 emissions reductions would be outweighed by the economic burden on some consumers, the potential impact on product availability, 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. However, if this situation were to change in the future, such that components could be made available in sufficient quantities to sustain higher production volumes across the range of product classes, DOE would consider TSL 4.

DOE then considered TSL 3, which would save an estimated 0.32 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be $1.04 billion using a discount rate of 7 percent, and $2.27 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 19.3 Mt of CO_2, 28.8 thousand tons of NO_X, 16.0 thousand tons of SO_2, 0.05 tons of Hg, 0.3 thousand tons of N_2O, and 85.9 thousand tons of CH_4. The estimated monetary value of the CO_2 emissions reductions at TSL 3 ranges from $137 million to $1,931 million.

At TSL 3, the average LCC impact is a savings of $64 for PC1, $99 for PC2, $147 for PC3, $207 for PC4, and $416 for PC5. The simple PBP is 0.2 years for PC1 and PC2, 2.8 years for PC3, 1.3 years for PC4, and 1.4 years for PC5. The fraction of consumers experiencing a net LCC cost is zero percent for PC1, 0.5 percent for PC2, 11.7 percent for PC3, 8.4 percent for PC4, and 10.7 percent for PC5.

At TSL 3, the projected change in INPV ranges from a decrease of $31.3 million to a decrease of $34.9 million, which correspond to decreases of 16.8 percent and 18.7 percent, respectively. Products that meet the efficiency standards specified at this TSL level represent 37 percent of shipments in 2018 (the year leading up to amended standards). As such, manufacturers would have to overhaul a significant fraction of products by the 2019 projected compliance date to meet demand. Redesigning significant component systems or developing entirely new platforms to meet the

efficiency levels specified by this TSL would require considerable capital and product conversion expenditures. At TSL 3, the estimated capital conversion costs total as much as $20.5 million, which is 1.8 times the industry annual capital expenditure in 2018 (the year leading up to the amended standards). DOE estimates that the redesigns necessary to meet these standards would cost the industry $30.2 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 5.6 times the industry annual budget for research and development in 2018, the year leading up to amended 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 (manufacturer capital pools), 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 18.7 percent in INPV to manufacturers of residential dehumidifiers.

Although some dehumidifiers may require higher efficiency compressors, the preservation of per-unit operating profit markup scenario efficiency levels specified at TSL 3 offer manufacturers multiple design pathways to meet the standard. This in turn offers manufacturers flexibility in meeting standards at this level and maintaining product offerings at certain capacities should a high efficiency compressor be unavailable at a

given compressor capacity. To this end, units are already available that meet the efficiency levels specified at TSL 3.

The Secretary tentatively concludes that at TSL 3 for residential dehumidifiers, the benefits of energy savings, positive NPV of consumer benefits, emission reductions, estimated monetary value of the CO_2 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.

After considering the analysis and the benefits and burdens of TSL 3, the Secretary tentatively concludes that this TSL will offer the maximum improvement in energy efficiency that is technologically feasible and economically justified, and will result in significant conservation of energy without eliminating or making unavailable any product classes or portions of product classes. Therefore, DOE today proposes to adopt TSL 3 for residential dehumidifiers. The proposed amended energy conservation standards for residential dehumidifiers, which are expressed as a minimum allowable IEF, are shown in Table V.31.

Table V.31 Proposed Amended Energy Conservation Standards for Residential Dehumidifiers

Portable Dehumidifier Product Capacity (pints/day)	**Minimum Integrated Energy Factor** (L/kWh)
30.00 or less	1.30
30.01–45.00	1.60
45.01 or more	2.80
Whole-Home Dehumidifier Product Case Volume (cubic feet)	
8.0 or less	2.09
More than 8.0	3.52

DOE requests comments on the proposed standards as well as any information or data that the agency should consider in adopting either a lower or higher TSL.

2. Summary of Benefits and Costs (Annualized) of the 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 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, which is another way of representing consumer NPV), and (2) the monetary value of the benefits of CO_2 and NO_X emission reductions.[69]

[69] 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 2014. 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 V.22. 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.

Table V.32 shows the annualized values for residential dehumidifiers under TSL 3, expressed in 2013$. 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 SCC series corresponding to a value of $40.5/ton in 2015 (in 2013$), the estimated cost of the proposed standards for residential dehumidifiers is $12.6 million per year in increased equipment costs, while the estimated annualized benefits are $122 million per year in reduced equipment operating costs, $35.9 million per year in CO_2 reductions, and $4.6 million per year in reduced NO_X emissions. In this case, the net benefit amounts to $150 million per year.

Using a 3-percent discount rate for all benefits and costs and the SCC series corresponding to a value of $40.5/ton in 2015 (in 2013$), the estimated cost of the proposed standards for residential dehumidifiers in today's rule is $12.5 million per year in increased equipment costs, while the benefits are $142.7 million per year in reduced operating costs, $35.9 million per year in CO_2 reductions, and $6.0 million per year in reduced NO_X emissions. In this case, the net benefit amounts to $172 million per year.

Table V.32 Annualized Benefits and Costs of Proposed Amended Standards (TSL 3) for Residential Dehumidifiers Sold in 2019–2048

	Discount Rate	Primary Estimate*	Low Net Benefits Estimate*	High Net Benefits Estimate*
		Million 2013$/year		
Benefits				
Consumer Operating Cost Savings	7%	122.0	116.8	126.3
	3%	142.7	136.3	149.2
CO_2 Reduction at $12.0/t**	5%	10.9	10.7	11.1
CO_2 Reduction at $40.5/t**	3%	35.9	35.3	36.7
CO_2 Reduction at $62.4/t**	2.5%	52.2	51.4	53.4
CO_2 Reduction at $119/t**	3%	110.9	109.2	113.4
NO_X Reduction†	7%	4.65	4.59	4.73
	3%	5.96	5.86	6.09
Total Benefits††	7% plus CO_2 range	138 to 238	132 to 231	142 to 244
	7%	163	157	168
	3% plus CO_2 range	160 to 260	153 to 251	166 to 269
	3%	185	177	192
Costs				
Consumer Incremental Product Costs	7%	12.6	12.3	13.7
	3%	12.5	12.0	13.9
Total Net Benefits				
Total††	7% plus CO_2 range	125 to 225	120 to 218	128 to 231
	7%	150	144	154
	3% plus CO_2 range	147 to 247	141 to 239	152 to 255
	3%	172	165	178

* The results include benefits to consumers which accrue after 2048 from the dehumidifiers purchased from 2019 through 2048. Costs incurred by manufacturers, some of which may be incurred prior to 2019 in preparation for the rule, are not directly included, but are indirectly included as part of incremental equipment costs. The extent of the costs and benefits will depend on the projected price trends of dehumidifiers, as the consumer demand for dehumidifiers is a function of dehumidifier prices. The Primary, Low Benefits, and High Benefits Estimates utilize forecasts of energy prices and housing starts from the AEO 2015 Reference case, Low Estimate, and High Estimate, respectively. In addition, incremental product costs reflect a medium decline rate for projected product price trends 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.F.1 of this notice.

** The CO_2 values represent global values (in 2013$) of the social cost of CO_2 emissions in 2013 under several scenarios. The values of $12.0, $40.5, and $62.4 per ton are the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The value of $119 per ton represents the 95th percentile of the SCC distribution calculated using a 3% discount rate.

† The $/ton values used for NO_X are described in section IV.L.2.

†† Total Benefits for both the 3% and 7% cases are derived using the SCC value calculated at a 3% discount rate, which is $40.5/ton in 2015 (in 2013$). In the rows labeled as "7% plus CO_2 range" and "3% plus CO_2 range," the operating cost and NO_X benefits are calculated using the labeled discount rate, and those values are added to the full range of CO_2 values.

VI. 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 this proposed standards 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 residential dehumidifiers that are not captured by the users of such equipment. These benefits include externalities related to public health, environmental protection, and national security that are not reflected in energy prices, such as reduced emissions of air pollutants and greenhouse gases that impact human health and global warming.

In addition, DOE has determined that today's regulatory action is a "significant regulatory action" under section (3)(f)(1) of Executive Order 12866. Accordingly, section 6(a)(3) of the Executive Order requires that DOE prepare a regulatory impact analysis (RIA) on this rule and that OIRA in OMB review this rule. DOE presented to OIRA for review the draft rule and other documents prepared for this rulemaking, including the RIA, and has included these documents in the rulemaking record. The assessments prepared pursuant to Executive Order 12866 can be found in the technical support document for this rulemaking.

DOE has also reviewed this regulation pursuant to Executive Order 13563. 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.

1. Description and Estimated Number of Small Entities Regulated

a. Methodology for Estimating the Number of Small Entities

For the manufacturers of residential dehumidifiers, 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. 65 FR 30836, 30848 (May 15, 2000), as amended at 65 FR 53533, 53544 (Sept. 5, 2000) and codified at 13 CFR part 121. The size standards are listed by NAICS code and industry description and are available at: www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf. Manufacturing of whole-home residential dehumidifiers is classified under NAICS codes

333415: Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing, whereas manufacturing of portable residential dehumidifiers is classified under 335210: Small Electrical Appliance Manufacturing. The SBA sets a threshold of 750 employees or less for an entity to be considered as a small business for either of these categories.

To estimate the number of companies that could be small business manufacturers of products covered by this rulemaking, DOE conducted a market survey using available public information to identify potential small manufacturers. DOE's research included searches of public databases (e.g., DOE's Compliance Certification Database,[70] the SBA Database[71]), individual company websites, and market research tools (e.g., Hoovers website[72]) to create a list of companies that manufacture or sell products covered by this rulemaking. DOE also asked stakeholders and industry representatives if they were aware of any other small manufacturers during manufacturer interviews and at DOE public meetings. DOE reviewed publicly-available data and contacted select companies on its list, as necessary, to determine whether they met the SBA's definition of a small business manufacturer of covered residential dehumidifiers. DOE screened out companies that do not manufacture products covered by this rulemaking, do not meet the definition of a "small business," or are foreign owned and operated.

[70] See http://www.regulations.doe.gov/certification-data/.
[71] See http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm.
[72] See http://www.hoovers.com/.

DOE initially identified 25 manufacturers of residential dehumidifier products sold in the U.S. DOE then determined that of the 25 companies, 20 were either large manufacturers, exclusively import products manufactured overseas, or are foreign owned and operated. DOE identified the remaining five manufacturers as domestic manufacturers that meet the SBA's definition of a "small business" and manufacture products covered by this rulemaking.

b. Manufacturer Participation

Before issuing this Notice, DOE attempted to contact all the small business manufacturers of residential dehumidifiers identified. DOE was only able to establish contact with two small business manufacturers, both of which consented to being interviewed as part of the manufacturing impact analysis. DOE also obtained information about small business impacts while interviewing large manufacturers.

c. Industry Structure

The five domestic small business manufacturers of residential dehumidifiers identified account for a small fraction of total industry shipments. In 2014, 96.8 percent of residential dehumidifiers sold in the U.S. are small portable units (belonging to product classes 1 and 2) and are made by large, diversified manufacturers. The remaining 3.2 percent of the market consists of high-capacity portable and whole-home dehumidifiers, which are primarily manufactured by small business manufacturers.

d. Comparison of Large and Small Entities

Several factors may contribute to a disproportionate burden on small business manufacturers from amended energy conservation standards for residential dehumidifiers relative to their larger counterparts. One way in which small manufacturers could be at a disadvantage is that they may be disproportionately affected by product and capital conversion costs. Product redesign, testing, and certification costs tend to be fixed per basic model and do not scale with sales volume. Both large and small business manufacturers must make investments in R&D to redesign their products, but small businesses lack the sales volumes to sufficiently recoup these upfront investments without substantially marking up their products. Similarly, upfront capital investments in new manufacturing capital for platform redesigns, as well as depreciated manufacturing capital, can only be spread across a lower volume of shipments for small business manufacturers.

In addition, because small business manufacturers typically have fewer engineers than large manufacturers, they must allocate a greater portion of their available human resources to meet an amended regulatory standard. Because engineers may need to spend more time redesigning and testing existing models as a result of the amended standard, they may have less time to develop new products.

Furthermore, smaller manufacturers may lack the purchasing power of larger manufacturers. For example, because fan motor suppliers give volume discounts to manufacturers based on the number of motors they purchase, larger manufacturers may

have a pricing advantage because they make higher volume purchases. This purchasing power difference between high-volume and low-volume orders applies to other residential dehumidifier components as well, including compressors and heat exchangers. DOE expects that certain larger manufacturers of lower-capacity portable dehumidifiers may even manufacture heat exchangers in-house. Additionally, because small business manufacturers produce higher-capacity units, they require larger/custom components (e.g., larger compressors and heat exchangers), than do the lower-capacity portable product manufacturers who account for the majority of the dehumidifier market. Because of the low-volume nature of the high-capacity portable and whole-home dehumidifier market, certain technological improvements to components may only be developed for lower-capacity portable products, or with significant lag time for application in high-capacity portable and whole-home dehumidifier products.

In terms of access to the capital required to cover the conversion costs associated with reaching the proposed standards, small business manufacturers would likely be forced to take on additional debt, whereas larger diversified manufacturers of small portable products would be better equipped to fund purchases with existing cash flow from operations. Additionally, since the recession of 2007 and 2008, small business lending has dropped substantially due to a combination of tightened lending standards, increasing collateral requirements and reduced focus on small business credit markets. Thus, small businesses generally have access to less capital than do larger companies.

2. Description and Estimate of Compliance Requirements

Since the standards in today's proposed rule for residential dehumidifiers could cause small manufacturers to be at a disadvantage relative to large manufacturers, DOE cannot certify that the proposed standards would not have a significant impact on a significant number of small businesses, and consequently, DOE has prepared this IRFA.

DOE estimates that the impacts on small business manufacturers are significantly disproportionate at TSLs 1 and 2, and relatively proportionate at TSLs 3 and 4. At TSL 3, the level proposed in today's notice, DOE estimates capital conversion costs of $1.7 million and product conversion costs of $5.0 million in the years leading up to the standard year for a typical small manufacturer. This is compared to capital conversion costs of $18.8 and product conversion costs of $25.2 million in the years leading up to the standard year for a typical large manufacturer. These costs and their impacts are described in detail below.

To estimate the potential impact on small business manufacturers, DOE used the GRIM results for high-capacity portables and whole-home dehumidifiers (product classes 3-5) to estimate the annual revenue, EBIT, capital expenditure, and R&D expense for a typical small manufacturer. DOE then compared these costs to the required product conversion costs at each TSL for both an average small manufacturer and an average large manufacturer. Table VI.1 and Table VI.2 show the capital and product conversion costs for a typical small manufacturer versus those of a typical large manufacturer. Table VI.3 and Table VI.4 report the total conversion costs as a percentage of annual R&D

expense, annual revenue, and EBIT for a typical small and large manufacturer, respectively. In the following tables, TSL 3 represents the proposed standard.

Table VI.1 Comparison of Typical Small and Large Manufacturer's Capital Conversion Costs

Trial Standard Level	Capital Conversion Costs for Typical Small Manufacturer (2013$ millions)	Capital Conversion Costs for Typical Large Manufacturer (2013$ millions)
TSL 1	$1.3	$-
TSL 2	$1.7	$-
TSL 3	$1.7	$18.8
TSL 4	$2.2	$30.9

Table VI.2 Comparison of Typical Small and Large Manufacturer's Product Conversion Costs

Trial Standard Level	Product Conversion Costs for Typical Small Manufacturer (2013$ millions)	Product Conversion Costs for Typical Large Manufacturer (2013$ millions)
TSL 1	$3.9	$0.04
TSL 2	$5.0	$0.05
TSL 3	$5.0	$25.2
TSL 4	$6.6	$41.5

Table VI.3 Impacts of Conversion Costs on a Typical Small Manufacturer

Trial Standard Level	Capital Conversion Cost as a Percentage of Annual Capital Expenditures	Product Conversion Cost as a Percentage of Annual R&D Expense	Total Conversion Cost as a Percentage of Annual Revenue	Total Conversion Cost as a Percentage of Annual EBIT
TSL 1	130%	774%	14%	235%
TSL 2	167%	1002%	18%	304%
TSL 3	167%	1002%	18%	304%
TSL 4	222%	1328%	23%	403%

*Note: Annual Capex, R&D, Revenues, and EBIT figures are for 2014.

Table VI.4 Impacts of Conversion Costs on a Typical Large Manufacturer

Trial Standard Level	Capital Conversion Cost as a Percentage of Annual Capital	Product Conversion Cost as a Percentage of Annual R&D	Total Conversion Cost as a Percentage of	Total Conversion Cost as a Percentage of

	Expenditures	Expense	Annual Revenue	Annual EBIT
TSL 1	0%	1%	0%	0%
TSL 2	0%	1%	0%	0%
TSL 3	219%	600%	14%	229%
TSL 4	359%	988%	22%	377%

*Note: Annual Capex, R&D, Revenues, and EBIT figures are for 2014.

Based on the above results for TSL 3, DOE understands that the potential conversions costs faced by small manufacturers may be greater than those faced by larger manufacturers. However, the disproportionality of these impacts would be much greater at TSLs 1 and 2. Small manufacturers have less engineering staff and lower R&D budgets. They also have lower capital expenditures annually. As a result, the conversion costs incurred by a small manufacturer would likely be a larger percentage of its annual capital expenditures, R&D expenses, revenue, and EBIT, than would be for a large manufacturer.

3. Duplication, Overlap, and Conflict with Other Rules and Regulations

DOE is not aware of any rules or regulations that duplicate, overlap, or conflict with the rule being proposed today.

4. Significant Alternatives to the Rule

The discussion above analyzes the disproportionality of impacts on small businesses that would result from the other TSLs DOE considered. TSLs lower than the proposed TSL would not be expected to significantly reduce the impacts on small businesses, and would actually result in higher disproportionate impacts on small

businesses. As a result, and given that DOE is required by EPCA to establish standards that achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified, DOE rejected the lower TSLs.

In addition to the other TSLs being considered, the NOPR TSD includes a regulatory impact analysis in chapter 17. For residential dehumidifiers, this report discusses the following policy alternatives: (1) no standard, (2) consumer rebates, (3) consumer tax credits, (4) manufacturer tax credits, and (5) early replacement. While these alternatives may mitigate to some varying extent the economic impacts on small entities compared to the standards, DOE determined that the energy savings of these alternatives are significantly smaller than those that would be expected to result from adoption of the proposed standard levels. Accordingly, DOE is declining to adopt any of these alternatives and is proposing the standards set forth in this rulemaking. (See chapter 17 of the NOPR TSD for further detail on the policy alternatives DOE considered.)

Additional compliance flexibilities may be available through other means. For example, individual manufacturers may petition for a waiver of the applicable test procedure. Further, EPCA provides that a manufacturer whose annual gross revenue from all of its operations does not exceed $8,000,000 may apply for an exemption from all or part of an energy conservation standard for a period not longer than 24 months after the effective date of a final rule establishing the standard. Additionally, Section 504 of the Department of Energy Organization Act, 42 U.S.C. 7194, provides authority for the Secretary to adjust a rule issued under EPCA in order to prevent "special hardship,

inequity, or unfair distribution of burdens" that may be imposed on that manufacturer as a result of such rule. Manufacturers should refer to 10 CFR part 430, subpart E, and part 1003 for additional details.

C. Review Under the Paperwork Reduction Act

Manufacturers of residential dehumidifiers must certify to DOE that their products comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their products according to the DOE test procedures for residential dehumidifiers, 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 residential dehumidifiers. 76 FR 12422 (Mar. 7, 2011). 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 20 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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://cxnepa.energy.gov/.

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). 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 small governments. 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.

Although today's proposed rule does not contain a Federal intergovernmental mandate, it may require expenditures of $100 million or more by the private sector. Specifically, the proposed rule will likely result in a final rule that could require expenditures of $100 million or more. Such expenditures may include: (1) investment in research and development and in capital expenditures by residential dehumidifiers 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 residential dehumidifiers, 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 the NOPR and the "Regulatory Impact Analysis" section of the NOPR 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), today's proposed rule would establish energy conservation standards for residential dehumidifiers 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 NOPR TSD for today's proposed rule.

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

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This 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

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

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

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

K. Review Under Executive Order 13211

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

DOE has tentatively concluded that today's regulatory action, which sets forth energy conservation standards for residential dehumidifiers, 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 Web site: http://energy.gov/eere/buildings/downloads/energy-conservation-standards-rulemaking-peer-review-report-0.

VII. 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 notice. 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 with laptop computers and other devices, such as tablets, to be checked upon entry into the building. Any person wishing to bring these devices into the Forrestal 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 ID requirements for individuals wishing to enter Federal buildings from specific states and U.S. territories. Driver's licenses from the following states or territory will not be accepted for building entry and 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:

http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/55. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements For Distribution

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

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule before or after the public meeting, but no later than the date provided in the DATES section at the beginning of this proposed rule. Interested parties may submit comments, data, and other information using any of the methods described in the ADDRESSES section at the beginning of this notice.

Submitting comments via www.regulations.gov. The www.regulations.gov web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

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

Do not submit to www.regulations.gov information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through 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, 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. 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 proposed product classes for residential dehumidifiers: (1) portable, less than 30.00 pints/day; (2) portable, 30.01 to 45.00 pints/day; (3) portable, 45.01 or

more pints /day; (4) whole-home, case volume less than or equal to 8.0 cubic feet; and (5) whole-home, case volume greater than 8.0 cubic feet (see section IV.A.2 of this notice or chapter 3 of the NOPR TSD).

2. Information or data about the availability of dehumidifiers with smart controls, including those currently available on the market or any working prototypes (see section IV.A.3 of this notice or chapter 3 of the NOPR TSD).

3. The efficiency levels considered for this analysis. DOE specifically seeks information from interested parties on whether the revised max-tech levels, which incorporate savings associated with permanent-magnet fan motors, are technologically feasible, and on whether the updated whole-home dehumidifier efficiency levels, which account for the updated test conditions, are appropriate. DOE also seeks comment on potential utility impacts at any of the analyzed efficiency levels (see section IV.C.1 of this notice or chapter 5 of the NOPR TSD).

4. Whether to promote installation of any of the design options, including variable-speed compressors, improved controls, and hygrometers, even though the resulting efficiency gains would not be measurable with the existing test procedure (see section IV.C.2 of this notice of chapter 5 of the NOPR TSD).

5. The determination that manufacturers would likely rely on improved compressor efficiency and increased heat exchanger sizes to achieve efficiencies below the max-tech level, and may incorporate permanent-magnet motors to further

improve efficiency. DOE also requests feedback on the incremental manufacturer production costs DOE estimated at each efficiency level (see section IV.C.2 of this notice or chapter 5 of the NOPR TSD).

6. The inputs to the energy use determination for portable and whole-home dehumidifiers, especially the operating hours by mode for each product type (see section IV.E of this notice or chapter 7 of the NOPR TSD).

7. The base-case efficiency distribution for each product class (see section IV.F.8 of this notice or chapter 8 of the NOPR TSD).

8. Whether the annual efficiency improvement (i.e., 0.25%) that DOE estimated is appropriate for the base-case analysis and if not, a more appropriate approach for DOE to project the base-case and standards-case efficiency distributions for the analysis period (see section IV.F.8 of this notice or chapter 8 of the NOPR TSD).

9. The inputs to the shipments model, particularly historical shipments of whole-home dehumidifiers, and the market share of portable dehumidifiers and whole-home dehumidifiers (see section IV.G of this notice or chapter 9 of the NOPR TSD).

10. Dehumidifier manufacturers that would be considered small businesses and the potential impacts of energy conservation standards on these manufacturers (see sections IV.J and V.B.2.d of this notice or chapter 12 of the NOPR TSD).

11. The proposed standards as well as any information or data that the agency should consider in adopting either a lower or higher TSL.

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this proposed rule.

List of Subjects in 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 May 14, 2015.

_____
David T. Danielson
Assistant Secretary
Energy Efficiency and Renewable Energy

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

PART 430 -- ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

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

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

2. In §430.32, add paragraph (v)(3) to read as follows:

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

* * * * *

(v) * * *

(3) Dehumidifiers manufactured on or after [date 3 years after the publication of the final rule] shall have an integrated energy efficiency ratio that meets or exceeds the following values:

Portable Dehumidifier Product Capacity (pints/day)	**Minimum Integrated Energy Efficiency Factor (liters/kWh)**
30.00 or less	1.30
30.01–45.00	1.60
45.01 or more	2.80
Whole-Home Dehumidifier Product Case Volume (cubic feet)	
8.0 or less	2.09
More than 8.0	3.52

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